

# Leq + x

## Lärmexposition, Ereignishäufigkeiten und Belästigung:

Re-Analyse von Daten zur Belästigung und Schlafstörung durch Fluglärm an  
deutschen und Schweizer Flughäfen

## Anhangsband zum Bericht

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Bochum: Ruhr-Universität Bochum, 30.11.2020

## Leq + x – Re-Analyse von Daten zur Belästigung und Schlafstörung durch Fluglärm an deutschen und Schweizer Flughäfen – Anhangband zum Bericht

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Veröffentlicht im Dezember 2020 unter:

Haubrich, J., Benz, S., Isermann, U. Schäffer, B. Schmid, R., Schreckenberger, D., Wunderli, J.-M. und Guski, R. : Leq+X - Lärmexposition, Ereignishäufigkeiten und Belästigung: Re-Analyse von Daten zur Belästigung und Schlafstörung durch Fluglärm an deutschen und Schweizer Flughäfen. Anhang zum Hauptbericht, Bochum, Ruhr-Universität Bochum, 2020, DOI: 10.46586/rub.164.139.



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# 1 Anhang A: Herleitung akustischer Näherungsbeziehungen

## 1.1 Näherungsweise Berechnung von nicht-energieäquivalenten Dauerschallpegeln (DLR)

Die Definition eines äquivalenten Dauerschallpegels  $L_{Aeq}(k)$  für einen Äquivalenzparameter  $k$  lautet

$$L_{Aeq,T}(k) = k \cdot \lg \left( \frac{t_0}{T} \sum_{i=1}^N 10^{L_{Ae,i}(k)/k} \right). \quad (A-1)$$

Man summiert also den Schallexpositionspegel  $L_{Ae}(k)$  über alle  $N$  Geräusche im Bezugszeitraum  $T$ .

Schreibt man den A-bewerteten Schallexpositionspegel  $L_{Ae}$  auf der Basis des A-bewerteten Maximalpegels  $L_{A,max}$  und einer effektiven Dauer  $t_e$  in der Form

$$L_{Ae}(k) = L_{A,max} + k \cdot \lg \left( \frac{t_e}{t_0} \right), \quad (A-2)$$

so geht der  $L_{Aeq,T}$  nach Gl.(A-1) über in

$$L_{Aeq,T}(k) = k \cdot \lg \left( \frac{t_0}{T} \sum_{i=1}^N 10^{L_{A,max,i}/k} \cdot \frac{t_{e,i}}{t_0} \right) = k \cdot \lg \left( \frac{1}{T} \sum_{i=1}^N 10^{L_{A,max,i}/k} \cdot t_{e,i} \right) \quad (A-3)$$

Bei der Auswertung von NORAH-Daten lag das Problem darin, dass man zwar Informationen über die Maximalpegel  $L_{A,max}$ , nicht aber über die zugehörigen Schallexpositionspegel  $L_{Ae}$  hatte. Was vorlag, waren  $NAT$ -Werte und mittlere Maximalpegel für verschiedene Schwellenwerte  $L_s$  sowie die energieäquivalenten Dauerschallpegel  $L_{Aeq}(k=10)$ .

Setzt man in (A-3) vereinfachend Mittelwerte  $L_{A,max,log}$  und  $\bar{t}_e$  über alle Geräusche ein, so kann man den Dauerschallpegel wie folgt berechnen:

$$L_{Aeq,T}(k) = k \cdot \lg \left( \frac{N \cdot \bar{t}_e}{T} \cdot 10^{\overline{L_{A,max}/k}} \right) = \overline{L_{A,max}} + k \cdot \lg \left( \frac{N}{T} \bar{t}_e \right) \quad (A-4)$$

Berücksichtigt man nun für die Berechnung des Dauerschallpegels nur Geräusche mit Maximalpegeln über  $L_s$  dB, so entspricht die Bewegungszahl  $N$  gerade dem  $NAT$ -Wert für diese Pegelschwelle und Gleichung (A-4) schreibt sich als

$$L_{Aeq,T,L_s}(k) = \overline{L_{A,max,L_s}} + k \cdot \lg \left( \frac{NAT_{L_s}}{T} \cdot \bar{t}_e \right) \quad (A-5)$$

Die Differenz zweier Dauerschallpegel für unterschiedliche Äquivalenzparameter ergibt sich daraus als

$$L_{Aeq,T,L_s}(k_1) - L_{Aeq,T,L_s}(k_2) = (k_1 - k_2) \cdot \lg \left( \frac{NAT_{L_s}}{T} \cdot \bar{t}_e \right) \quad (A-6)$$

Mit  $k_2=10$  und  $k_1=k$  ergibt sich der damit Dauerschallpegel  $L_{Aeq,T}(k)$  aus dem energieäquivalenten Dauerschallpegel  $L_{Aeq,T}(10)$  als

$$L_{Aeq,T,L_s}(k) = L_{Aeq,T,L_s}(10) + (k-10) \cdot \lg\left(\frac{\bar{t}_e}{T} \cdot NAT_{L_s}\right) \quad (A-7)$$

Der logarithmische Term in (A-7) ergibt sich gemäß Gl.(A-5) aus vorhandenen Größen für  $k = k = 10$  als

$$\lg\left(\frac{\bar{t}_e}{T} \cdot NAT_{L_s}\right) = \frac{L_{Aeq,T,L_s}(10) - \overline{L_{A,max,L_s}}}{10} \quad (A-8)$$

Damit ergibt sich die Differenz  $\Delta L_{Aeq}(k)$  zwischen den Dauerschallpegeln für als

$$\Delta L_{Aeq,T,L_s}(k) = L_{Aeq,T,L_s}(k) - L_{Aeq,T,L_s}(10) = (k-10) \cdot \left(\frac{L_{Aeq,T,L_s}(10) - \overline{L_{A,max,L_s}}}{10}\right) \quad (A-9)$$

bzw.

$$\Delta L_{Aeq,T,L_s}(k) = \frac{k-10}{10} \cdot (L_{Aeq,T,L_s}(10) - \overline{L_{A,max,L_s}}) \quad (A-10)$$

Zur Überprüfung dieses einfachen Modells wurden die Nachberechnungen für die RDF-Studie, die im Rahmen des Projektes durchgeführt wurden, herangezogen: Hier wurden gemittelte Maximalpegel, NAT-Werte und Dauerschallpegel für  $k = 10, 20$  und  $30$  ermittelt. Die Resultat dieser Analyse zeigen Abbildung 1-1 für den Tages- und Abbildung 1-2 für den Nacht- $L_{eq}$ .

Aufgetragen ist hier die Differenz zwischen dem nach Gl.(A-10) abgeschätzten Dauerschallpegel und dem mit einer AzB-Berechnung ermittelten Pegelwert für die Äquivalenzparameter  $20$  und  $30$ . Die Auftragung erfolgt über dem energieäquivalenten Dauerschallpegel  $L_{Aeq}(10)$ <sup>1</sup>.

Die mittleren Maximalpegel wurden hier durch logarithmische Mittelung bestimmt. Nach Erweiterung des verwendeten Rechenprogramms wurde auch eine entsprechende Rechnung mit arithmetisch gemittelten Pegeln durchgeführt. Diese führte allerdings zu einer deutlich schlechteren Anpassung. Primär dürfte dies damit zusammenhängen, dass eine arithmetische Mittelung mit zunehmender Breite der Maximalpegelverteilung immer „instabiler“ im Vergleich zu einer logarithmischen Mittelung wird, bei der der Mittelwert durch die hohen Pegel bestimmt wird. Außerdem basiert ein Dauerschallpegel auf einer (vergleichbaren) logarithmischen Summation.

Tendenziell liefert die erarbeitete Näherung für energieäquivalente Dauerschallpegel von  $50$  dB für den Tag und  $45$  dB für die Nacht für den Flughafen Frankfurt bei einem Äquivalenzparameter von  $20$  eine gute Übereinstimmung mit der vollständigen Berechnung. Für  $k = 30$  ist die Übereinstimmung schlechter.

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<sup>1</sup> Bei der Berechnung der energieäquivalenten Dauerschallpegel wurde keine Maximalpegelschwelle mit einbezogen, es gingen also alle Geräusche in die Berechnung ein, wie es auch bei den NORAH-Berechnungen der Fall war. Bei einer Pegelschwelle von  $50$  dB sind die damit verbundenen Überschätzungen des Dauerschallpegels aber erfahrungsgemäß kleiner als  $0.5$  dB.

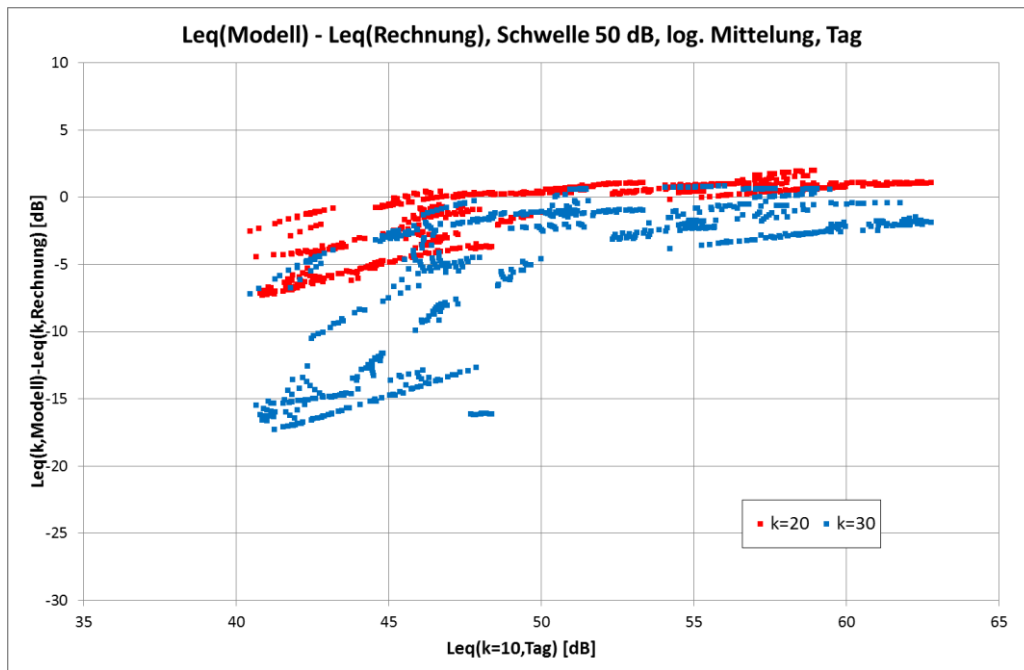


Abbildung 1-1: Differenzen zwischen dem nach Gl.(A-10) näherungsweise ermittelten  $L_{eq,Tag}(k)$  und dem durch eine AzB-Rechnung berechneten Wert für die Nachberechnung der RDF-Studie. Die mittleren Maximalpegel wurden für eine Pegelschwelle von 50 dB berechnet.

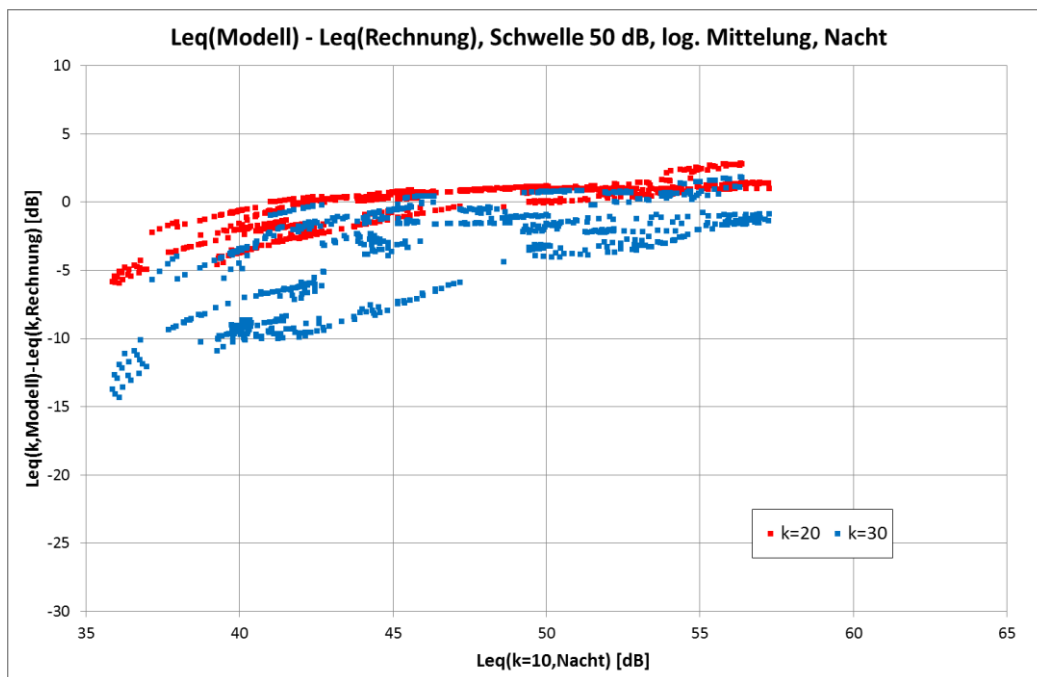


Abbildung 1-2: Differenzen zwischen dem nach Gl.(A-10) näherungsweise ermittelten  $L_{eq,Nacht}(k)$  und dem durch eine AzB-Rechnung berechneten Wert für die Nachberechnung der RDF-Studie. Die mittleren Maximalpegel wurden für eine Pegelschwelle von 50 dB berechnet.

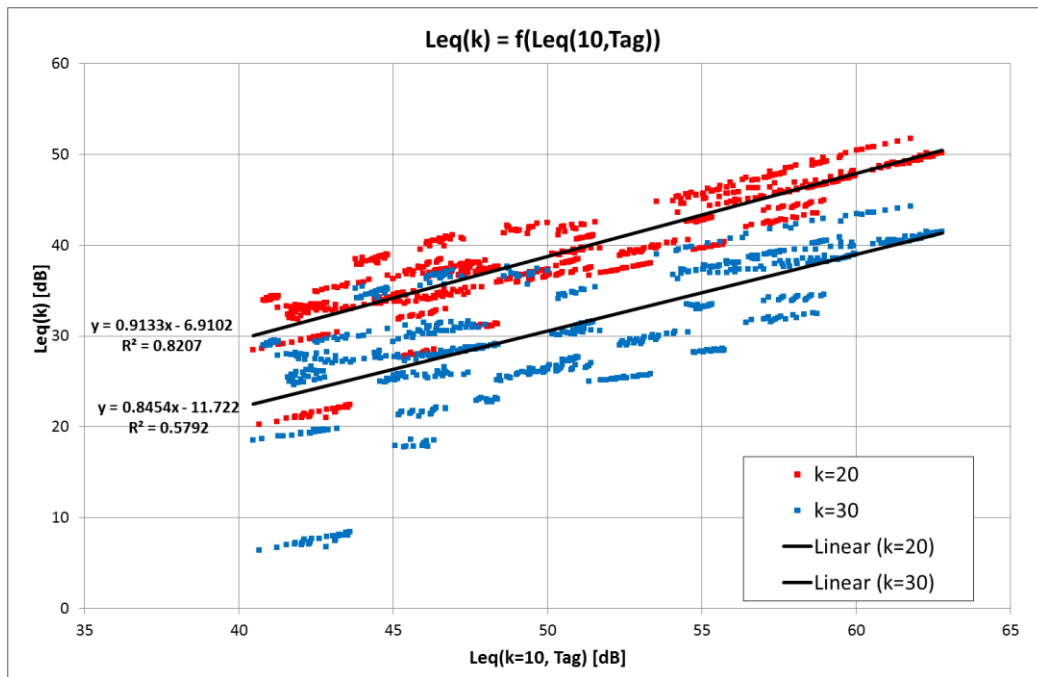


Abbildung 1-3: Zusammenhang zwischen energieäquivalentem und nicht-energieäquivalentem Dauerschallpegel für den Tag (AzB-Nachberechnung RDF-Studie)

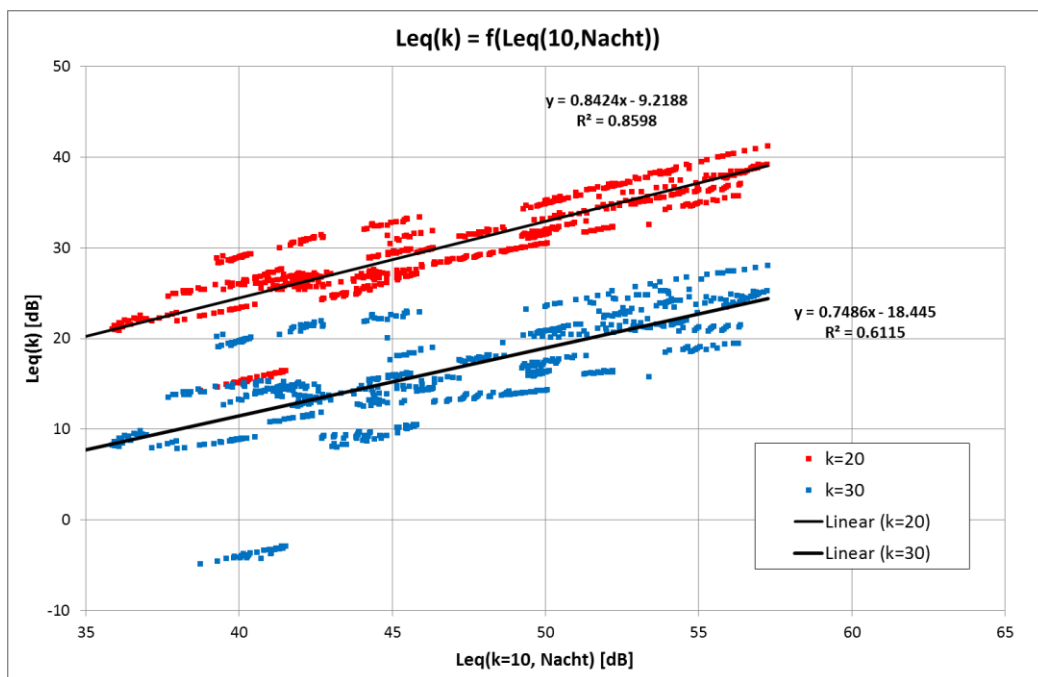


Abbildung 1-4: Zusammenhang zwischen energieäquivalentem und nicht-energieäquivalentem Dauerschallpegel für die Nacht (AzB-Nachberechnung RDF-Studie)

In den Abbildung 1-3 und Abbildung 1-4 sind die nicht-energieäquivalenten Dauerschallpegel mit dem  $L_{Aeq}(10)$  für Tag und Nacht verglichen. Man erkennt bei den Darstellungen Bandstrukturen, die sich unterschiedlichen Einflüssen, insbesondere einzelnen Flugstrecken, zuordnen lassen. Hierzu werden zukünftige Untersuchungen geplant.

Die Näherungsrechnungen sind zwar für Frankfurt durchgeführt, die Ergebnisse dürften aber auf die anderen im Rahmen von NORAH untersuchten Flughäfen anwendbar sein: Dort lagen die Untersuchungsbereiche näher am Flughafen und damit tendenziell bei höheren mittleren Maximalpegeln. Das ist der Bereich, in dem die Näherungsformel eine gute Anpassung liefert – d.h. Korrektur kann bei diesen Flughäfen auch niedrigere  $L_{Aeq(10)}$ -Werte angewendet werden.

## 1.2 Berechnung der mittleren Maximalschallpegel (Empa)

### 1.2.1 Berechnungsverfahren gemäß Leitfaden Fluglärm<sup>2</sup>

Für den  $L_{AS,max,log,L_S}$  oberhalb einer Lärmschwelle  $L_S$  werden die  $\bar{L}_{AS,max,j}$ -Footprints (d.h. mittlere Maximalpegel pro Typ  $j$  und Route) energetisch gemittelt. Dazu werden sie mit den Bewegungszahlen pro Flugzeugtyp  $j$  und Route  $k$  ( $N_{j,k}$ ) sowie mit dem Gewichtungsfaktoren  $WT_{j,k}$  gewichtet, welcher sich daraus berechnet, wie weit der Wert des  $\bar{L}_{AS,max,j,k}$ -Footprints am jeweiligen Gitterpunkt über oder unter der Lärmschwelle  $L_S$  liegt:

$$WT_{j,k} = 0.5 \times ERF \left( \frac{\bar{L}_{AS,max,j,k} - L_S}{\sqrt{2} \times s_{LAS,max}} \right), \quad (A-1)$$

wobei die Standardabweichung der Maximalpegel der Einzelereignisse  $s_{LAS,max} = 2$  dB gesetzt wird und ERF die Error-Funktion ist, d.h. die integrierte Gaußverteilung für  $L_S$  und  $s_{LAS,max}$ . Die resultierende Verteilfunktion von  $WT_{j,k}$  in Abhängigkeit von  $\bar{L}_{AS,max,j,k}$  (pro Gitterpunkt) ist in Abbildung 1-5 exemplarisch für  $L_S = 68$  dB dargestellt. Die Summe aller im Szenario verwendeter Gewichtungsfaktoren ( $N_{j,k} \times WT_{j,k}$ ) pro Gitterpunkt fällt unterschiedlich aus, da der Maximalpegel und somit auch  $WT_{j,k}$  an jedem Punkt anders ist.

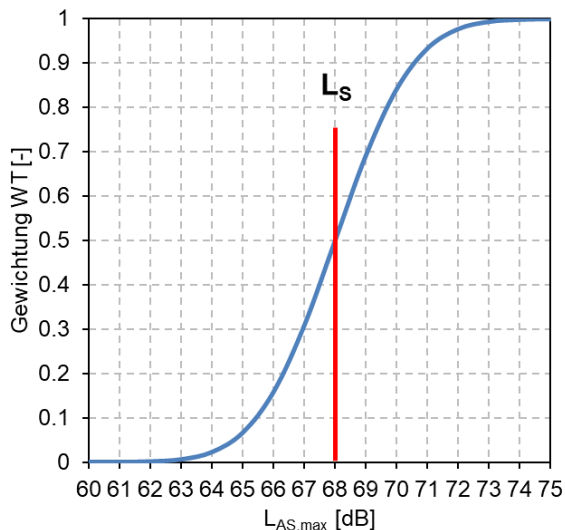


Abbildung 1-5. Gewichtungsfaktor  $WT$  zur Ermittlung des mittleren Maximalpegels  $L_{AS,max}$  im Beispiel für  $L_S = 68$  dB und  $s_{LAS,max} = 2$  dB.

<sup>2</sup> Vorgehen gemäss Leitfaden Fluglärm (S. 27) (BAFU et al., 2016), SANC-TE-Dokumentation (S. 37) (Krebs et al., 2014) und ECAC Doc.29 (Abschnitte 5.3 und 5.4) (ECAC, 2016).



Aus FLULA2-Simulationen liegen die  $\bar{L}_{AS,max,j}$ -Footprints für die Flughäfen GVA und ZRH aus Radardaten pro Typ und Route vor (logarithmisch gemittelter  $L_{AS,max}$  aller berechneten Einzelflüge eines Typen auf einer bestimmten Route), für den Flughafen BSL hingegen aus idealisierte Flugbahnen pro Typ und Flugbahn vor (d.h. für jede einzelne Flugbahn pro Route: Mittelspur + Offsetsuren). Erstere beinhalten die Flugbahnstreuung pro Route bereits implizit, letztere hingegen nicht (keine Mittelung über alle Flugbahnen pro Typ und Route).

Bis anhin wurde an der Empa das vom Leitfaden Fluglärm (BAFU et al., 2016) bzw. von der SANC-TE Dokumentation (Krebs, Lobsiger & Schäffer, 2014) vorgeschriebene Verfahren nur für idealisierte Flugbahnen umgesetzt, namentlich für eine Heliport-Berechnung im Rahmen von Projekt Nr. 5214.003438, in der Testplattform SANC-TE (zu letzterer siehe (Krebs, Balmer & Lobsiger, 2008; BAFU et al., 2016)). Dort wurden zuerst die individuellen, Flugbahn-spezifischen  $\bar{L}_{AS,max,j}$ -Footprints über alle idealisierten Flugbahnen pro Typ und Route logarithmisch gemittelt, um die Footprints pro Typ und Route zu erhalten. Auf diese wurde obige Gewichtung ( $N_{j,k} \times WT_{j,k}$ ) angewandt, um den  $L_{AS,max,log,L_s}$  oberhalb der Lärmschwelle  $L_s$  zu erhalten. Das Vorgehen war aber weder für beide Footprint-Arten gemischt (basierend auf idealisierten und realen Flugbahnen) direkt anwendbar noch ohne größeren Aufwand für die Footprints basierend auf idealisierten Flugbahnen für umfangreiche Szenarien (wie BSL 2011) anwendbar..

Ursprünglich geplantes Verfahren für Projekt Leq+X

- Für die Flughäfen GVA und ZRH (Radardaten) sollte obiges Berechnungsverfahren direkt auf die Routen-spezifischen  $\bar{L}_{AS,max,j}$ -Footprints angewandt werden (Programm-Erweiterung im Rahmen von Leq+X). → "SANC-TE" Verfahren, angewandt auf Footprints aus realen Flugbahnen.
- Für den Flughafen BSL (idealisierte Flugbahnen) sollte (aus Aufwandgründen) vereinfachend obiges Berechnungsverfahren auf die Flugbahn-spezifischen Footprints angewandt werden, ohne vorgängige Berechnung eines Routen-spezifischen Footprints (d.h. keine Programm-Erweiterung). → "neues" Verfahren, d.h. modifiziertes SANC-TE Verfahren für Footprints aus idealisierten Flugbahnen.

Dieses Verfahren, welches die Footprints je nach Herkunft (Radardaten, idealisierte Flugbahnen) unterschiedlich behandelt, wurde vorgängig zur Anwendung in Leq+X geprüft. Dazu wurde die Differenz zwischen den zwei möglichen Verfahren ermittelt, nämlich der Berechnung strikt nach SANC-TE (Krebs et al., 2014), d.h. zuerst Mittelung der Flugbahn-spezifischen Footprints zu Routen-spezifischen  $\bar{L}_{AS,max,j}$ -Footprints mit anschließender Gewichtung ( $N_{j,k} \times WT_{j,k}$ ), und dem „neuem“ Verfahren, d.h. separater Gewichtung für jeden Flugbahn-spezifischen Footprint. Wenn Differenz die nicht zu groß wird, kann obiges „neue“ Vorgehen angewendet werden, auch wenn es streng genommen nicht konform zum Leitfaden Fluglärm ist. Zur Prüfung wurde die Heliport-Berechnung in der Testplattform (s.o.) wiederholt, und zwar einmal mit einer sehr tiefen Lärmschwelle  $L_s$  von 1dB (praktisch "ohne  $L_s$ ") und einmal mit einer hohen  $L_s$  von 68 dB.

**Resultat:** Es zeigt sich, dass ohne/mit tiefer  $L_s$  die beiden Verfahren praktisch dasselbe Resultat ergeben (vgl. Abbildung 1-6). Große Unterschiede in den Resultaten zwischen den beiden Verfahren ergeben sich jedoch, wenn eine „genügend hohe“ Schwelle  $L_s$  verwendet wird (Abbildung 1-7). Die Resultate reagieren daher sensitiv auf das Verfahren, und die beiden Verfahren können nicht als äquivalent betrachtet werden.

### 1.2.2 Für Projekt Leq+x umgesetztes Vorgehen

Da das Verfahren die Resultate bei hoher  $L_S$  stark beeinflusst, wurde der  $L_{AS,max,log,L_S}$  schließlich aus den berechneten Summenhäufigkeiten ( $L_{AS,max} = 50\text{--}120$  dB, in 1dB-Schritten) berechnet, aus welchen bereits der NAT bestimmt worden war. So ist gewährleistet, dass die Resultate (NAT und  $L_{AS,max,log,L_S}$ ) in sich konsistent sind.

Bemerkung: Dasselbe Verfahren (*Footprints* aus Einzelflugbahnen für idealisierte Geometrien bzw. aus Bündeln von Flugbahnen für Radardaten) wird auch für die Ermittlung der Summenhäufigkeiten angewendet. Da dort jedoch keine Lärmschwelle  $L_S$  vorgegeben wird, d.h. vollständige Maximalpegelverteilungen berechnet werden, hängen die Resultate kaum vom Verfahren ab (Abbildung 1-6).

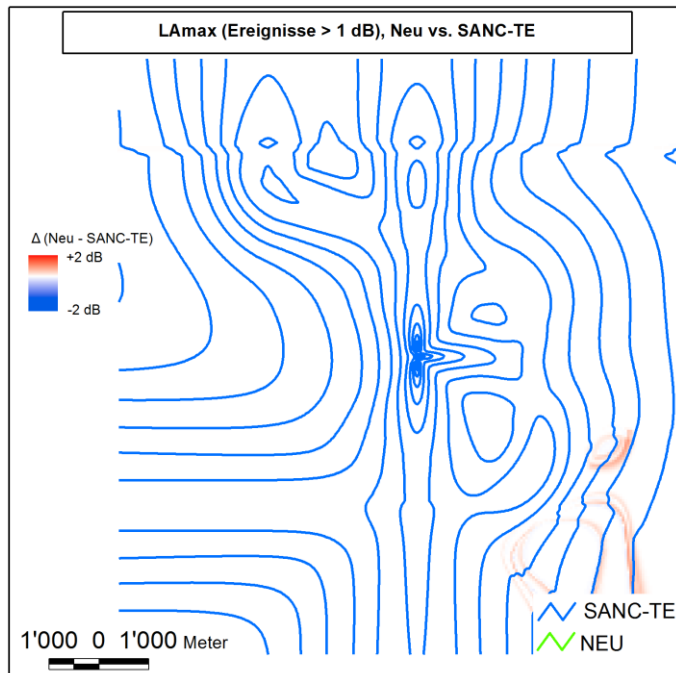


Abbildung 1-6. Differenz zwischen der neuen und strikt nach SANC-TE vorgeschriebenen Methodik zur Ermittlung des mittleren Maximalpegels  $L_{AS,max,log,L_S}$  für eine tiefe Lärmschwelle  $L_S$  von 1 dB, für den Heliport der Testplattform SANC-TE. Die beiden Ansätze liefern größtenteils annähernd identische Resultate.

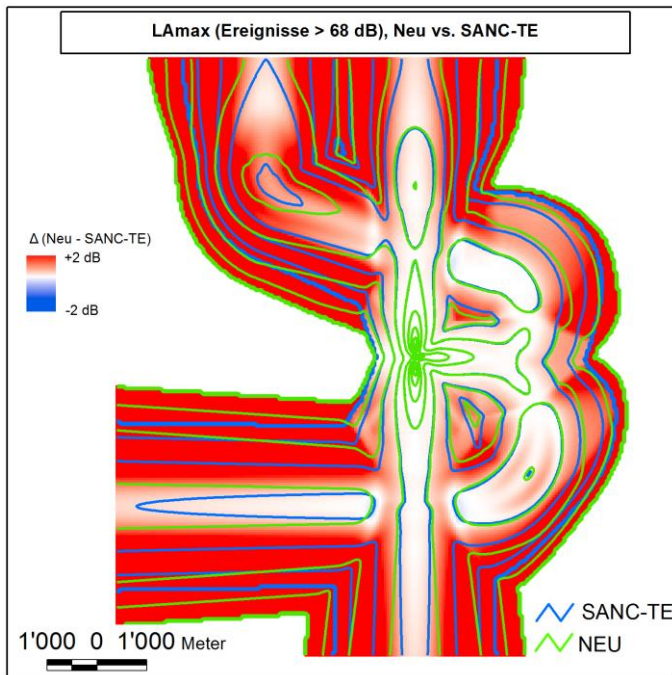


Abbildung 1-7. Differenz zwischen der neuen und strikt nach SANC-TE vorgeschriebenen Methodik zur Ermittlung des mittleren Maximalpegels  $L_{AS,max,log,L_S}$  für eine hohe Lärmschwelle  $L_S$  von 68 dB, für den Heliport in der Testplattform SANC-TE. Der neue Ansatz liefert großenteils deutlich höhere mittlere Maximalpegel als die SANC-TE Methodik.

### 1.3 Näherungsweise Berechnung von nicht-energieäquivalenten Dauerschallpegeln (Empa)

#### 1.3.1 Rechenvorschrift<sup>3</sup>

Der Äquivalenzparameter  $k$  wird für die Berechnung des nicht-energieäquivalenten Dauerschallpegels verwendet. Aus diesem ergibt sich der Halbierungsparameter  $q$  ( $q = k \times 3/10$ ). Für  $k = 10$  wird  $q = 3$ , und für  $k = 33.3$  wird  $q = 10$ . Damit entspricht eine Halbierung der Häufigkeit von Ereignissen einer Verminderung des Pegels um 3 dB ( $k = 10$ ) bzw. 10 dB ( $k = 33.3$ ). Somit werden mit zunehmendem  $k$  bzw.  $q$  die Anzahl Bewegungen bzw. die resultierende Schallenergie zunehmend stärker gewichtet. Ein Einzelereignispegel eines Flugzeugtypen  $j$  berechnet sich aus einem simulierten Pegelzeitverlauf zu

$$L_{AE,j}(k) = k \times \lg \left( \frac{1}{t_0} \times \int 10^{L(t)/k} dt \right), \quad (\text{A-2})$$

wobei  $t_0 =$  Bezugsdauer (1 s). Die Momentanpegel  $L(t)$  kommen in diskreten Zeitschritten vor (z. B. 1 s). Für  $k = 10$  entsprechen sie dem physikalischen (energieäquivalenten) Schalldruckpegel. Aus den resultierenden nicht-energieäquivalenten  $L_{AE,j}(k)$  kann der nicht-energieäquivalente Dauerschallpegel berechnet werden als Superposition mit  $k \neq 10$  über alle Einzelereignisse  $i$

<sup>3</sup> Basierend auf dem internen DLR-Dokument *rechenparameter.docx* vom 27.09.2017.

$$L_{Aeq}(k) = k \times \lg \left( \frac{t_0}{T} \sum_i 10^{L_{AE,i}(k)/k} \right), \quad (A-3)$$

bzw. unter Verwendung von *Footprints*

$$\begin{aligned} L_{Aeq}(k) &= L_{AE,tot}(k) + k \times \lg \left( \frac{t_0}{T} \right) \\ &= k \times \lg \left( \sum_{i=1}^m n_j \times 10^{\bar{L}_{AE,j}(k)/k} \right) + k \times \lg \left( \frac{t_0}{T} \right) \end{aligned} \quad (A-4)$$

wobei  $T$  = Bezugsdauer,  $t_0 = 1$  s,  $L_{AE,tot}(k)$  = Gesamtenergiepegel,  $n_j$  = Anzahl Flugereignisse pro Typ  $j$ ,  $m$  = Anzahl Typen- und Routen-spezifische *Footprints* und  $\bar{L}_{AE,j}(k)$  = nicht-energieäquivalente *Footprints*, d.h. mittlere nicht-energieäquivalente Typen- und Routen-spezifische Ereignispegel:

$$\bar{L}_{AE,j}(k) = k \times \lg \left( \frac{1}{n_j} \sum_{i=1}^{n_j} 10^{L_{AE,ij}(k)/k} \right). \quad (A-5)$$

Diese *Footprints* werden idealerweise mittels nicht-energieäquivalenter Simulation gemäß Gleichungen (A-2) und (A-5) ermittelt.

### 1.3.2 Problem: Fehlende Datengrundlagen

An der Empa sind nur energieäquivalente *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ), d.h. Typen- und Routen-spezifische Ereignis- bzw. Maximalpegel als logarithmische Mittelwerte ( $k = 10$ ) vieler Flugereignisse verfügbar. Diese werden folgendermaßen ermittelt. Zuerst werden aus Momentanpegeln  $L(t)$  ( $k = 1$  in Zeitschritten von üblicherweise 1 s) Pegelzeitverläufe berechnet. Aus diesen werden der Maximalpegel  $L_{AS,max,j}$  und Ereignispegel  $L_{AE,j}$  pro Ereignis berechnet (Gleichung (A-2) für  $k = 10$ ). Schließlich werden diese Größen über viele ( $n$ ) Ereignisse  $i$  pro Flugzeugtyp  $j$  logarithmisch (bzw. energetisch) gemittelt, um die *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) zu erhalten:

$$\bar{L}_{AE,j} = 10 \times \lg \left( \frac{1}{n_j} \sum_{i=1}^{n_j} 10^{L_{AE,ij}/10} \right) \text{ und} \quad (A-6)$$

$$\bar{L}_{AS,max,j} = 10 \times \lg \left( \frac{1}{n_j} \sum_{i=1}^{n_j} 10^{L_{AS,max,ij}/10} \right). \quad (A-7)$$

Da nur die energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) verfügbar sind, müssen aus diesen die nicht-energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}(k)$ ) geschätzt werden, bevor daraus mit Gleichung (A-4) der nicht-energieäquivalente  $L_{Aeq}(k)$  ermittelt werden kann.

### 1.3.3 Näherungslösung<sup>4</sup>

Aus den energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) werden die nicht-energieäquivalenten  $\bar{L}_{AE,j}(k)$  wie folgt geschätzt.

**Schritt 1:** Zusammenhang zwischen  $\bar{L}_{AE,j}$ ,  $\bar{L}_{AS,max,j}$  und mittlerer Ereignisdauer  $\bar{t}_e$

<sup>4</sup> Basierend auf dem internen DLR-Dokument *Effektivpegelmittelung.pdf* vom 07.12.2017.

Geht man von der *Footprint*-Definition  $\bar{L}_{AE,j}(k)$  gemäß Gleichung (A-5) aus und verwendet den Zusammenhang zwischen  $L_{AE}$ ,  $L_{AS,max}$  und Ereignisdauer  $t_e$  nach Matschat und Müller (1984) (S. 9), so erhält man für die sog. „effektive Ereignisdauer“  $t_e$  als Zusammenhang zwischen  $L_{AE}$  und  $L_{AS,max}$ :

$$10^{L_{AS,max}/k} \times t_e = \int 10^{L(t)/k} dt \quad (A-8)$$

Gleichung (A-8) bedeutet, dass man das Integral des „echten“ Pegel-Zeit-Verlaufs der Rechteckfläche  $L_{AS,max} \times t_e$  gleichsetzen kann (gleicher Energie-Inhalt, vgl. Abbildung 1-8). Im Folgenden wird näherungsweise  $t_e$  als nicht von  $k$  abhängig angenommen.

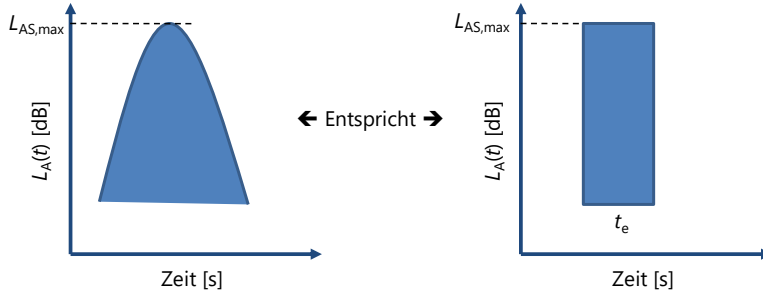


Abbildung 1-8. zur Definition der Ereignisdauer  $t_e$  gemäß Matschat und Müller (1984), mit Momentanpegel ( $L_A(t)$ ) und Maximalpegel ( $L_{AS,max}$ ).

Aus Gleichungen (A-2) und (A-8) folgt für ein einzelnes Ereignis:

$$10^{L_{AS,max}/k} \times t_e = \int 10^{L(t)/k} dt = t_0 \times 10^{L_{AE}(k)/k}, \text{ bzw.} \quad (A-9)$$

$$L_{AE}(k) = L_{AS,max} + k \times \lg\left(\frac{t_e}{t_0}\right). \quad (A-10)$$

Für Ereignis- und Maximalpegel-*Footprints* ( $\bar{L}_{AE,j}(k)$  und  $\bar{L}_{AS,max,j}(k)$  gemäß Gleichungen (A-6) und (A-7) für beliebiges  $k$ ) kann Gleichung (A-10) formuliert werden zu

$$\begin{aligned} \bar{L}_{AE,j}(k) &= k \times \lg\left(\frac{1}{n_j} \sum_{i=1}^{n_j} 10^{L_{AS,max,ij}/k} \times \left(\frac{t_{e,ij}}{t_0}\right)\right) \\ &= k \times \lg\left(\frac{1}{n_j} \sum_{i=1}^{n_j} 10^{L_{AS,max,ij}/k}\right) + k \times \lg\left(\frac{1}{n_j} \sum_{i=1}^{n_j} \frac{t_{e,ij}}{t_0}\right) \\ &= \bar{L}_{AS,max,j}(k) + k \times \lg\left(\frac{\bar{t}_e}{t_0}\right) \end{aligned} \quad (A-11)$$

bzw.

$$\bar{t}_{e,j} = 10^{[\bar{L}_{AE,j}(k) - \bar{L}_{AS,max,j}(k)]/k} \times t_0 \quad (A-12)$$

Für  $k = 10$  kann aus den verfügbaren energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) unter Verwendung von Gleichung (A-12) somit die mittlere effektive Ereignisdauer  $\bar{t}_e$  geschätzt werden zu

$$\bar{t}_{e,j} = 10^{[\bar{L}_{AE,j} - \bar{L}_{AS,max,j}]/10} \times t_0 \quad (A-13)$$

Diese auf  $k = 10$  beruhende Schätzung von  $\bar{t}_e$  wird anschließend für die Berechnungen mit  $k = 20$  und  $k = 30$  verwendet. Die Annahme, dass  $\bar{t}_e$  unabhängig von  $k$  sei, ist nur eine grobe Näherung, insbesondere für kleine Entfernungen (d.h. hohe Pegel), wie Abbildung 1-9 zeigt. Dennoch wird im Rahmen dieses Projektes diese Vereinfachung angenommen und auf dieser Basis der nicht-energieäquivalenten Dauerschallpegel  $L_{Aeq}(k)$  berechnet.

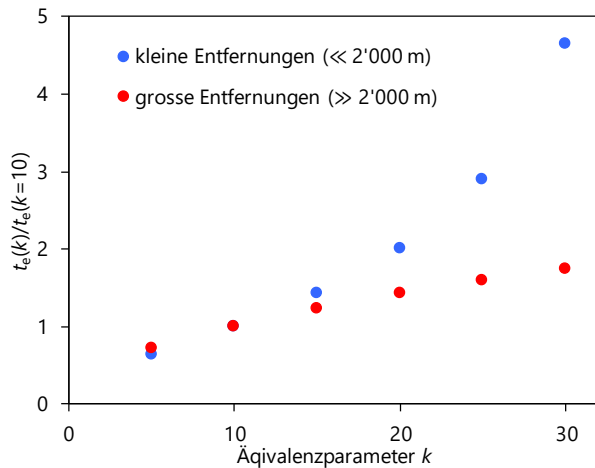


Abbildung 1-9. Abschätzung der Geräuschkdauer (aufgetragen als Verhältnis  $t_e(k)/t_e(k = 10)$ ) in Abhängigkeit des Äquivalenzparameters  $k$  für kleine und große Entfernungen. Schätzung des DLR vom 19.02.2017 (14\_teff\_von\_k.xlsx), unter Verwendung des analytischen Ansatzes von Matschat and Müller (1979).

Wenn nun  $\bar{t}_e$  mit Gleichung (A-13) aus den energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) ermittelt wurde, kann unter Annahme, dass  $\bar{t}_e$  unabhängig von  $k$  sei, mit Gleichung (A-11) der  $\bar{L}_{AE,j}(k)$  aus  $\bar{L}_{AS,max,j}(k)$  ermittelt werden. Somit muss noch  $\bar{L}_{AS,max,j}(k)$  geschätzt werden ( $\rightarrow$  Schritt 2).

**Schritt 2:** Berechnung von  $\bar{L}_{AS,max,j}(k)$  aus  $\bar{L}_{AS,max,j}$

Gemäss Matschat (1993) (S. 55) kann der nicht-energieäquivalente  $\bar{L}_{A,max,j}(k)$  aus dem energieäquivalenten *Footprint* ( $\bar{L}_{AS,max,j}$ ) an einem Immissionsort geschätzt zu

$$\bar{L}_{AS,max,j}(k) = \bar{L}_{AS,max,j} + \frac{1}{2} \times s_{LAS,max}^2 \times \ln(10) \times \left( \frac{1}{k} - \frac{1}{10} \right) \quad (A-14)$$

wobei  $s_{LAS,max}$  = Standardabweichung der Maximalpegel der Einzelereignisse in dB.

**Schritt 3:** Kombinationen der Schritte 1 und 2

Unter Verwendung der Gleichungen (A-11), (A-13) und (A-14) erfolgt die Ermittlung des  $\bar{L}_{AE,j}(k)$  aus den energieäquivalenten *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) zu:

$$\bar{L}_{AE,j}(k) = \bar{L}_{AS,max,j} + \frac{1}{2} \times s_{LAS,max}^2 \times \ln(10) \times \left( \frac{1}{k} - \frac{1}{10} \right) + \frac{k}{10} \times (\bar{L}_{AE,j} - \bar{L}_{AS,max,j}) \quad (A-15)$$

Gleichung (A-15) wird in Gleichung (A-4) (nicht-energieäquivalente Superposition) eingesetzt:

$$L_{Aeq}(k) = k \times \lg \left( \sum_{j=1}^m n_j \times 10^{\left[ \bar{L}_{AS,max,j} + \frac{1}{2} \times s_{LA,max}^2 \times \ln(10) \times \left( \frac{1}{k} - \frac{1}{10} \right) + \frac{k}{10} \times (\bar{L}_{AE,j} - \bar{L}_{AS,max,j}) \right] / k} \right) + k \times \lg \left( \frac{t_0}{T} \right) \quad (A-16)$$

Gleichung (A-16) liefert für  $k = 10$  exakt dasselbe Resultat liefert wie die „normale“ energieäquivalente Superposition, da im Exponenten außer  $\bar{L}_{AE,j}/10$  alles wegfällt. Bei der nicht-energieäquivalenten Superposition (d.h. nicht-energieäquivalente logarithmische Addition der energieäquivalenten *Footprints* ( $k = 10$ ) unter Gewichtung mit den Bewegungszahlen) werden somit folgende Größen benötigt:

- Typen- und Routen-spezifische Bewegungszahlen ( $n_j$ ) gemäß Bewegungsstatistiken,
- Typen- und Routen-spezifische *Footprints* ( $\bar{L}_{AE,j}$  und  $\bar{L}_{AS,max,j}$ ) mit  $k = 10$ .
- Äquivalenzparameter  $k$ , hier  $k = 10, 20, 30$  ( $k = 10$  für energieäquivalente Superposition),
- Standardabweichung der Maximalpegel (hier gesetzt zu  $s_{LA,max} = 2$  dB, und
- Bezugszeit  $T$  gemäß Zeitperiode (*Day, Evening, Night*), d.h.  $T = 43200$  s,  $14400$  s,  $28800$  s.

### 1.3.4 Kontrolle der Näherungslösung

Im Rahmen von Leq+X wurde die nicht-energieäquivalente Simulation in FLULA2 neu implementiert. Zur Überprüfung der obigen Näherungslösung (A-16) wurden nicht-energieäquivalente Simulationen ( $k = 20, k = 30$ ) für GVA und ZRH der Jahre 2014 und 2015 durchgeführt und die daraus resultierenden  $L_d, L_e$  und  $L_n$  mit den Resultaten der Näherungslösung verglichen. Es war im Rahmen dieses Projektes aus Aufwand-Gründen nicht möglich, sämtliche Flughäfen und Jahre neu zu simulieren. Die Szenarien BSL 2011 (*Footprints* 1999) sowie ZRH2001 und 2003 basieren auf Simulationen mit einer früheren FLULA2-Version (Version 001 bzw. 002) und auf einem früheren Quelldatensatz (RC\_91 bzw. RC2001\_01). Diese Berechnungen zu wiederholen, hätte großen Aufwand nach sich gezogen.

Die Resultate der Vergleiche (Näherungslösung vs. exakt) sind in Abbildung 1-10 und Abbildung 1-11 dargestellt. Es zeigt sich, dass die Näherungslösung insbesondere bei hohen Belastungen die exakt berechneten nicht-energieäquivalenten Werte systematisch unterschätzt. Für  $k = 20$  beträgt die Unterschätzung bis zu  $\sim 5$  dB, bei  $k = 30$  bis zu  $\sim 15$  dB (Abbildung 1-10). Interessanterweise hängt die Differenz zwischen näherungsweise und exakter Berechnung bei ZRH stark vom Absolutpegel ab, bei GVA hingegen weniger (Abbildung 1-11). Bei diesen recht großen Differenzen ist zu beachten, dass es sich streng genommen nicht "dB" sondern von "kB" handelt (für  $k \neq 10$ ), und dass für  $k = 20$  bzw.  $k = 30$  eine Differenz von 3 kB weniger als einer Verdoppelung/Halbierung der Schallenergie entspricht.

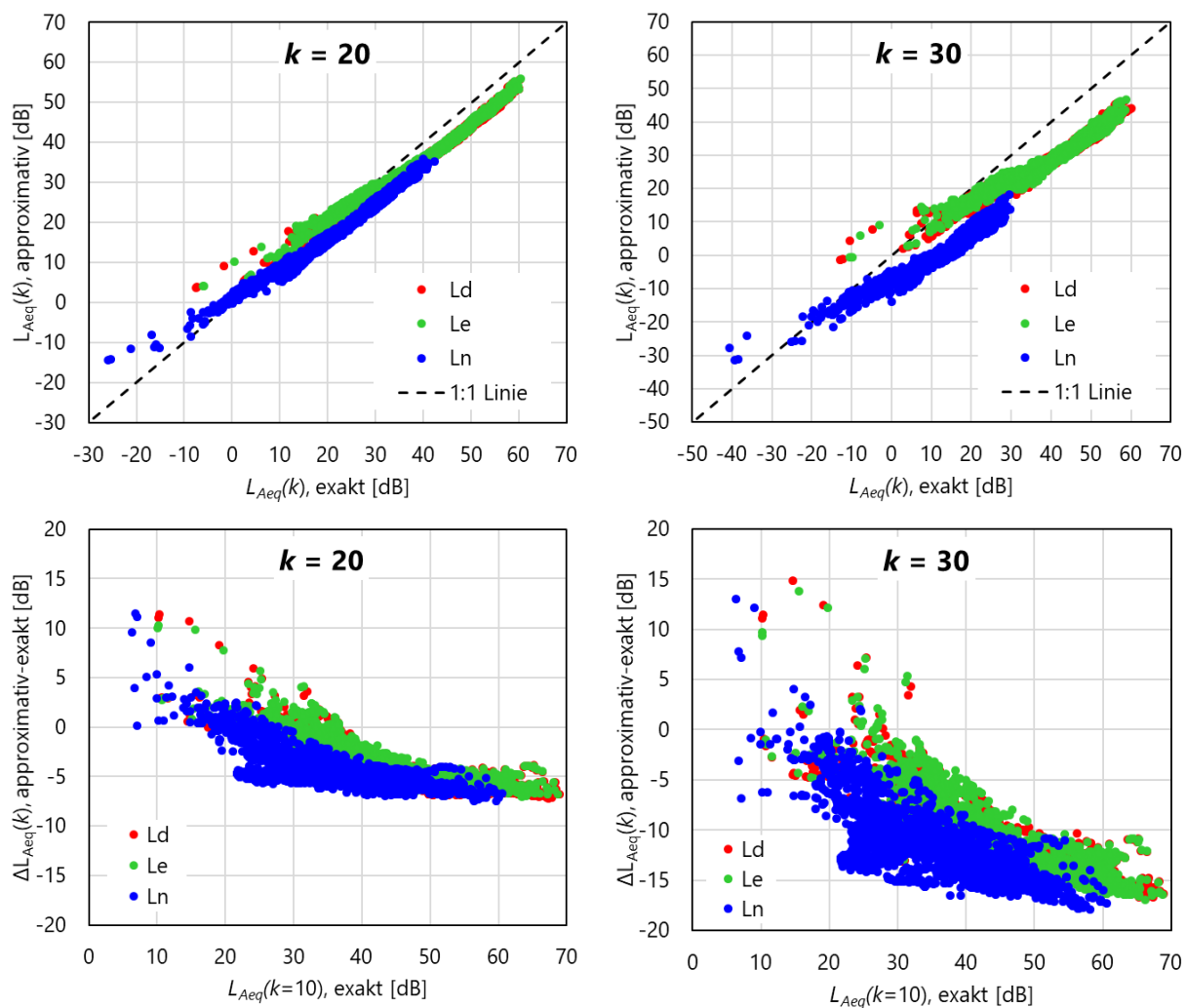


Abbildung 1-10. Kontrolle der Näherungslösung I. **Oben:** Zusammenhang zwischen den nach der Näherungslösung (A-16) und durch exakte Simulation ermittelten  $L_d$ ,  $L_e$  und  $L_n$ . **Unten:** Differenzen zwischen den  $L_d$ ,  $L_e$  und  $L_n$  der Näherungslösung (A-16) und der exakten Simulation in Abhängigkeit des jeweiligen energieäquivalenten  $L_d$ ,  $L_e$  und  $L_n$  ( $k = 10$ ). Links für  $k = 2$ . rechts für  $k = 30$ . Datengrundlage: Belastungen GVA und ZRH der Jahre 2014 und 2015, berechnet an den jeweiligen Empfängerpunkten der Studienteilnehmer.



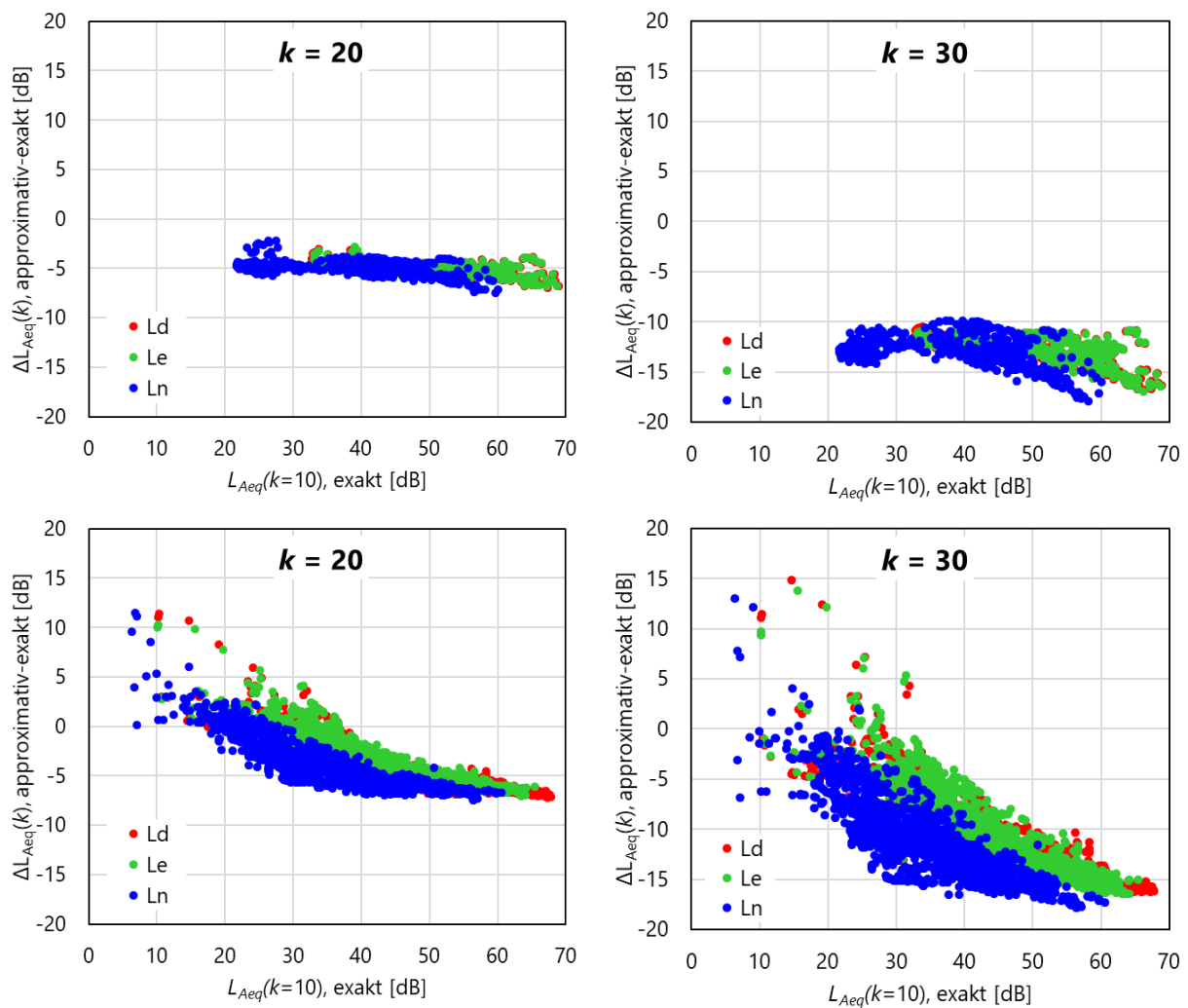


Abbildung 1-11. Kontrolle der Näherungslösung II. **Oben:** Differenzen zwischen den  $L_d$ ,  $L_e$  und  $L_n$  der Näherungslösung (A-16) und der exakten Simulation in Abhängigkeit des jeweiligen energieäquivalenten  $L_d$ ,  $L_e$  und  $L_n$  ( $k = 10$ ), für GVA (oben) und ZRH (unten). Links für  $k = 2$ , rechts für  $k = 30$ . Datengrundlage: Belastungen GVA und ZRH der Jahre 2014 und 2015, berechnet an den jeweiligen Empfängerpunkten der Studienteilnehmer.

Die systematische Unterschätzung dürfte großenteils auf oben getroffenen Annahme zurückgeführt werden, dass  $\bar{t}_e$  unabhängig von  $k$  sei. So wird nach Abbildung 1-9 für den Nahbereich (d.h. hohe Pegel)  $\bar{t}_e$  für  $k = 20$  um einen Faktor von  $\sim 2$  und für  $k = 30$  um einen Faktor von  $\sim 4$  unterschätzt, was gemäss Gleichung (A-11) für einen mittleren *Footprint* in einer Differenz von rund 6 dB ( $k = 20 \rightarrow 20 \times \log(2)$ ) resp. 18 dB ( $k = 30 \rightarrow 30 \times \log(4)$ ) resultieren würde. Die Annahme einer Flugzeugtypen-unabhängigen Standardabweichung  $s_{L_{Amax}} = 2$  dB für Gleichung (A-14) dürfte hingegen deutlich weniger zur Differenz beigetragen haben. Dies wird durch Abbildung 1-12 und Abbildung 1-13 gestützt, welche exemplarisch geschätzte und exakt berechnete  $\bar{L}_{AE,j}(k)$ - und  $\bar{L}_{AS,max,j}(k)$ -*Footprints* miteinander vergleichen<sup>5</sup>. So können die  $\bar{L}_{AS,max,j}(k)$ -*Footprints* unter Annahme einer Flugzeugtypen-unabhängigen Standardabweichung zumindest bei hohen Pegeln gut geschätzt werden, während die

<sup>5</sup> Weitere Vergleiche in internen Empa-Dateien *GVA\_Verifikation\_SingleFootprints\_V1.xlsx* und *ZRH\_Verifikation\_SingleFootprints\_V1.xlsx*.

$\bar{L}_{AE,j}(k)$ -Footprints die oben bereits für den  $L_d$ ,  $L_e$  und  $L_n$  beobachtete systematische Unterschätzung von  $\sim 5$  dB ( $k = 20$ ) bzw.  $\sim 15$  dB ( $k = 30$ ) aufweisen.

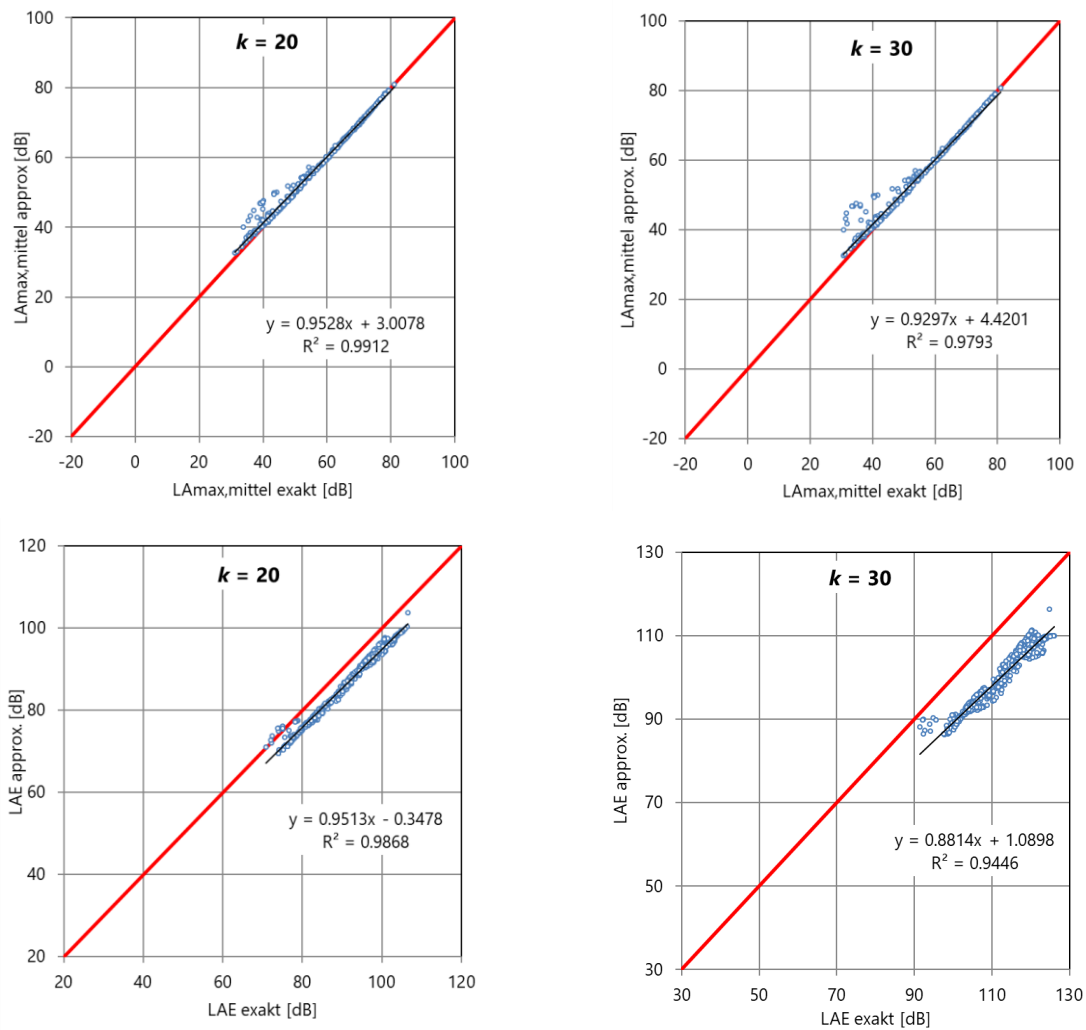


Abbildung 1-12. Kontrolle der Näherungslösung III. **Oben:** Zusammenhang zwischen den nach der Näherungslösung (A-14) ("approx.") und durch exakte Simulation ermittelten  $\bar{L}_{AS,max,j}(k)$ -Footprints. **Unten:** Zusammenhang zwischen den nach der Näherungslösung (A-15) ("approx.") und durch exakte Simulation ermittelten  $\bar{L}_{AE,j}(k)$ -Footprints. Links für  $k = 20$ , rechts für  $k = 30$ . Datengrundlage: GVA, Footprint Start A320 auf Route D05CN im Jahr 2014, an den Empfängerpunkten der Studienteilnehmer GVA 2014.

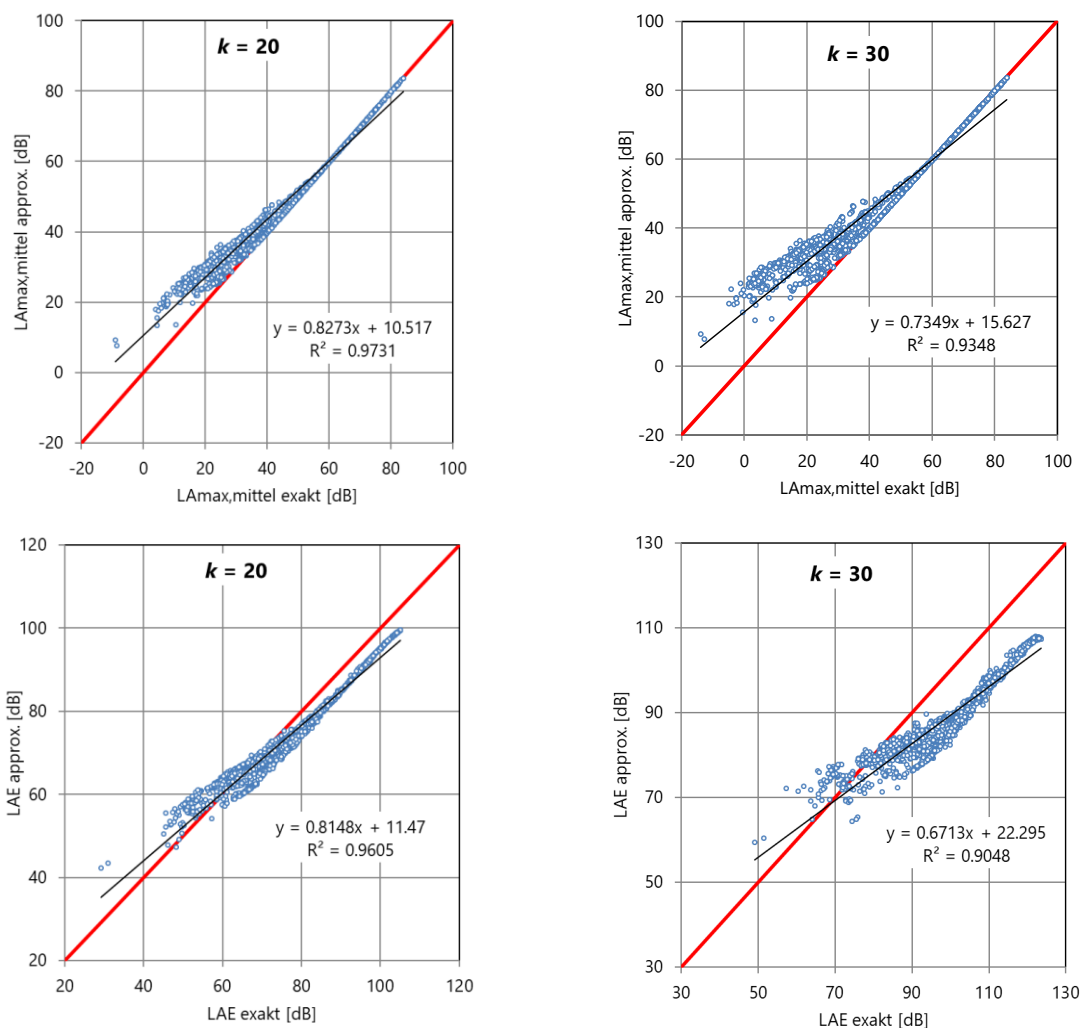


Abbildung 1-13. Kontrolle der Näherungslösung IV. **Oben:** Zusammenhang zwischen den nach der Näherungslösung (A-14) ("approx.") und durch exakte Simulation ermittelten  $\bar{L}_{AS,max,j}(k)$ -Footprints. **Unten:** Zusammenhang zwischen den nach der Näherungslösung (A-15) ("approx.") und durch exakte Simulation ermittelten  $\bar{L}_{AE,j}(k)$ -Footprints. Links für  $k = 2$ . rechts für  $k = 30$ . Datengrundlage: ZRH, Footprint Landung A3403 auf Route Q34 im Jahr 2015, an den Empfängerpunkten der Studienteilnehmer ZRH 2014 und 2015.

Interessanterweise liefert die Näherungslösung des DLR, welche den nicht-energieäquivalenten  $L_{Aeq}$  in Abhängigkeit des energieäquivalenten  $L_{Aeq}(k = 10)$  schätzt, zumindest für hohe Pegel eine deutlich bessere Übereinstimmung zwischen Näherungslösung und exakter Berechnung, obwohl beide Näherungen (DLR und Empa) auf ähnlichen Annahmen beruhen. Es wäre interessant, Gründe für die Unterschiede der Resultate der beiden Näherungslösungen zu ergründen. Abschließend bleibt zu bemerken, dass die Näherungslösung der Empa mit erhöhter Unsicherheit behaftet ist. Außerdem liefern die Näherungslösungen des DLR und der Empa nicht direkt vergleichbare Resultate. Insgesamt werden die Trends aber trotz Unterschätzung richtig wiedergegeben (vgl. Abbildung 1-10 oben); somit erscheint es vertretbar, die Resultate der Näherungsformel zu verwenden.

In Abbildung 1-14 werden die nicht-energieäquivalenten Dauerschallpegel gegen den energieäquivalenten  $L_{Aeq}(k = 10)$  für  $L_d$ ,  $L_e$  und  $L_n$  aufgetragen. Im Gegensatz zu den Vergleichen, die das DLR für die RDF-Studie durchführte, sind hier keine Bandstrukturen erkennbar.

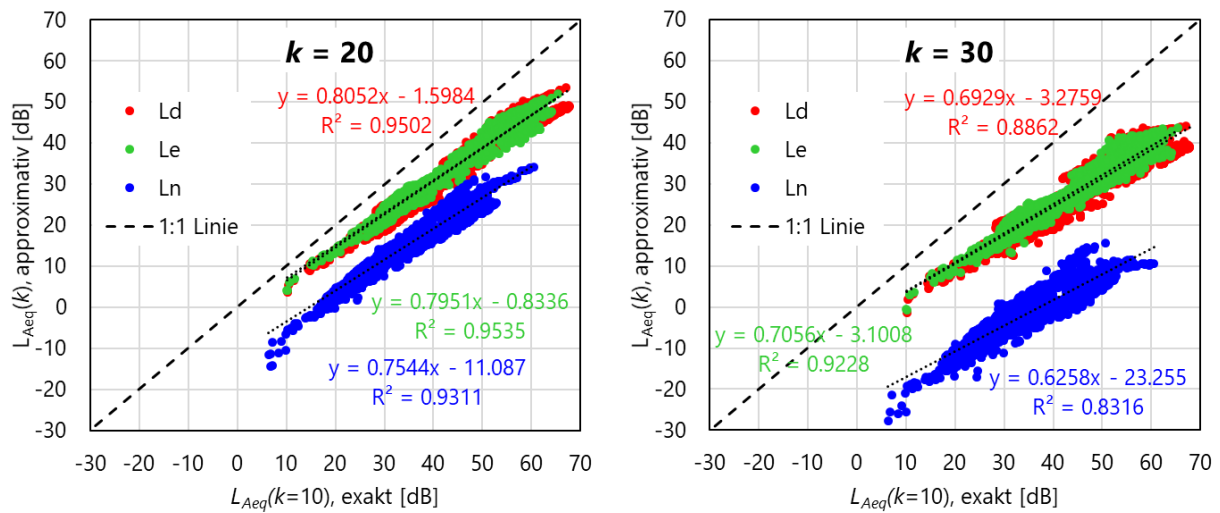


Abbildung 1-14. Kontrolle der Näherungslösung V. Zusammenhang zwischen den energieäquivalenten ( $k = 10$ ) und nicht-energieäquivalenten (Näherungslösung (A-16)) Dauerschallpegeln  $L_d$ ,  $L_e$  und  $L_n$ , links für  $k = 20$ , rechts für  $k = 30$ . Datengrundlage: Belastungen GVA und ZRH der Jahre 2014 und 2015, berechnet an den jeweiligen Empfängerpunkten der Studienteilnehmer

## 1.4 Zustände Zürich 2001 und 2003: Repräsentativität von 8 statt 12 Monaten

Abbildung 1-15 zeigen die Jahresgänge (monatliche Bewegungszahlen für die Jahre 2000 bis 2001 und 2002 bis 2003). Die Bewegungszahlen der jeweils nicht verwendeten 4 Vorjahresmonate sind sehr ähnlich wie diejenigen der 8 verwendeten Monate; die Monate danach (September–Dezember 2001 bzw. 2003) brachen hingegen stark ab.

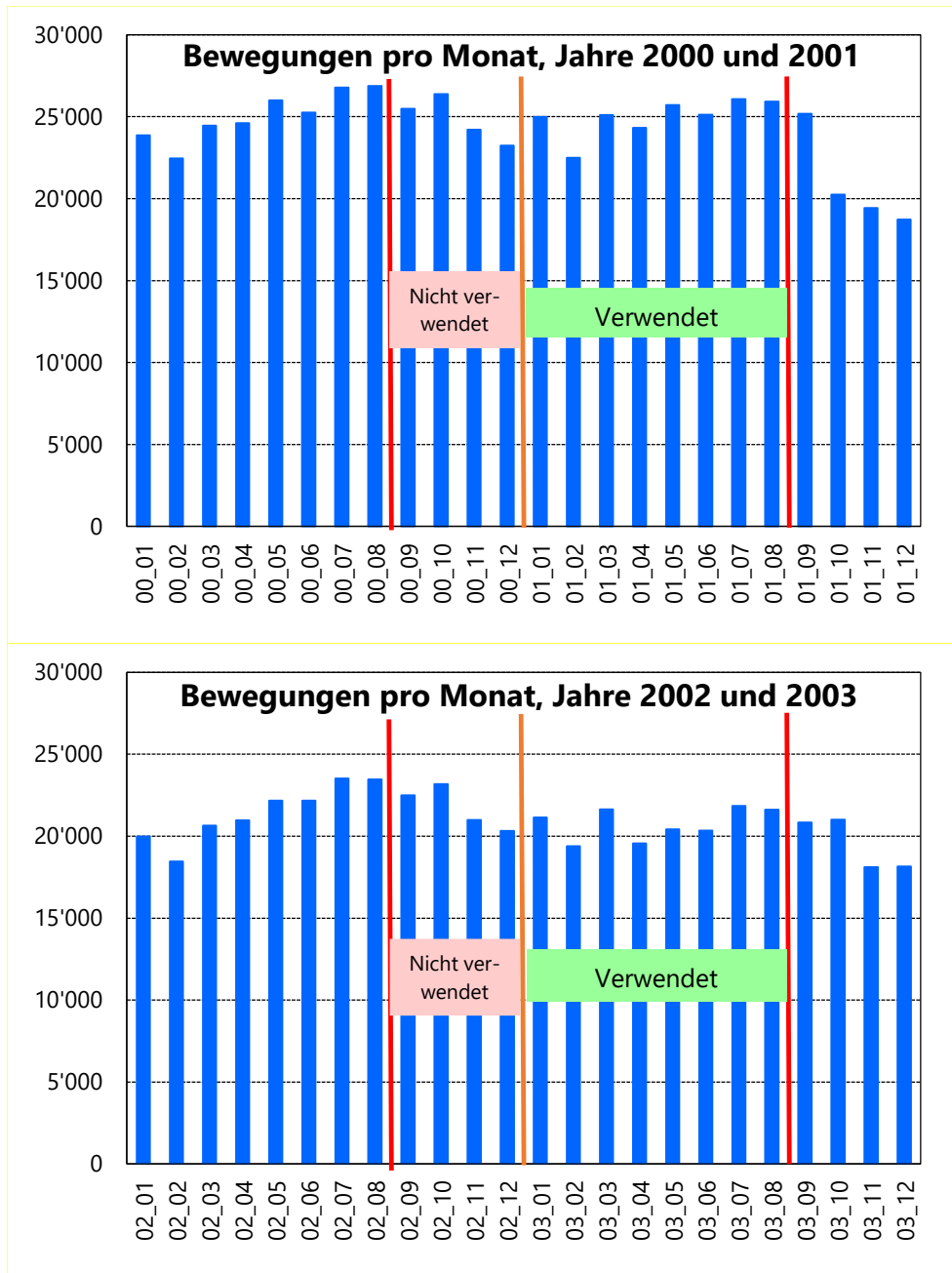


Abbildung 1-15. Jahresgänge 2000/2001 (oben) und 2002/2003 (unten). Ebenfalls gezeigt sind die in den Berechnungen verwendeten 8 Monate und nicht verwendeten 4 Vorjahresmonate.

Tabelle 1-1. Anzahl Tage, Anzahl Bewegungen und Anzahl Bewegungen pro Tag der Großflugzeuge im Zeitraum September–August 2001 und September–August 2002, separat nach den Monaten September–Dezember (4 Vorjahresmonate, nicht berücksichtigt in den Berechnungen) und Januar–August (8 Monate, berücksichtigt in den Berechnungen) und insgesamt (12 Monate), sowie Fehler im  $L_{Aeq}$ , bezogen auf die Bewegungsdifferenz ( $\Delta L = 10 \cdot \log[(\text{Bewegungen } 8 \text{ Monate})/(\text{Bewegungen } 12 \text{ Monate})]$ ), unter Annahme gleichen Flottenmixes, gleicher Routenbelegung sowie gleichen Tagesganges der 4 nicht verwendeten Vorjahresmonate wie der verwendeten 8 Monate.

Zeitraum	# Tage	# Bew	#Bew/Tag	
2000, Sep-Dez	122	99'317	814	
2001, Jan-Aug	243	199'740	822	$\Delta L_{8vs12Mte}$
<b>12 Monate</b>	<b>365</b>	<b>299'057</b>	<b>819</b>	<b>0.01</b>
2002, Sep-Dez	122	86'999	713	
2003, Jan-Aug	243	165'937	683	$\Delta L_{8vs12Mte}$
<b>12 Monate</b>	<b>365</b>	<b>252'936</b>	<b>693</b>	<b>-0.06</b>

## 1.5 Betriebsrichtungen für die Schweizer Flughäfen

Tabelle 1-2. Pistenbelegungen BSL für Starts und Landungen für die Jahre 2010–2015, insgesamt (Tag + Nacht, aus den Umweltberichten, oben) und getrennt nach Tag und Nacht (aus der Berechnung, unten).

Tag + Nacht	Start-Pisten				Lande-Pisten					
	RWY08	RWY15	RWY26	RWY33	Total	RWY08	RWY15	RWY26	RWY33	Total
2010	0 %	73 %	6 %	21 %	100 %	0 %	90 %	0 %	10 %	100 %
2011	0 %	76 %	7 %	17 %	100 %	0 %	93 %	0 %	6 %	100 %
2012	0 %	76 %	6 %	18 %	100 %	0 %	92 %	0 %	7 %	100 %
2013	0 %	74 %	6 %	20 %	100 %	0 %	93 %	0 %	7 %	100 %
2014	0 %	74 %	6 %	20 %	100 %	0 %	93 %	0 %	6 %	100 %
2015	0 %	72 %	6 %	22 %	100 %	0 %	92 %	0 %	8 %	100 %
2011 Tag †	0 %	81 %	7 %	13 %	100 %	0 %	92 %	0 %	7 %	100 %
2011 Nacht †	0 %	17 %	1 %	82 %	100 %	0 %	98 %	0 %	2 %	100 %
2011 Tag + Nacht †	0 %	77 %	6 %	16 %	100 %	0 %	93 %	0 %	6 %	100 %

† Für die Belastungsrechnungen 2011 verwendete Daten

Tabelle 1-3. Pistenbelegungen GVA für Starts und Landungen für die Jahre 2010–2015, getrennt nach Tag (oben) und Nacht (unten). RWY00: Helikopterbewegungen.

<b>Tag</b>	<b>Start-Pisten</b>				<b>Land-Pisten</b>			
<b>Jahr</b>	<b>RWY00</b>	<b>RWY05</b>	<b>RWY23</b>	<b>Total</b>	<b>RWY00</b>	<b>RWY05</b>	<b>RWY23</b>	<b>Total</b>
2010	0 %	42 %	58 %	100 %	0 %	42 %	58 %	100 %
2011	0 %	39 %	61 %	100 %	0 %	39 %	60 %	100 %
2012	0 %	40 %	60 %	100 %	0 %	40 %	60 %	100 %
2013	0 %	43 %	57 %	100 %	0 %	43 %	57 %	100 %
2014		37 %	63 %	100 %		37 %	63 %	100 %
2015		42 %	58 %	100 %		43 %	57 %	100 %

<b>Nacht</b>	<b>Start-Pisten</b>				<b>Land-Pisten</b>			
<b>Jahr</b>	<b>RWY00</b>	<b>RWY05</b>	<b>RWY23</b>	<b>Total</b>	<b>RWY00</b>	<b>RWY05</b>	<b>RWY23</b>	<b>Total</b>
2010		41 %	59 %	100 %		40 %	60 %	100 %
2011	0 %	41 %	59 %	100 %		39 %	61 %	100 %
2012	0 %	34 %	66 %	100 %	0 %	38 %	62 %	100 %
2013		37 %	63 %	100 %		40 %	60 %	100 %
2014		33 %	67 %	100 %		36 %	64 %	100 %
2015		37 %	63 %	100 %		43 %	57 %	100 %

Tabelle 1-4. Pistenbelegungen ZRH für Starts für die Jahre 1997–2003 und 2010–2015, getrennt nach Tag und Nacht. RWY00: Helikopterbewegungen.

Tag		Start-Pisten						Total
Jahr	RWY00	RWY10	RWY14	RWY16	RWY28	RWY32	RWY34	
1997	0 %	3 %		29 %	64 %	1 %	4 %	100 %
1998	0 %	3 %	0 %	28 %	63 %	2 %	4 %	100 %
1999	0 %	1 %	1 %	27 %	64 %	3 %	4 %	100 %
2000	0 %	0 %		39 %	55 %	1 %	4 %	100 %
2001 ‡	0 %	3 %		24 %	66 %	2 %	5 %	100 %
2001 †	0 %	3 %	0 %	25 %	65 %	2 %	5 %	100 %
2002	0 %	2 %		22 %	68 %	4 %	4 %	100 %
2003 ‡	0 %	2 %		24 %	61 %	10 %	3 %	100 %
2003 †	0 %	2 %		25 %	60 %	9 %	4 %	100 %
2010	0 %	3 %		14 %	69 %	11 %	2 %	100 %
2011	0 %	2 %		13 %	70 %	12 %	2 %	100 %
2012	0 %	2 %		13 %	69 %	14 %	2 %	100 %
2013		3 %		11 %	70 %	14 %	2 %	100 %
2014		3 %		11 %	69 %	15 %	2 %	100 %
2015		3 %		11 %	66 %	19 %	2 %	100 %

Nacht		Start-Pisten						Total
Jahr	RWY00	RWY10	RWY14	RWY16	RWY28	RWY32	RWY34	
1997	0 %	0 %	0 %	0 %	13 %	2 %	85 %	100 %
1998	0 %	0 %	0 %	2 %	5 %	3 %	89 %	100 %
1999	0 %	0 %	1 %	3 %	6 %	2 %	88 %	100 %
2000	0 %	0 %	0 %	2 %	3 %	2 %	93 %	100 %
2001 ‡	0 %	0 %	0 %	1 %	4 %	3 %	93 %	100 %
2001 †	0 %			1 %	4 %	3 %	93 %	100 %
2002	0 %	0 %	0 %	1 %	5 %	2 %	92 %	100 %
2003 ‡	0 %	0 %	0 %	1 %	5 %	17 %	77 %	100 %
2003 †		0 %		1 %	7 %	13 %	79 %	100 %
2010	0 %	0 %	0 %	3 %	0 %	42 %	56 %	100 %
2011	0 %	0 %	0 %	0 %	0 %	44 %	56 %	100 %
2012	0 %	0 %	0 %	2 %	1 %	43 %	54 %	100 %
2013	0 %	0 %	0 %	1 %	0 %	43 %	56 %	100 %
2014	0 %	0 %	0 %	1 %	0 %	31 %	68 %	100 %
2015	0 %	0 %	0 %	1 %	0 %	46 %	52 %	100 %

Anmerkungen.

‡ Jahresbewegungen (ganzes Kalenderjahr)

† Hochskalierung der Bewegungen von 243 Tagen (Januar–August) auf das ganze Jahr (365 Tage). Für die Belastungsrechnungen 2011 verwendete Daten



Tabelle 1-5. Pistenbelegungen für Landungen ZRH für die Jahre 1997–2003 und 2010–2015, getrennt nach Tag und Nacht. RWY00: Helikopterbewegungen.

<b>Tag</b>		<b>Lande-Pisten</b>						
<b>Jahr</b>	<b>RWY00</b>	<b>RWY10</b>	<b>RWY14</b>	<b>RWY16</b>	<b>RWY28</b>	<b>RWY32</b>	<b>RWY34</b>	<b>Total</b>
1997	0 %		80 %	17 %	2 %			100 %
1998	0 %		81 %	15 %	4 %	0 %		100 %
1999	0 %	0 %	80 %	16 %	4 %	0 %	0 %	100 %
2000	0 %	0 %	85 %	13 %	2 %	0 %	0 %	100 %
2001 ‡	0 %	0 %	80 %	16 %	3 %	0 %	0 %	100 %
2001 †	0 %	0 %	82 %	15 %	3 %	0 %	0 %	100 %
2002	0 %	0 %	75 %	21 %	4 %	0 %	0 %	100 %
2003 ‡	0 %	0 %	85 %	4 %	11 %		1 %	100 %
2003 †	0 %		85 %	4 %	11 %			100 %
2010	0 %		76 %	5 %	10 %		9 %	100 %
2011	0 %		78 %	3 %	11 %		8 %	100 %
2012	0 %		78 %	0 %	12 %		9 %	100 %
2013			80 %	0 %	11 %		9 %	100 %
2014			78 %	1 %	12 %		9 %	100 %
2015			77 %	0 %	15 %		8 %	100 %

<b>Nacht</b>		<b>Lande-Pisten</b>						
<b>Jahr</b>	<b>RWY00</b>	<b>RWY10</b>	<b>RWY14</b>	<b>RWY16</b>	<b>RWY28</b>	<b>RWY32</b>	<b>RWY34</b>	<b>Total</b>
1997	0 %	0 %	11 %	88 %	2 %	0 %	0 %	100 %
1998	0 %	0 %	10 %	88 %	2 %	0 %	0 %	100 %
1999	0 %	0 %	10 %	85 %	4 %	0 %	0 %	100 %
2000	0 %	0 %	10 %	87 %	3 %	0 %	0 %	100 %
2001 ‡	0 %	0 %	10 %	82 %	7 %	0 %	0 %	100 %
2001 †	0 %		11 %	86 %	3 %	0 %		100 %
2002	0 %	0 %	7 %	30 %	63 %	0 %	0 %	100 %
2003 ‡	0 %	0 %	18 %	20 %	62 %	0 %	0 %	100 %
2003 †			11 %	23 %	66 %			100 %
2010	0 %	0 %	4 %	2 %	76 %	0 %	18 %	100 %
2011	0 %	0 %	4 %	1 %	78 %	0 %	16 %	100 %
2012	0 %	0 %	5 %	0 %	74 %	0 %	21 %	100 %
2013	0 %	0 %	5 %	0 %	75 %	0 %	19 %	100 %
2014	0 %	0 %	3 %	1 %	75 %	0 %	21 %	100 %
2015	0 %	0 %	5 %	0 %	74 %	0 %	21 %	100 %

*Anmerkungen.*

‡ Jahresbewegungen (ganzes Kalenderjahr)

† Hochskalierung der Bewegungen von 243 Tagen (Januar–August) auf das ganze Jahr (365 Tage). Für die Belastungsrechnungen 2011 verwendete Daten

## 1.6 Bewegungen in der Nachtruhezeit auf den Schweizer Flughäfen

Bemerkung: Teilweise wurden für untenstehende Quantifizierungen die detaillierten, bestimmte Flugzeugklassen betreffende Bestimmungen der Flughäfen für die Nachtruhezeit vereinfacht, so dass die Quantifizierungen mit einer gewissen Unsicherheit behaftet sind. Die Daten von BSL sind mit größerer Unsicherheit behaftet, da die Umwelt-Bulletins nur Angaben zu Ausnahmegewilligungen, nicht aber zu den übrigen Flügen in der Sperr-Zeit und zum Verspätungsabbau enthalten.

Tabelle 1-6. Bewegungen in der Nachtruhezeit, BSL 2010 – 2015.

Jahr	Verspätungsabbau		Sperr-Zeit		Nacht-Zeit total	
	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.
2010 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	57	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2011 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	27	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2012 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	16	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2013 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	18	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2014 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	37	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2015 <sup>g</sup>	L: 23:00-23:30	-	L: 23:30-05:00	39	L: 23:00-05:00	-
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2011 <sup>h</sup>	L: 23:00-23:30	661	L: 23:30-05:00	196	L: 23:00-05:00	856
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	

Anmerkungen.

<sup>g</sup> Angaben aus Umwelt-Bulletin des EuroAirport Basel Mulhouse Freiburg (Annex zu Umweltbericht), S. 16 (Ausnahmegewilligungen). Keine Angaben zum Verspätungsabbau.

<sup>h</sup> Gemäß Fluglärmrechnungen 2011. Unterschiede zu 2011 aus Umwelt-Bulletin wegen anderer Definition (Ausnahmegewilligung vs. Bewegungen innerhalb Sperr-Zeit).

Tabelle 1-7. Bewegungen in der Nachtruhezeit, GVA 2010 – 2015.

Jahr	Verspätungsabbau		Sperr-Zeit		Nacht-Zeit total	
	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.
2010	L: 00:00-00:30	321	L: 00:30-06:00	69	L: 00:00-06:00	390
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2011	L: 00:00-00:30	85	L: 00:30-06:00	25	L: 00:00-06:00	110
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2012	L: 00:00-00:30	75	L: 00:30-06:00	12	L: 00:00-06:00	87
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2013	L: 00:00-00:30	107	L: 00:30-06:00	26	L: 00:00-06:00	133
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2014	L: 00:00-00:30	128	L: 00:30-06:00	26	L: 00:00-06:00	154
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2015	L: 00:00-00:30	155	L: 00:30-06:00	22	L: 00:00-06:00	177
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	

Tabelle 1-8. Bewegungen in der Nachtruhezeit, ZRH 1997 – 2003 und 2010 – 2015.

Jahr	Verspätungsabbau		Sperr-Zeit		Nacht-Zeit total	
	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.	Zeiten	Anz. Bew.
1997	L: 00:00-00:30	0	L: 00:30-05:00	87	L: 00:00-05:00	87
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
1998	L: 00:00-00:30	66	L: 00:30-05:00	54	L: 00:00-05:00	120
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
1999	L: 00:00-00:30	145	L: 00:30-05:00	49	L: 00:00-05:00	194
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2000	L: 00:00-00:30	102	L: 00:30-05:00	57	L: 00:00-05:00	159
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2001 <sup>a</sup>	L: 00:00-00:30	3	L: 00:30-05:00	13	L: 00:00-05:00	16
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2001 <sup>b</sup>	L: 00:00-00:30	1	L: 00:30-05:30	13	L: 00:00-05:30	14
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2002	L: 00:00-00:30	44	L: 00:30-05:30	35	L: 00:00-05:30	79
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2003 <sup>c</sup>	L: 00:00-00:30	27	L: 00:30-05:30	33	L: 00:00-05:30	60
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2003 <sup>d</sup>	L: 00:00-00:30	5	L: 00:30-06:00	4	L: 00:00-06:00	9
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2010 <sup>e</sup>	L: 00:00-00:30	53	L: 00:30-06:00	30	L: 00:00-06:00	83
	S: 00:00-00:30		S: 00:30-06:00		S: 00:00-06:00	
2010 <sup>f</sup>	L: 23:00-23:30	804	L: 23:30-06:00	165	L: 23:00-06:00	969
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	
2011	L: 23:00-23:30	1721	L: 23:30-06:00	144	L: 23:00-06:00	1865
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	
2012	L: 23:00-23:30	2065	L: 23:30-06:00	227	L: 23:00-06:00	2292
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	
2013	L: 23:00-23:30	1888	L: 23:30-06:00	161	L: 23:00-06:00	2049
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	
2014	L: 23:00-23:30	2073	L: 23:30-06:00	169	L: 23:00-06:00	2242
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	
2015	L: 23:00-23:30	2187	L: 23:30-06:00	205	L: 23:00-06:00	2392
	S: 23:00-23:30		S: 23:30-06:00		S: 23:00-06:00	

Anmerkungen.

<sup>a</sup> bis 18.10.2001

<sup>b</sup> ab 19.10.2001

<sup>c</sup> bis 29.10.2003

<sup>d</sup> ab 30.10.2003

<sup>e</sup> bis 28.07.2010

<sup>f</sup> ab 29.07.2010

## 2 Anhang B: Häufigkeitsverteilungen über Pegelklassen pro Stichprobe

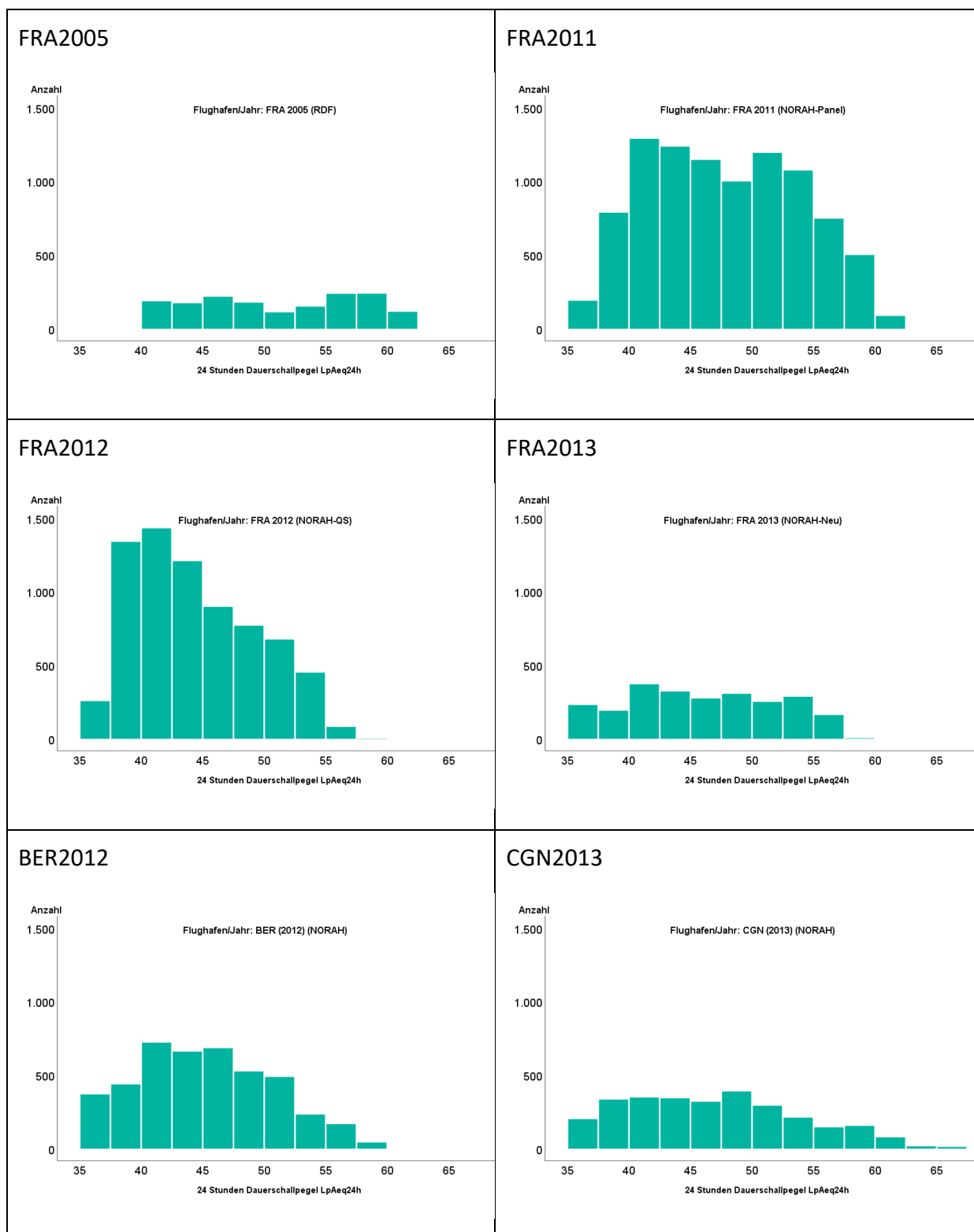


Abbildung 2-1. Häufigkeitsverteilungen über  $L_{Aeq}$ -Klassen pro Flughafen und Jahr.

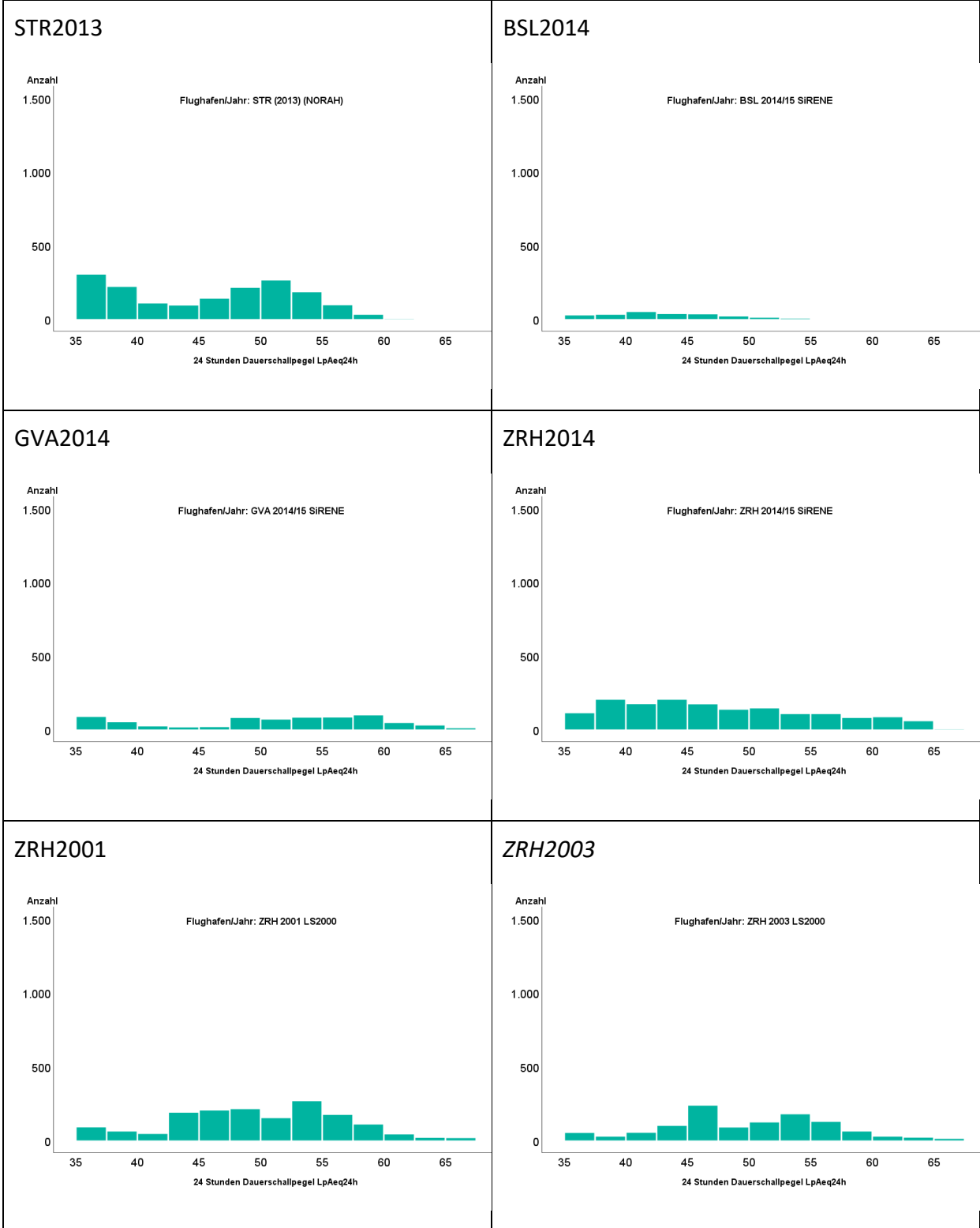


Abbildung 2-2. Häufigkeitsverteilungen über  $L_{Aeq}$ -Klassen pro Flughafen und Jahr.

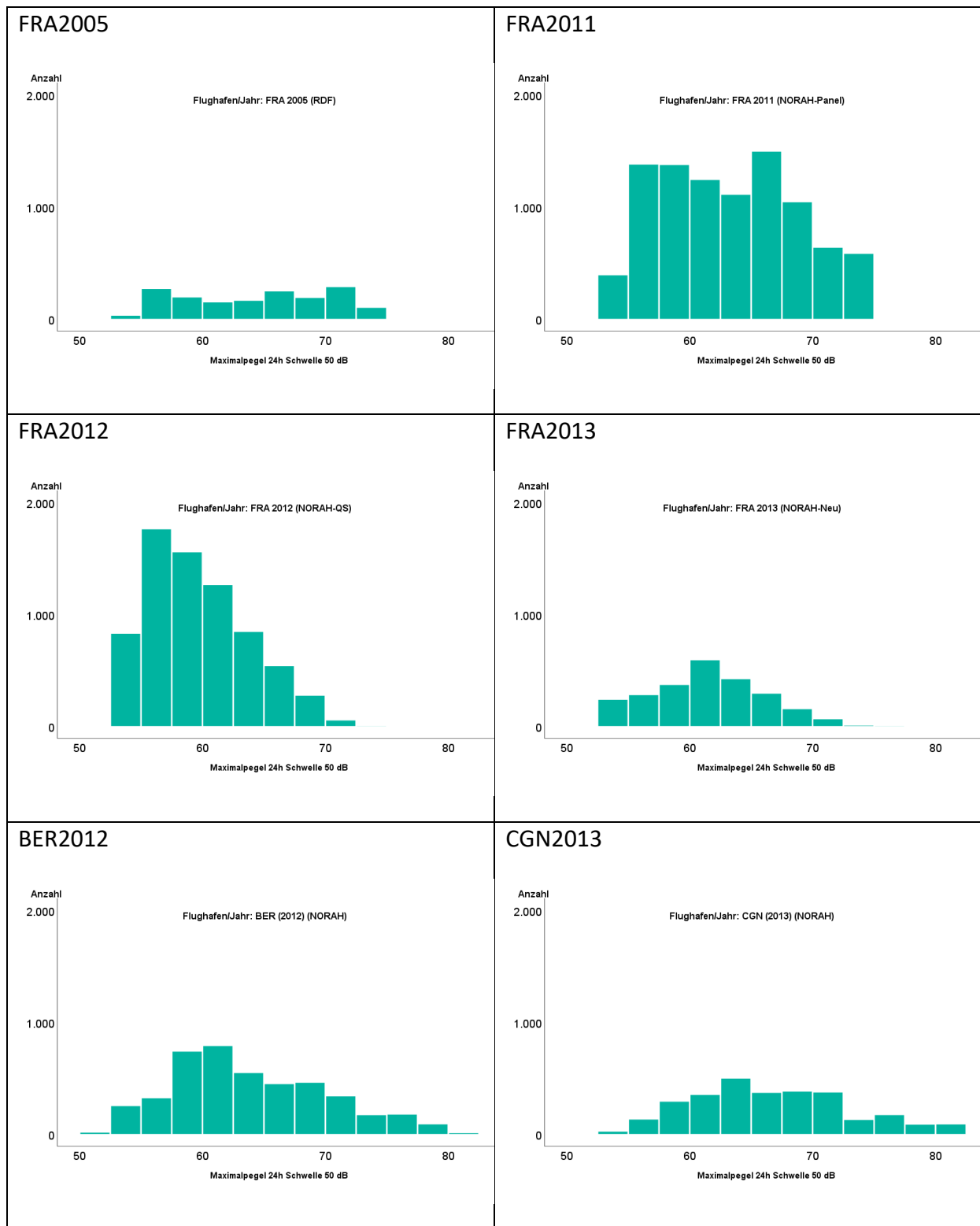


Abbildung 2-3. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,50})$  pro Flughafen und Jahr.

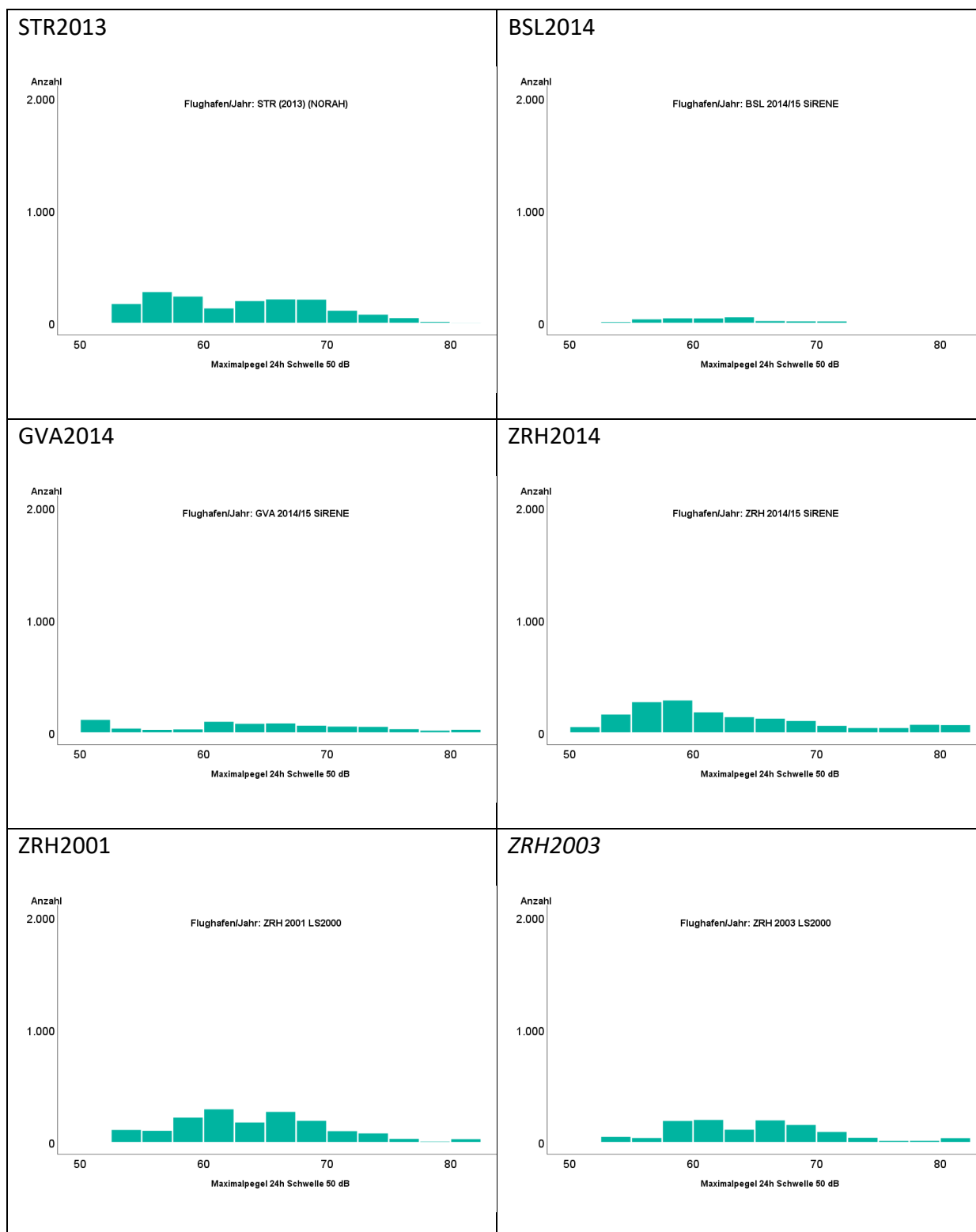


Abbildung 2-4. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,50})$  pro Flughafen und Jahr.

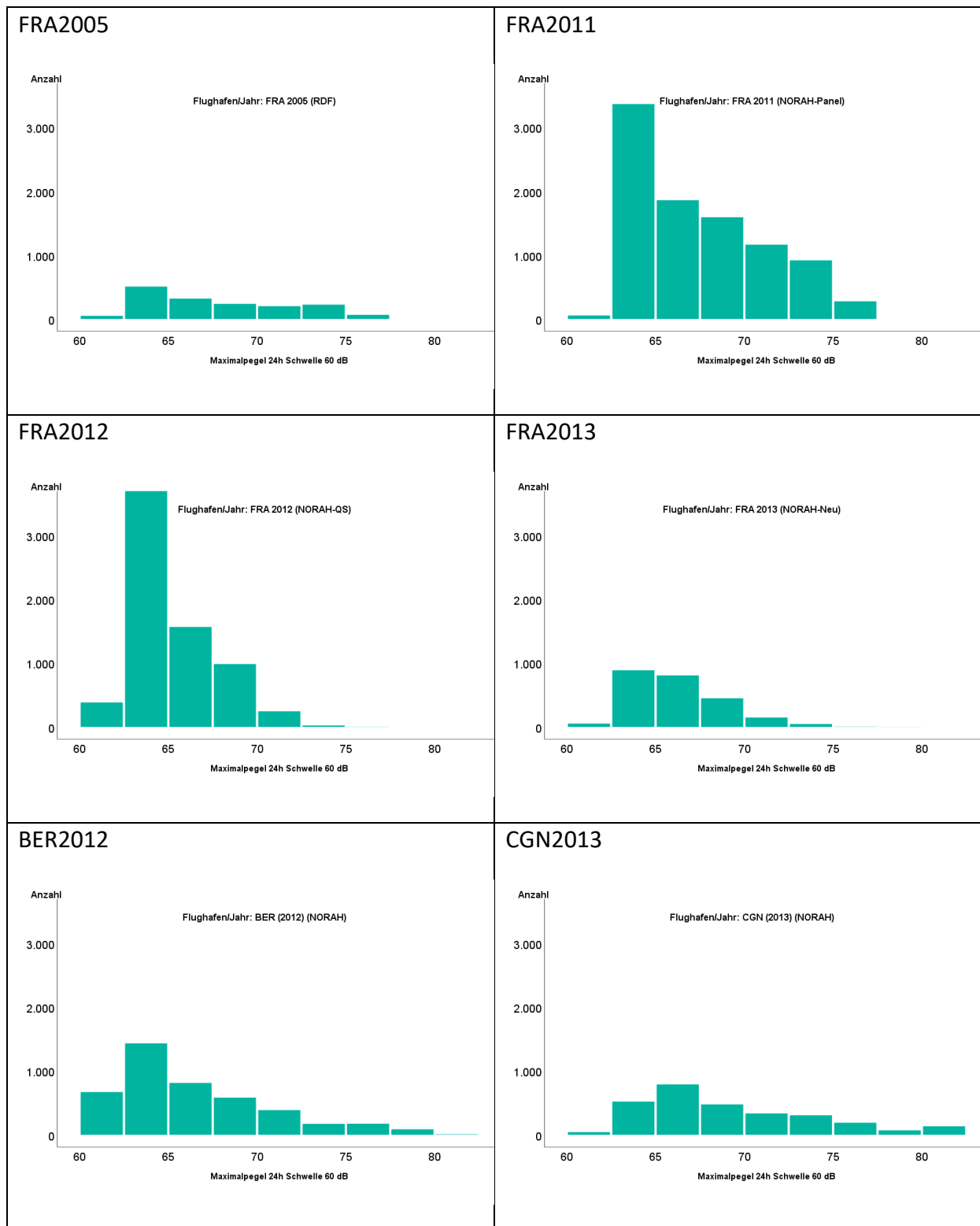


Abbildung 2-5. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,60})$  pro Flughafen und Jahr.



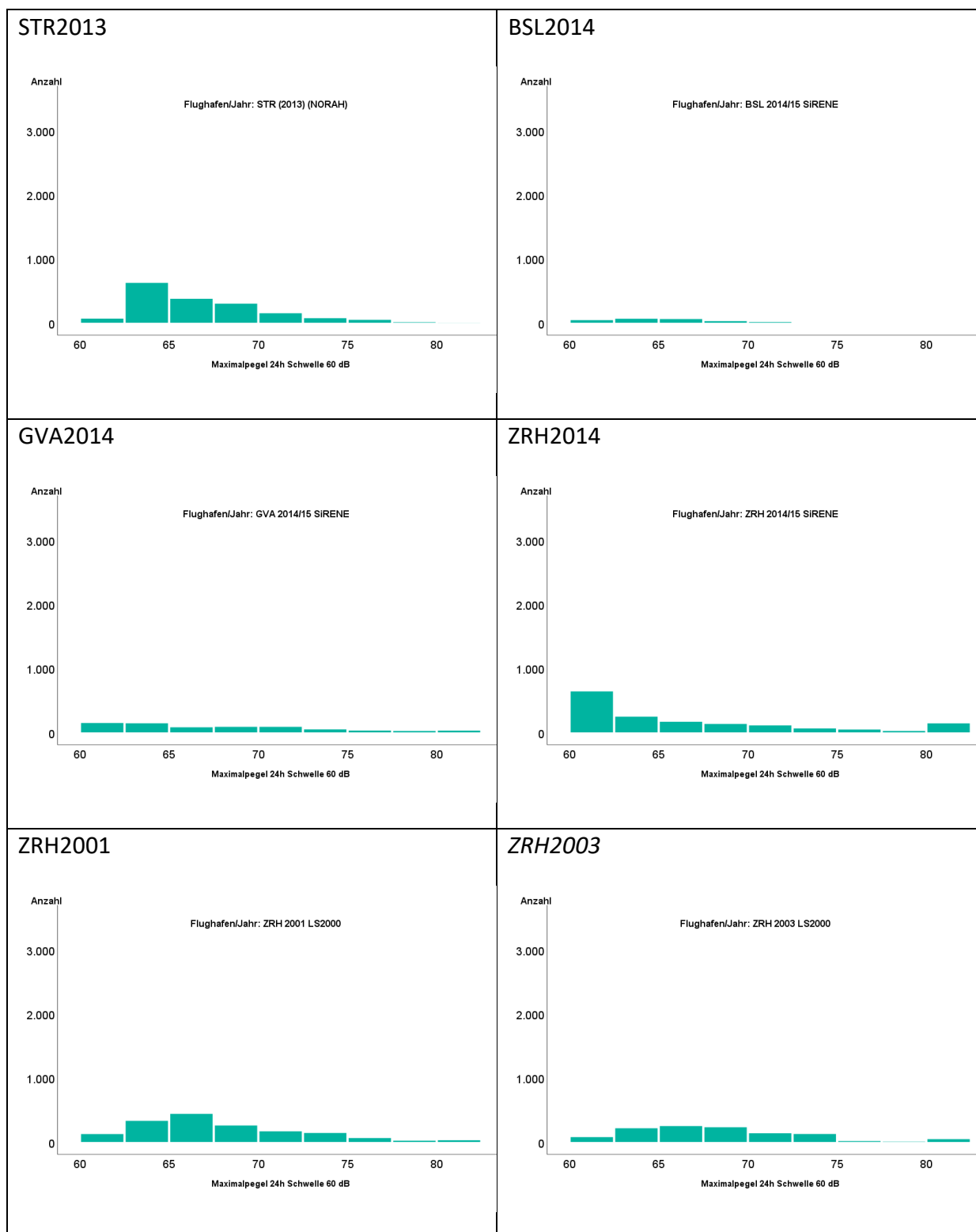


Abbildung 2-6. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,60})$  pro Flughafen und Jahr.

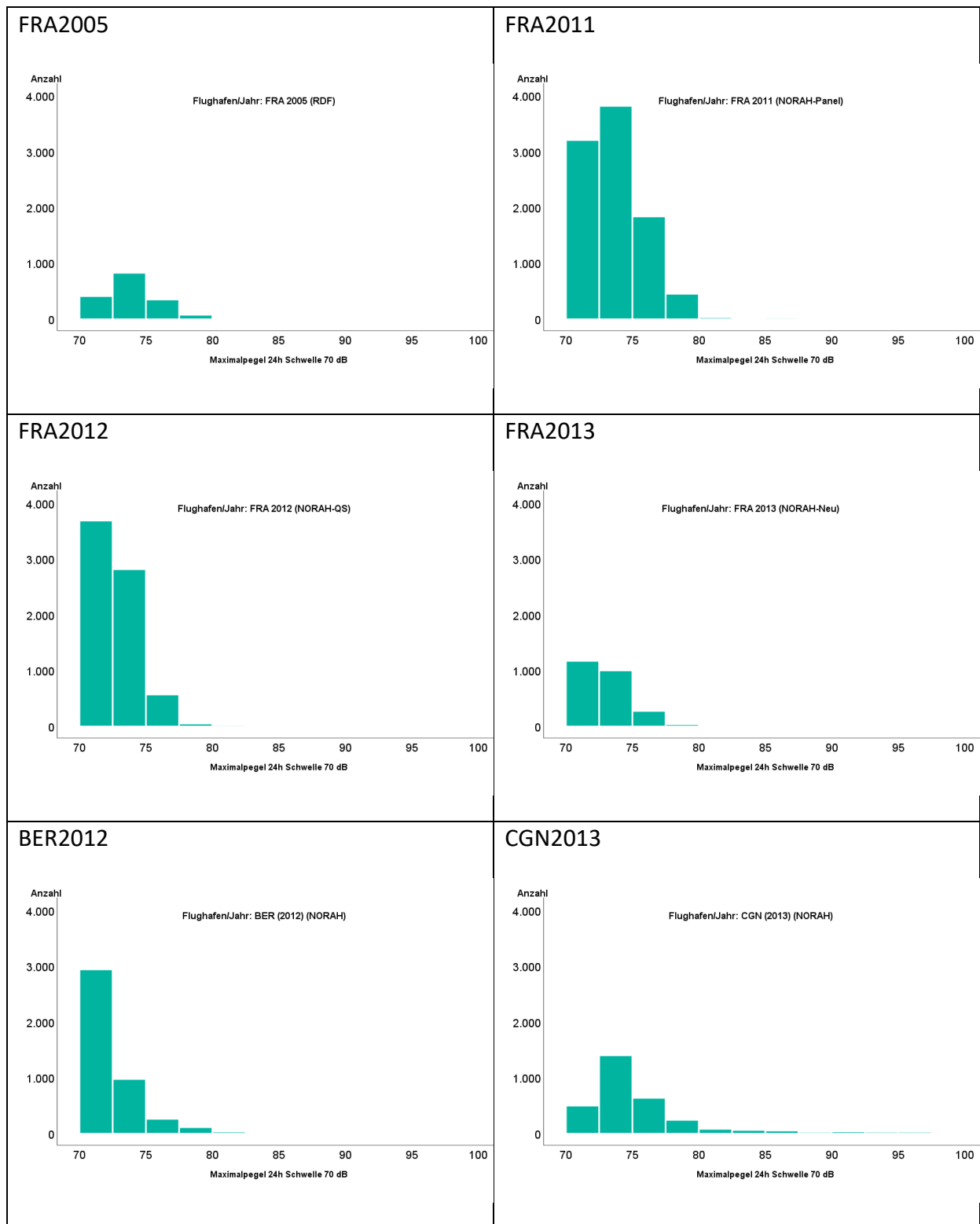


Abbildung 2-7. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,70})$  pro Flughafen und Jahr.

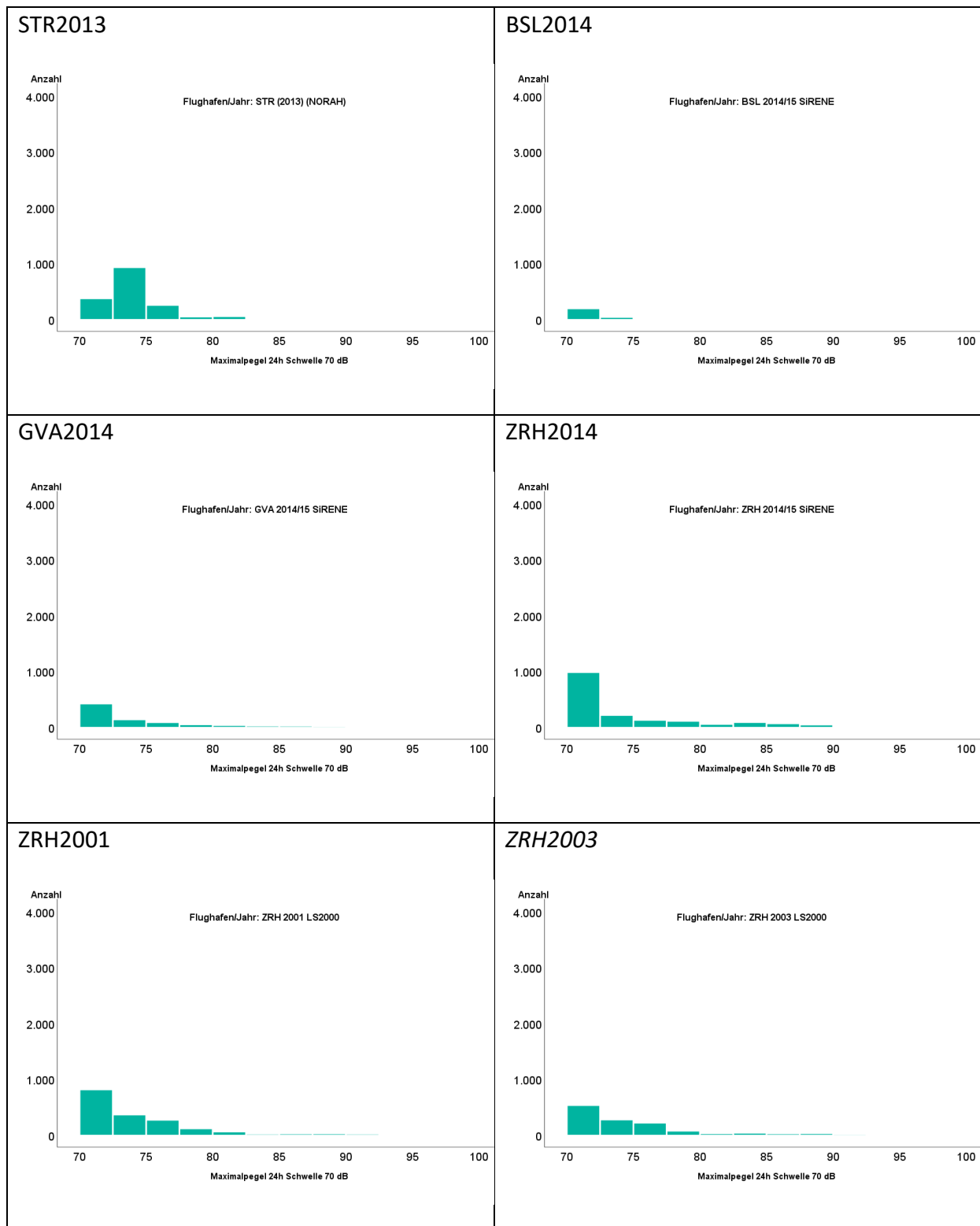


Abbildung 2-8. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,70})$  pro Flughafen und Jahr.

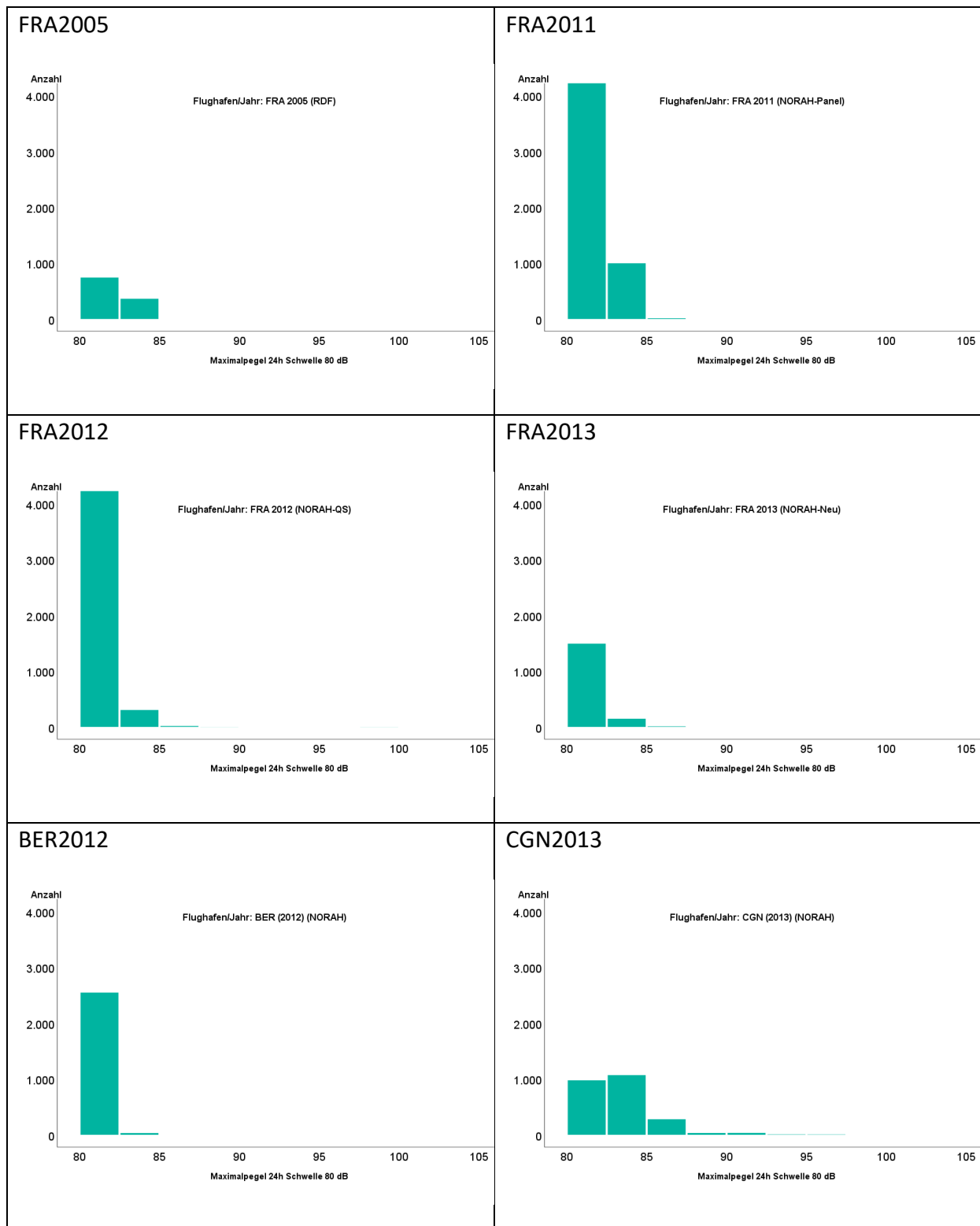


Abbildung 2-9. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,80})$  pro Flughafen und Jahr.

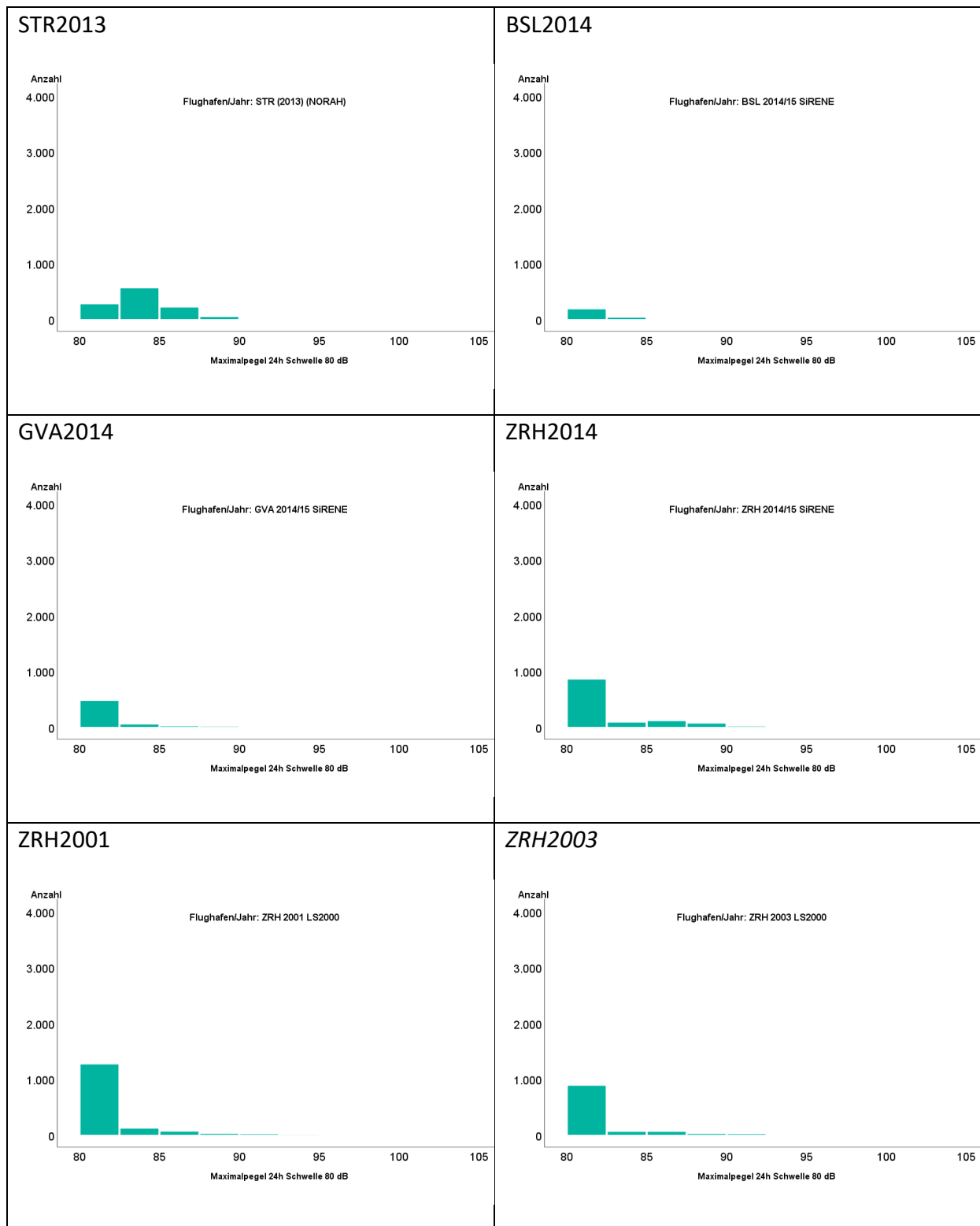


Abbildung 2-10. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $\log(\text{NAT}_{24h,80})$  pro Flughafen und Jahr.

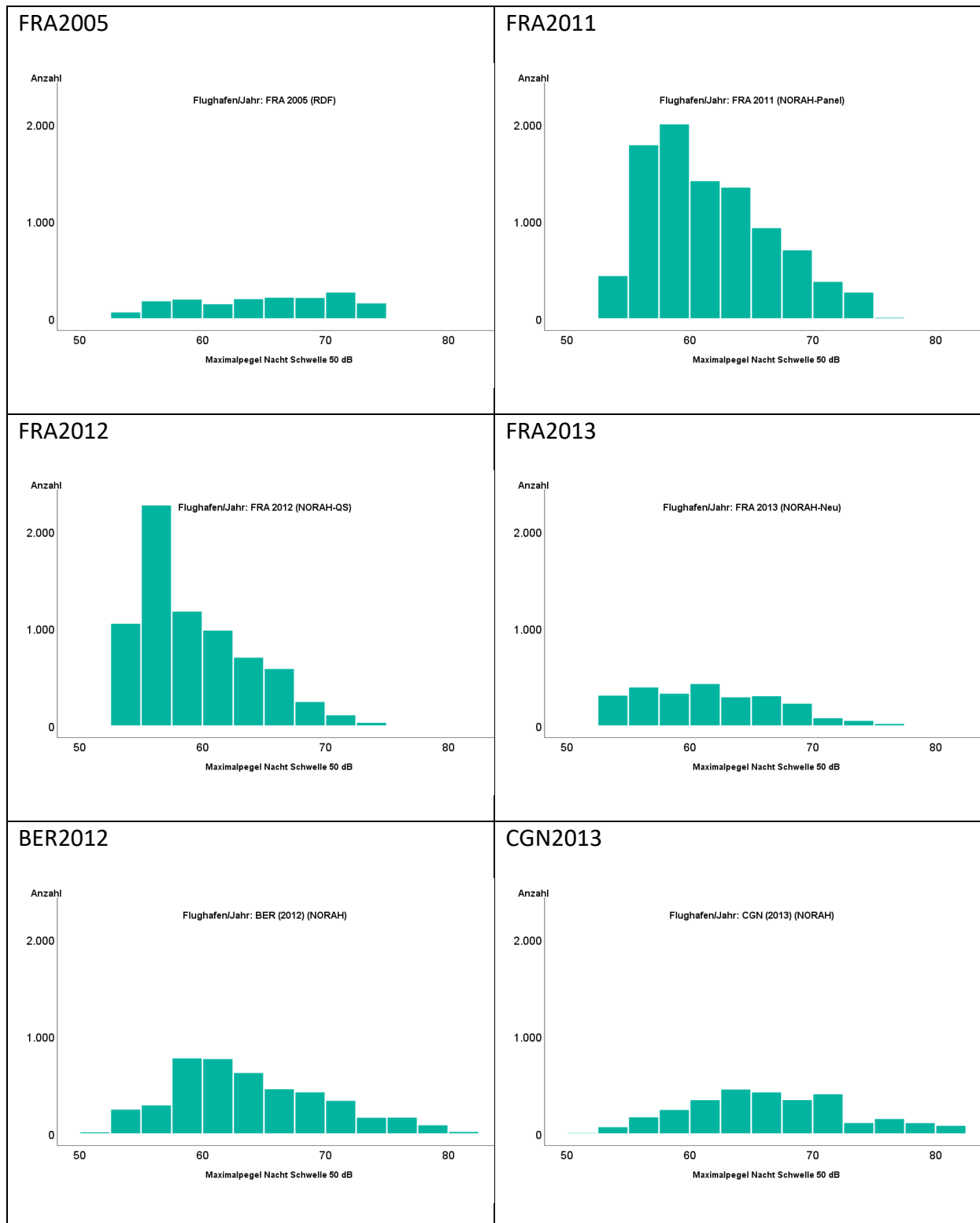


Abbildung 2-11. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,50}$  Uhr pro Flughafen und Jahr.

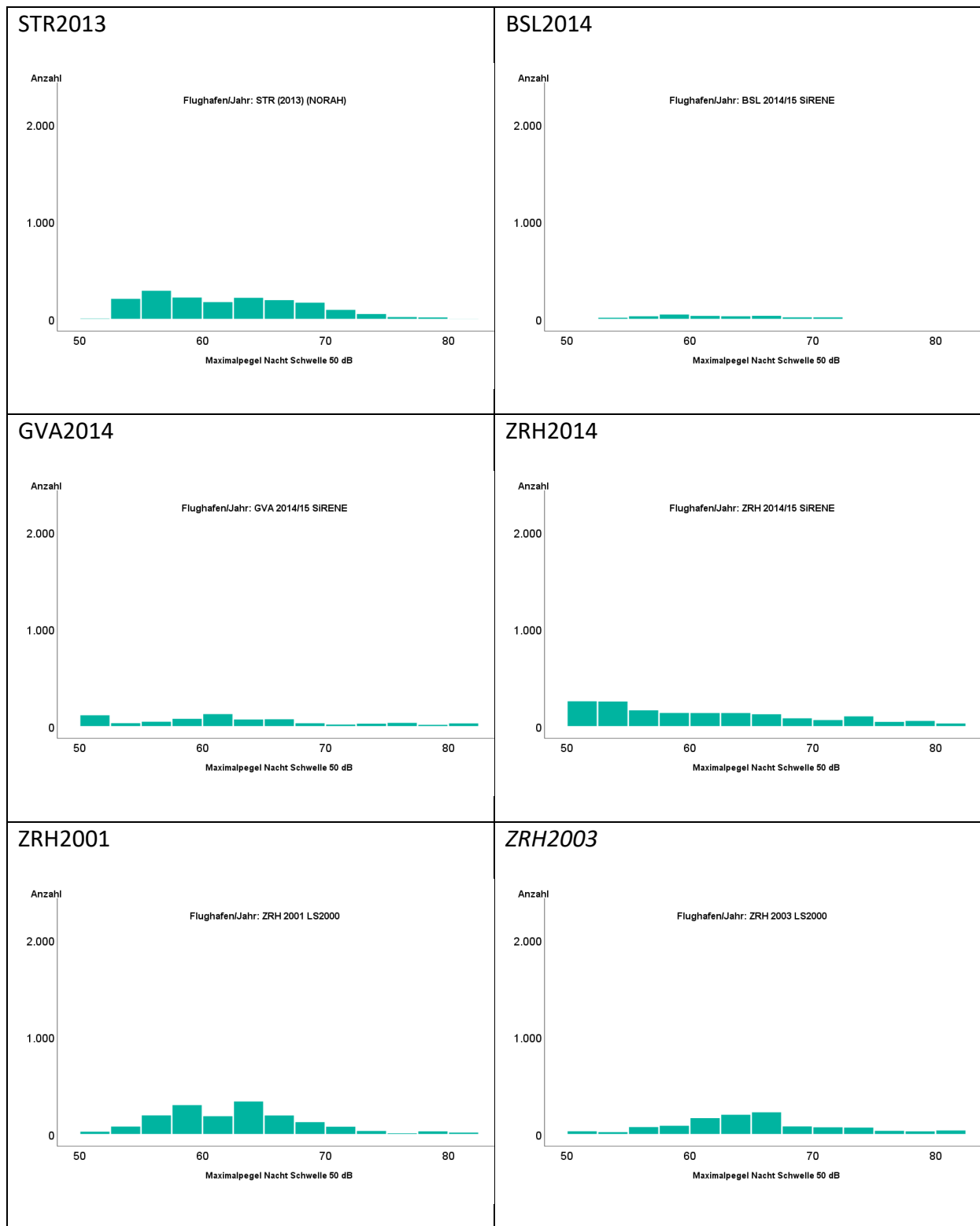


Abbildung 2-12. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,50}$  pro Flughafen und Jahr.

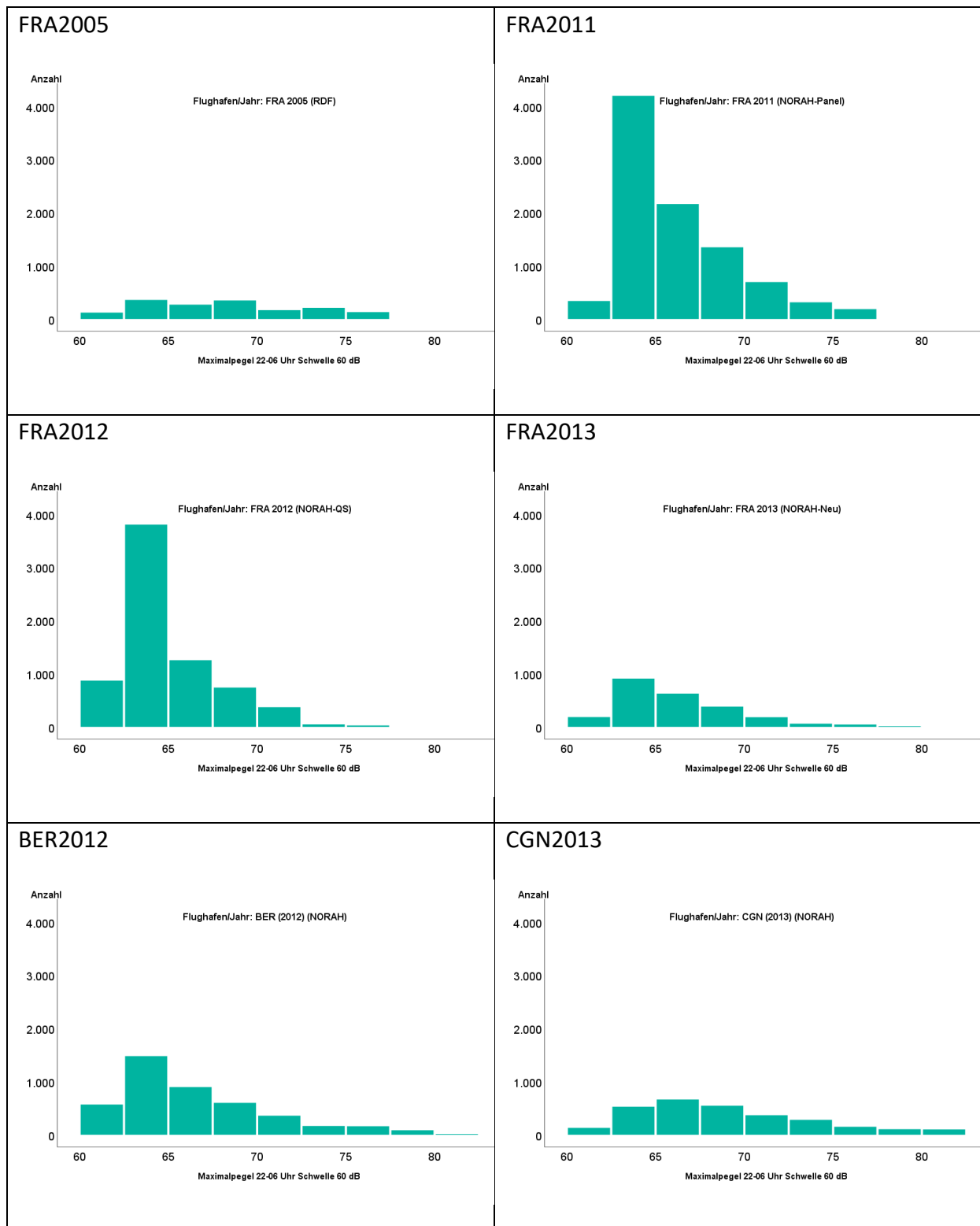


Abbildung 2-13. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,60}$  pro Flughafen und Jahr.



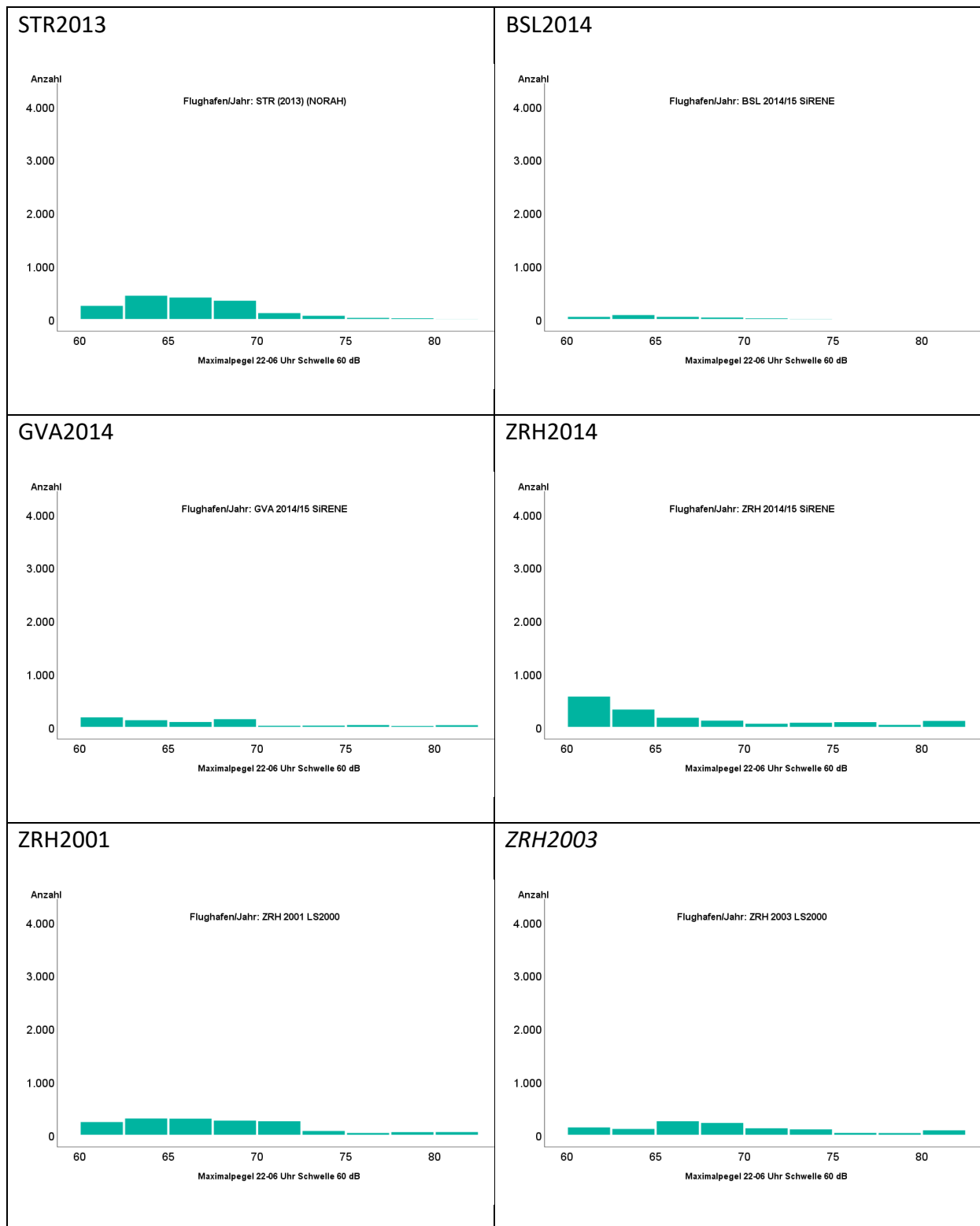


Abbildung 2-14. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,60}$  pro Flughafen und Jahr.

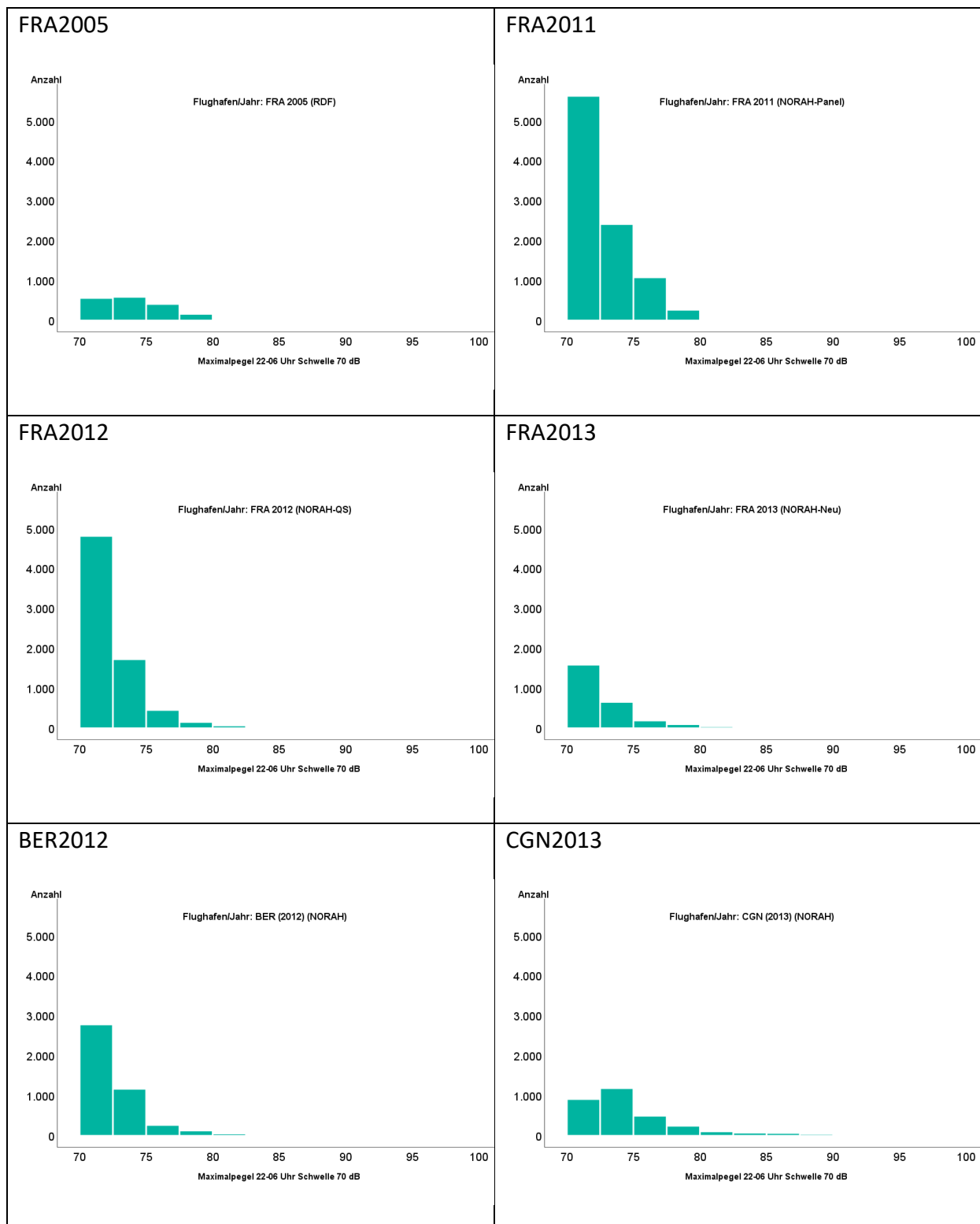


Abbildung 2-15. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,70}$  pro Flughafen und Jahr.

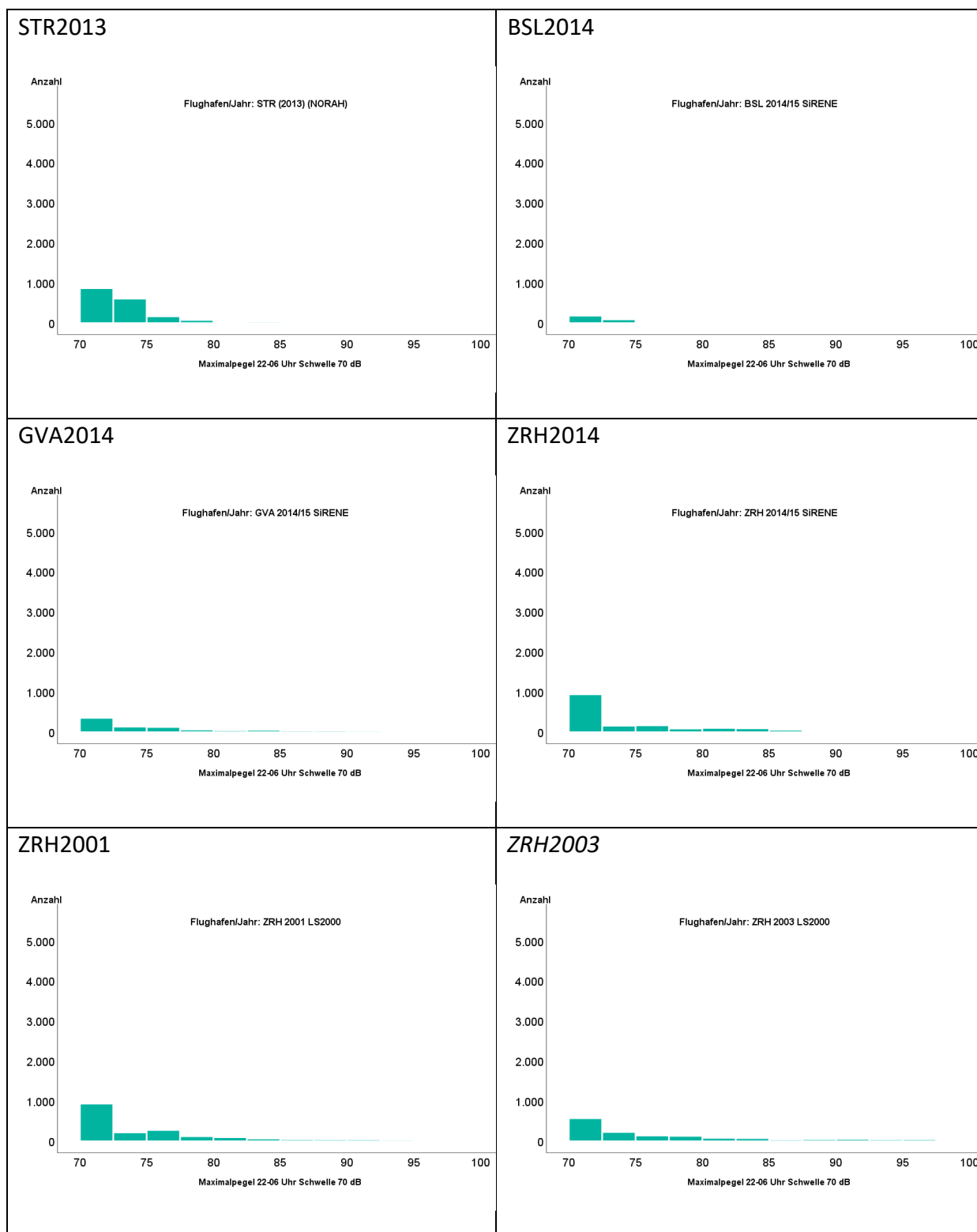


Abbildung 2-16. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,70}$  pro Flughafen und Jahr.

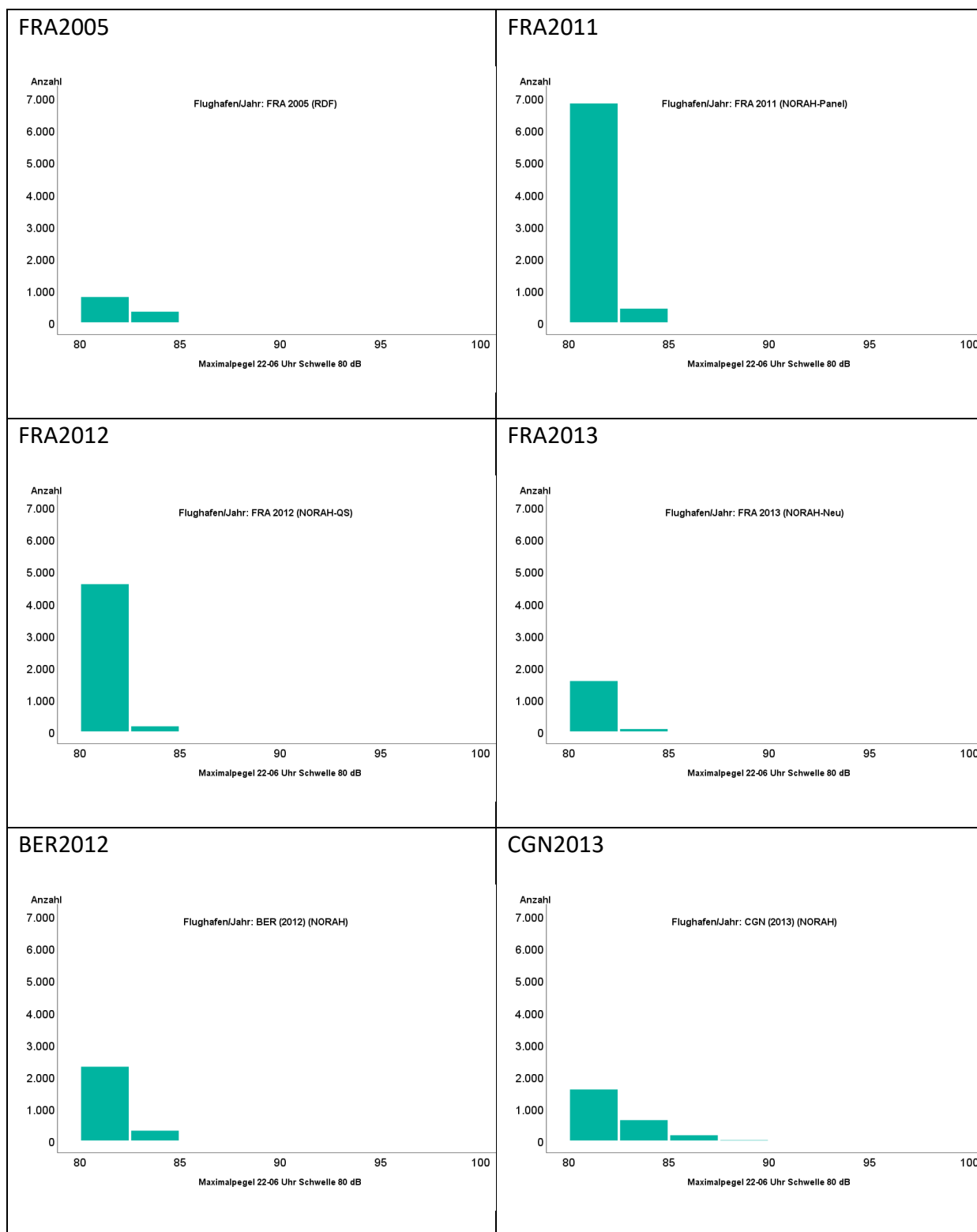


Abbildung 2-17. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,80}$  pro Flughafen und Jahr.

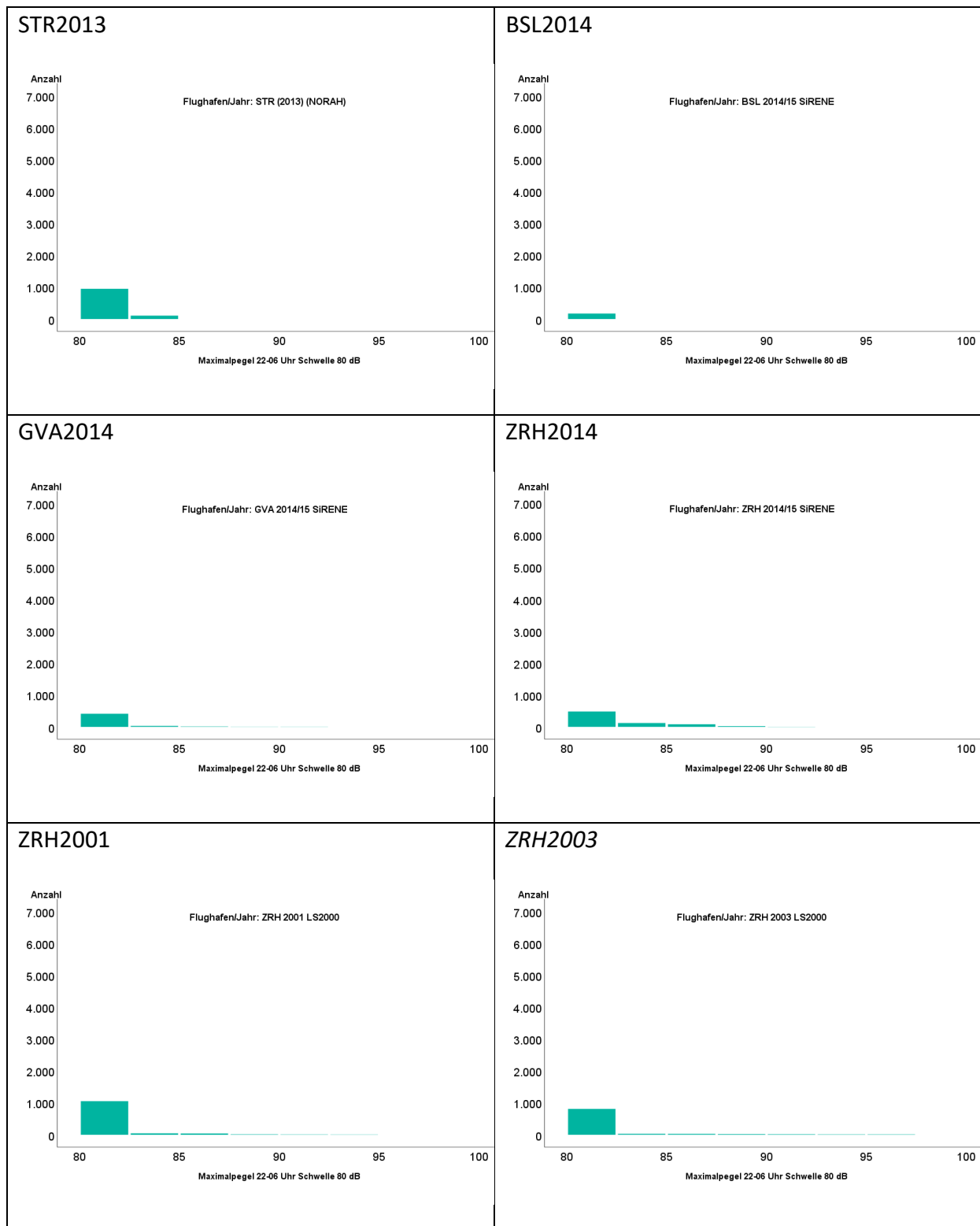


Abbildung 2-18. Häufigkeitsverteilungen über Klassen des mittleren Maximalpegels  $L_{AS,max,log,22-06h,80}$  pro Flughafen und Jahr.

### 3 Anhang C: Streudiagramme für Pegelklassen und Kriterien

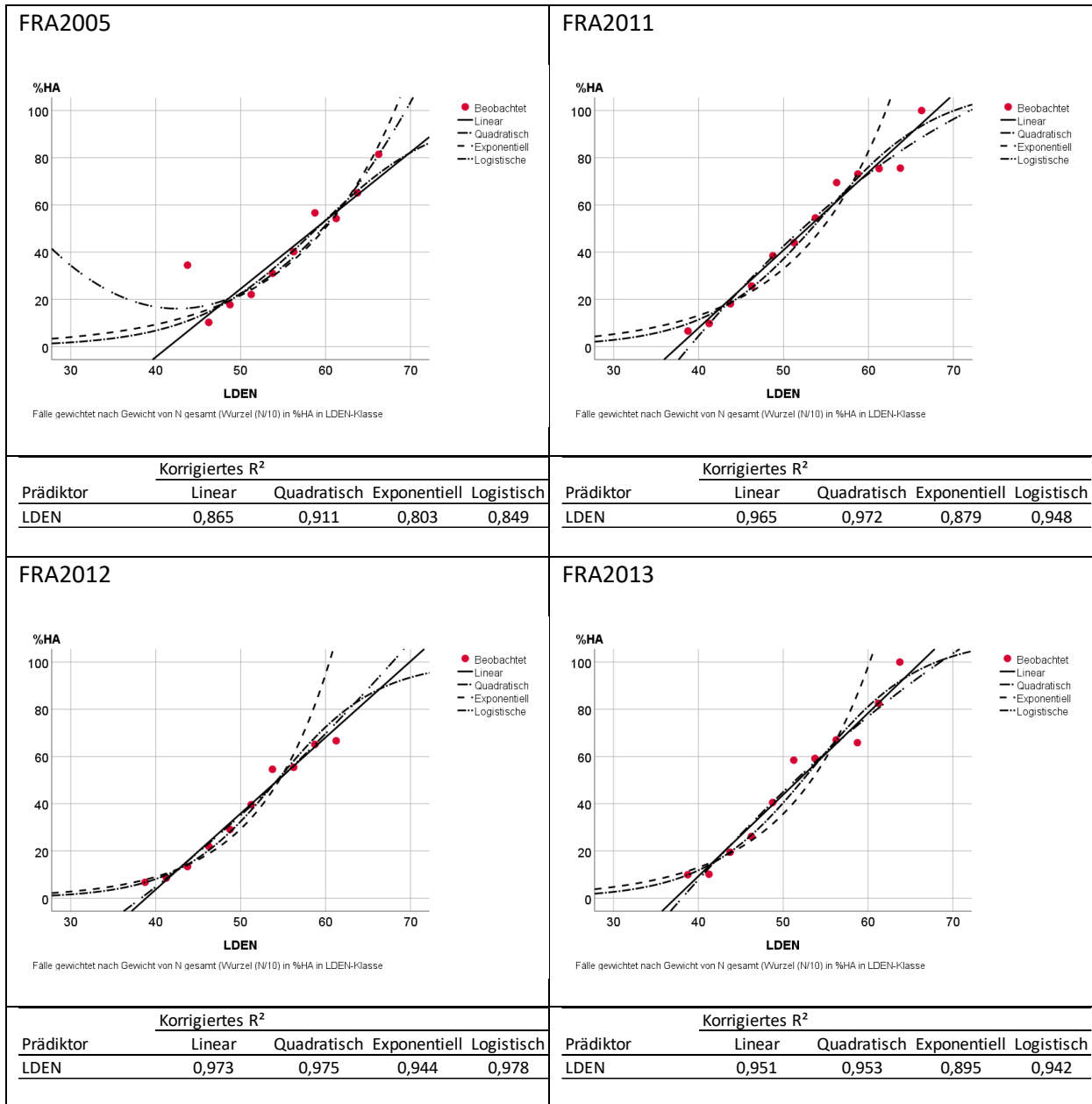


Abbildung 3-1 - % HA nach L<sub>den</sub>-Klassen

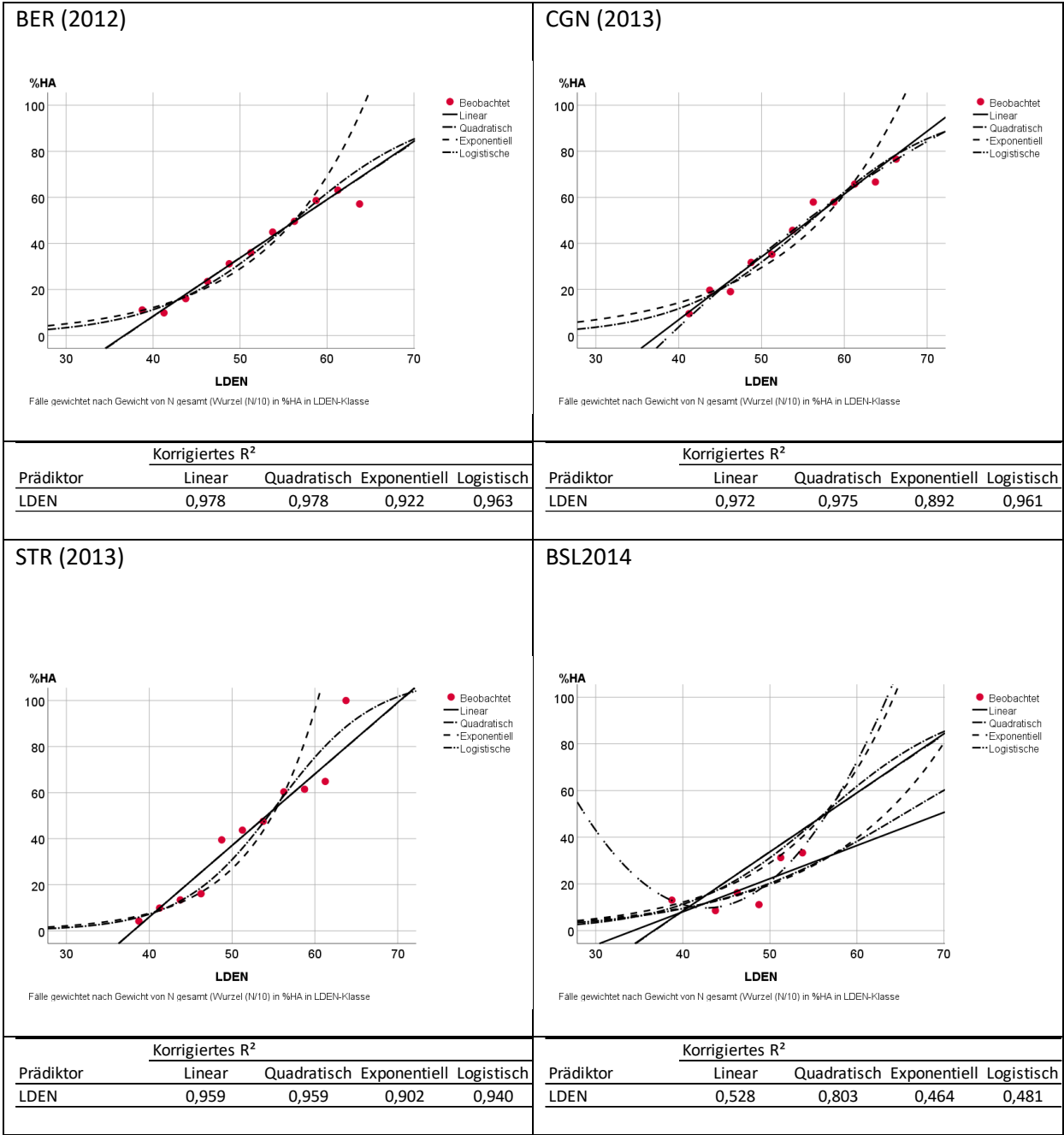


Abbildung 9-33 (fortgesetzt) - % HA nach L<sub>den</sub>-Klassen

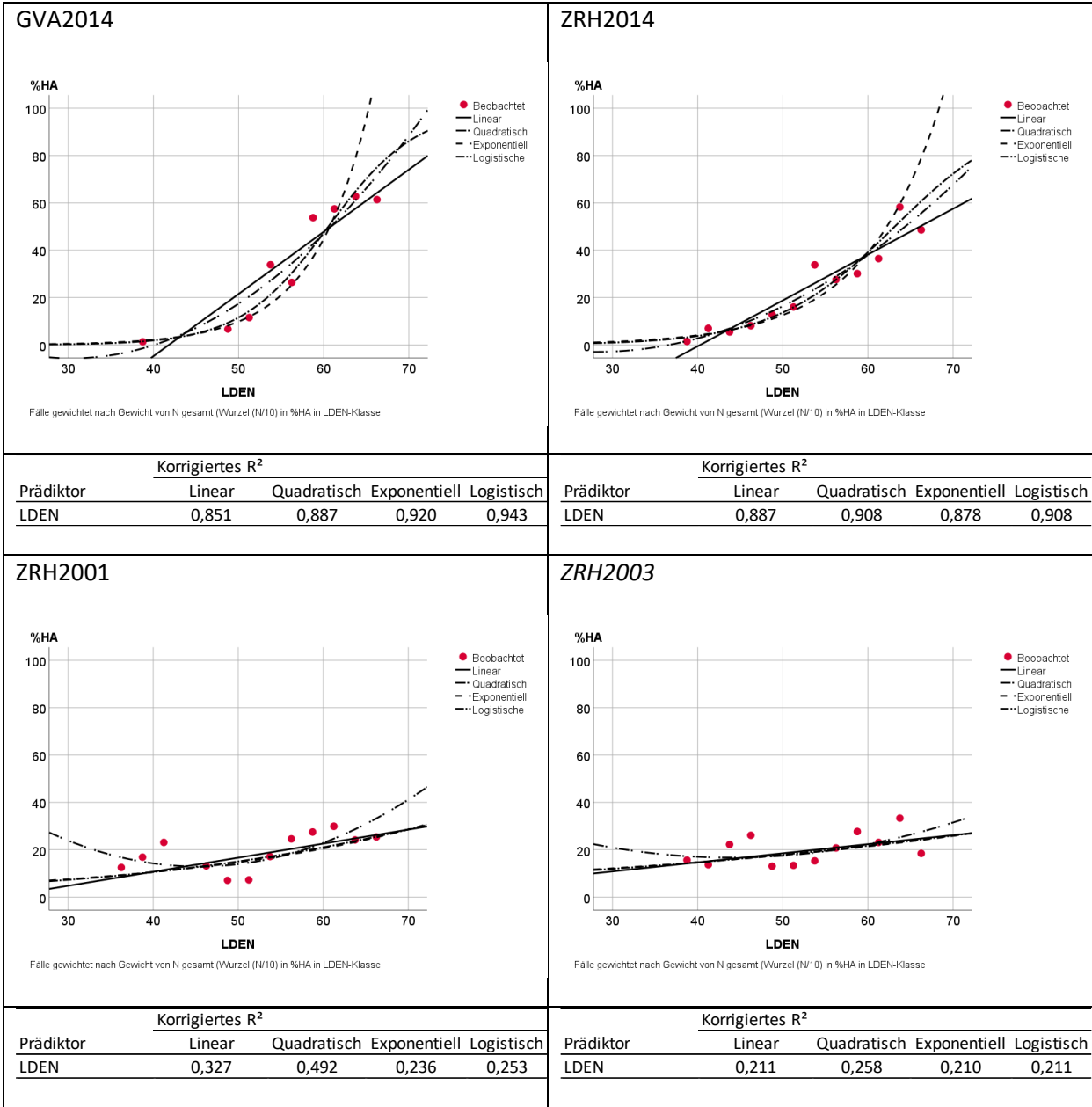


Abbildung 9-33 (fortgesetzt) - % HA nach L<sub>den</sub>-Klassen



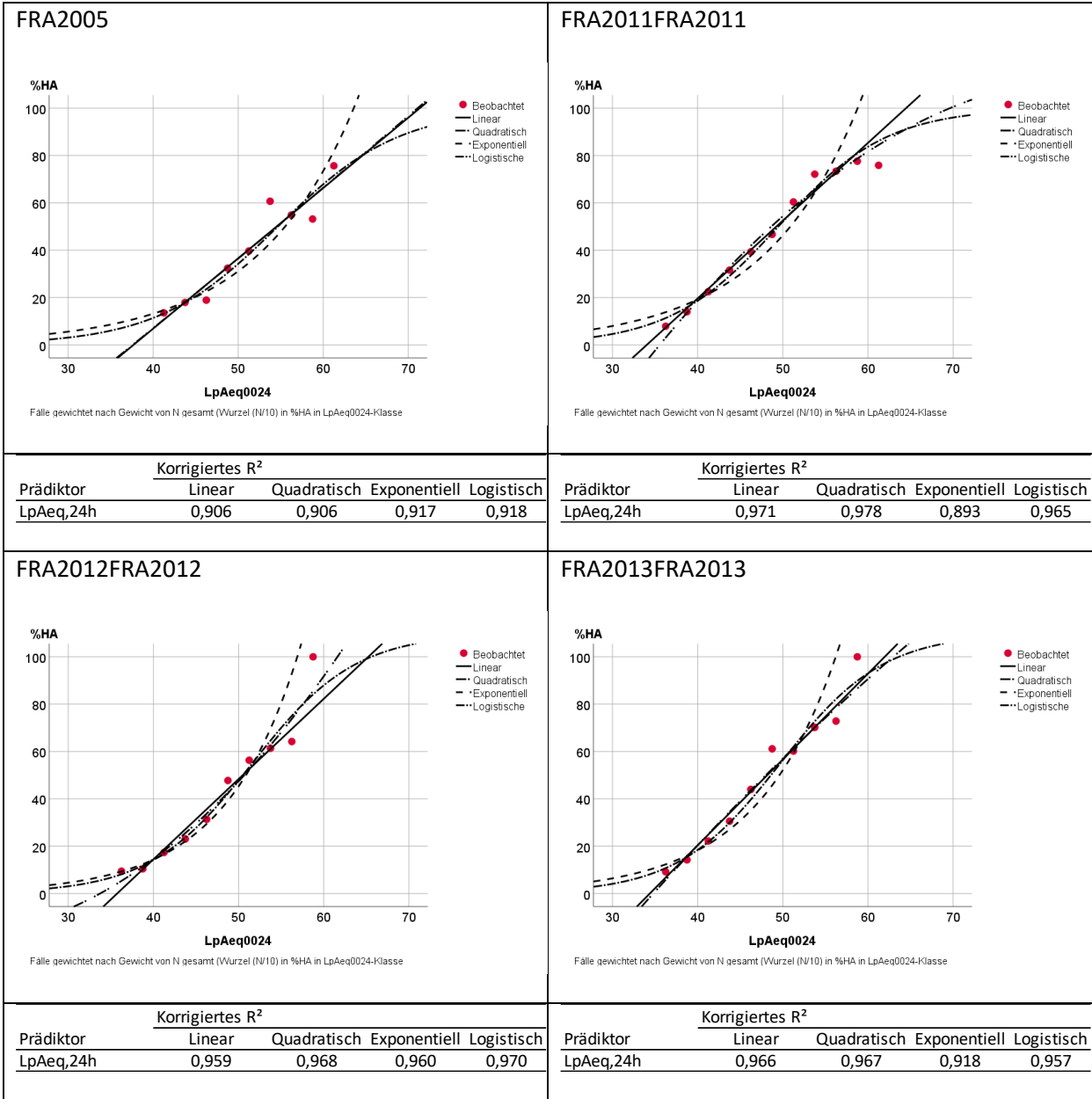


Abbildung 3-2 - % HA nach  $L_{Aeq,24h}$ -Klassen

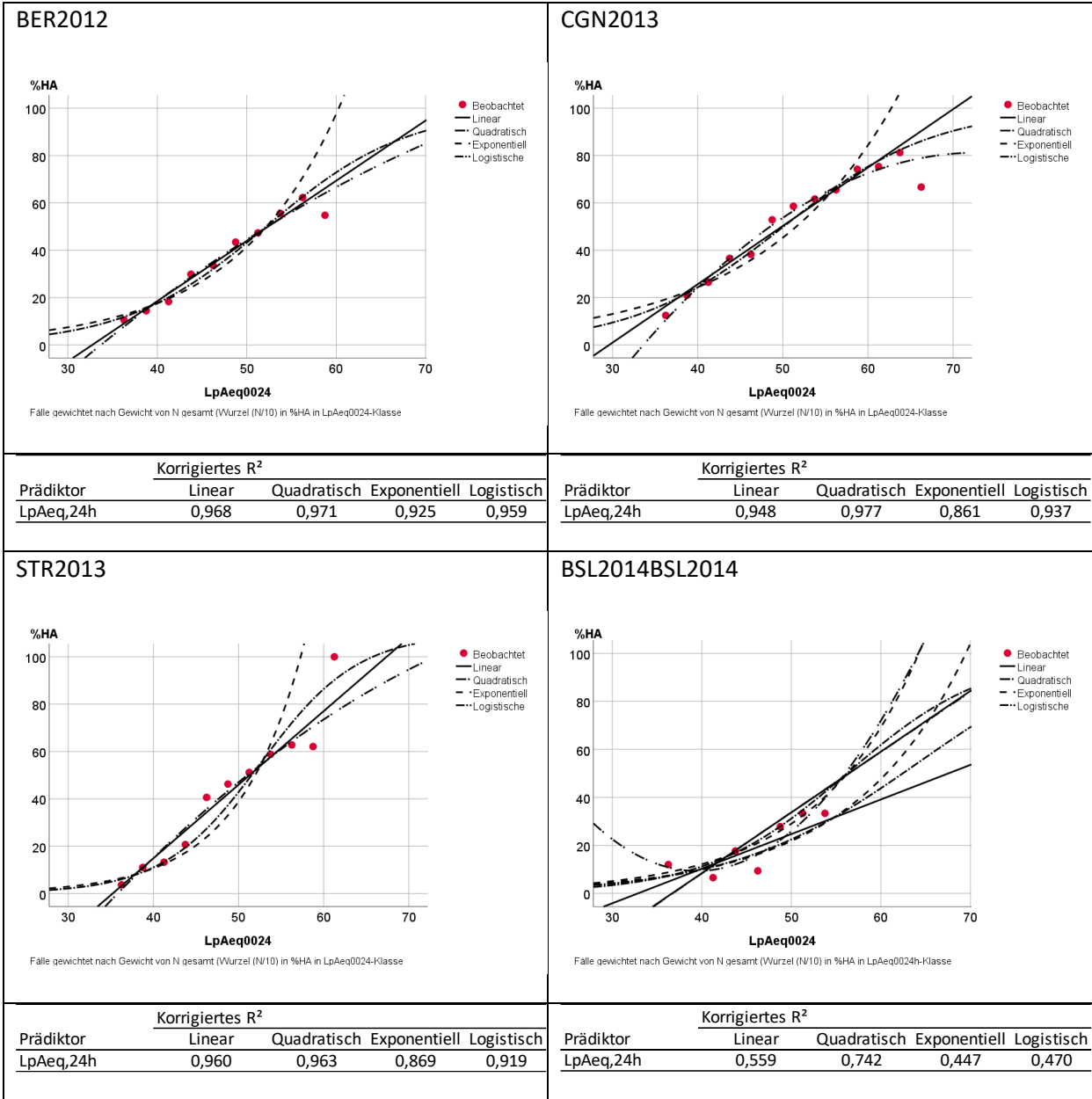


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}$ -Klassen

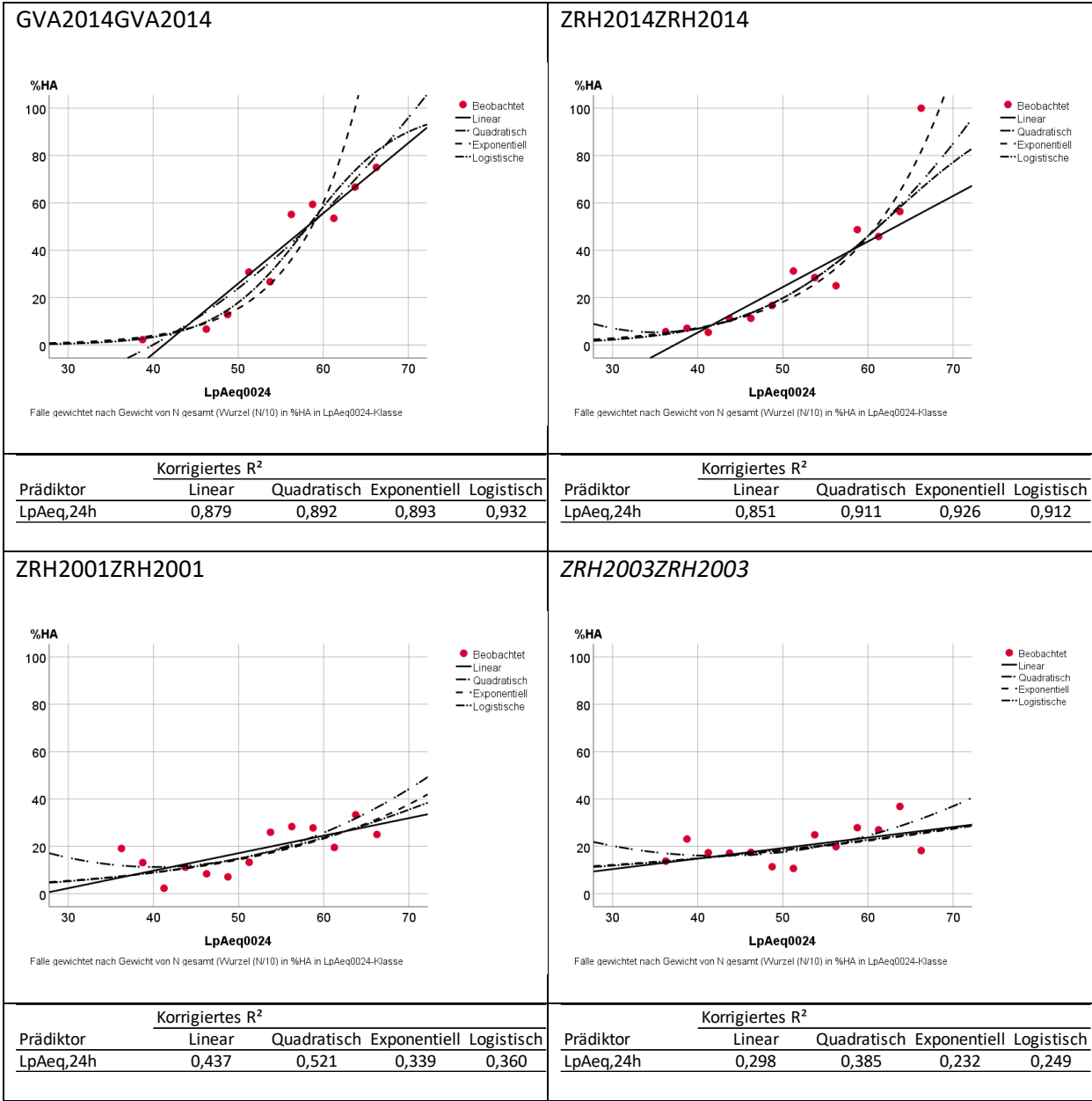


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}$ -Klassen

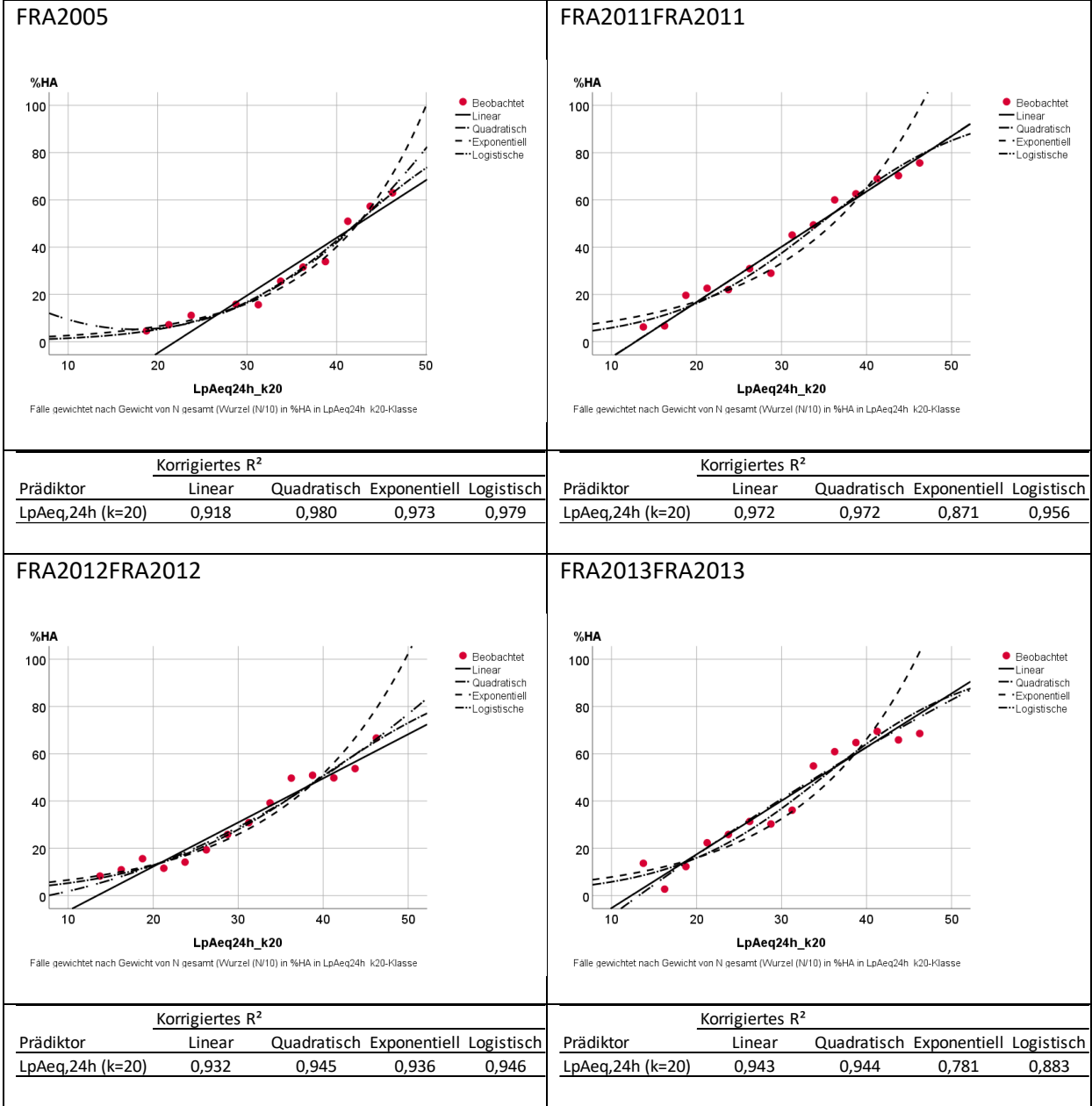


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}(k=20)$ -Klassen

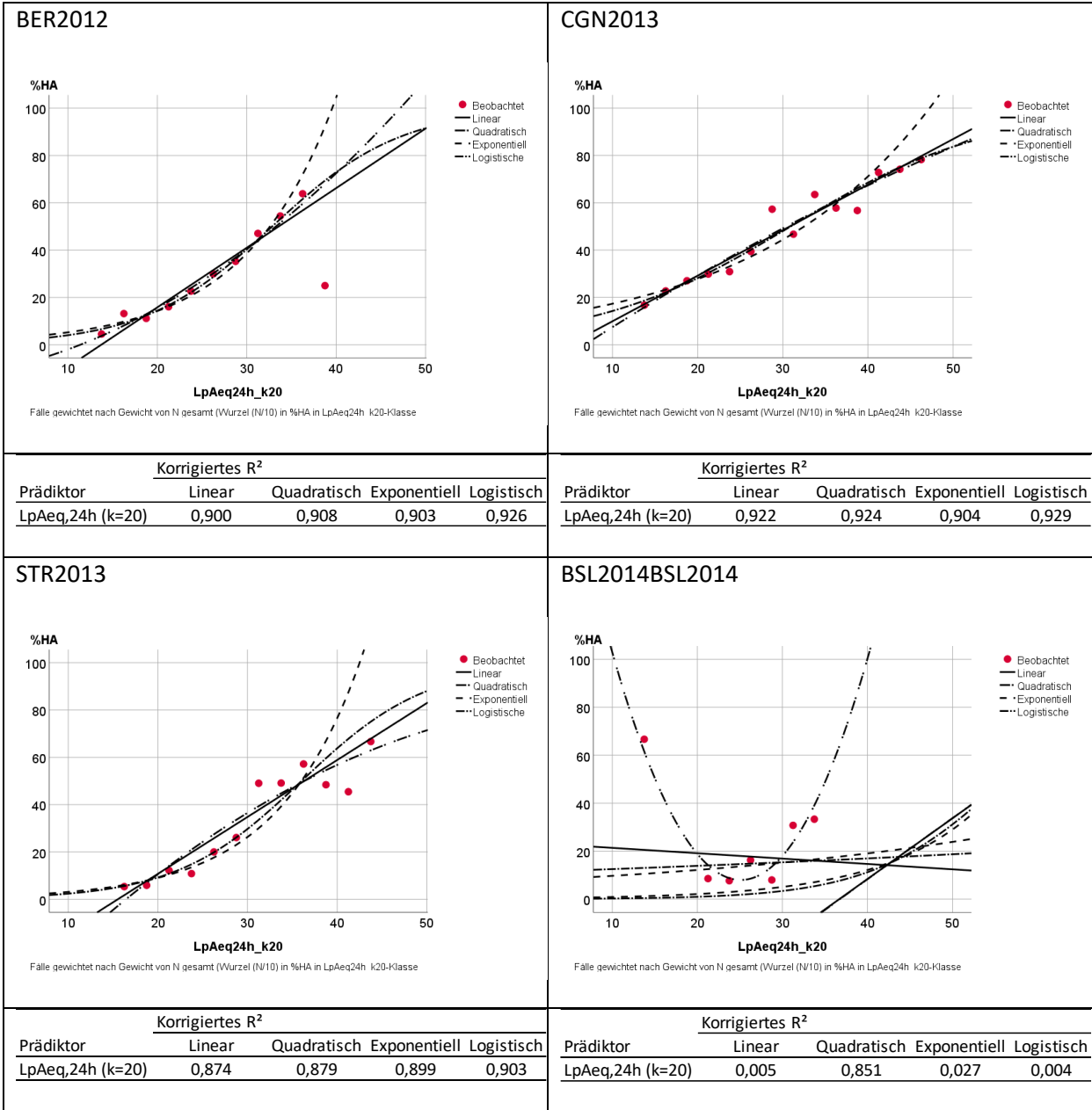


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}(k = 20)$ -Klassen

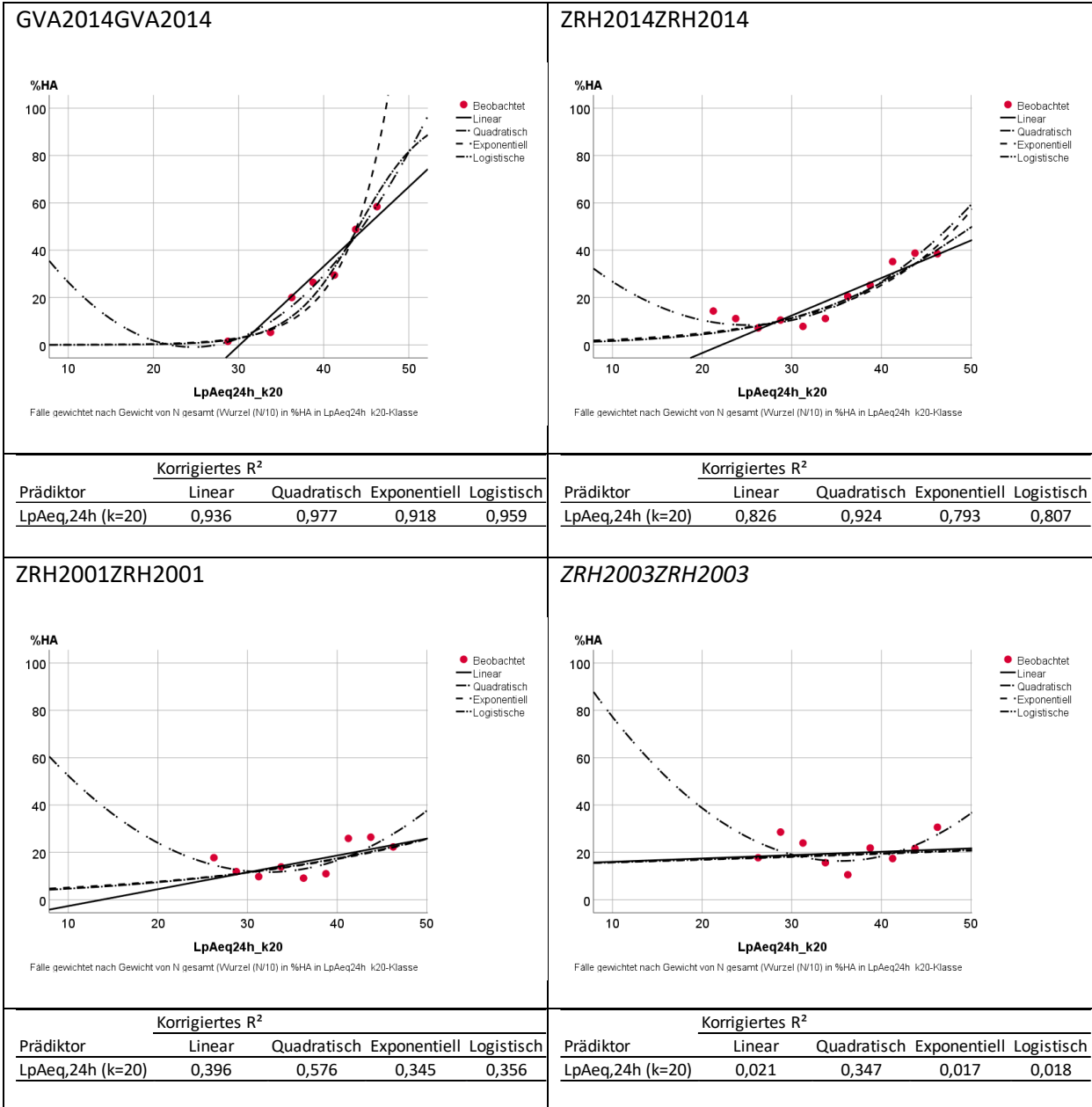


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}(k = 20)$ -Klassen

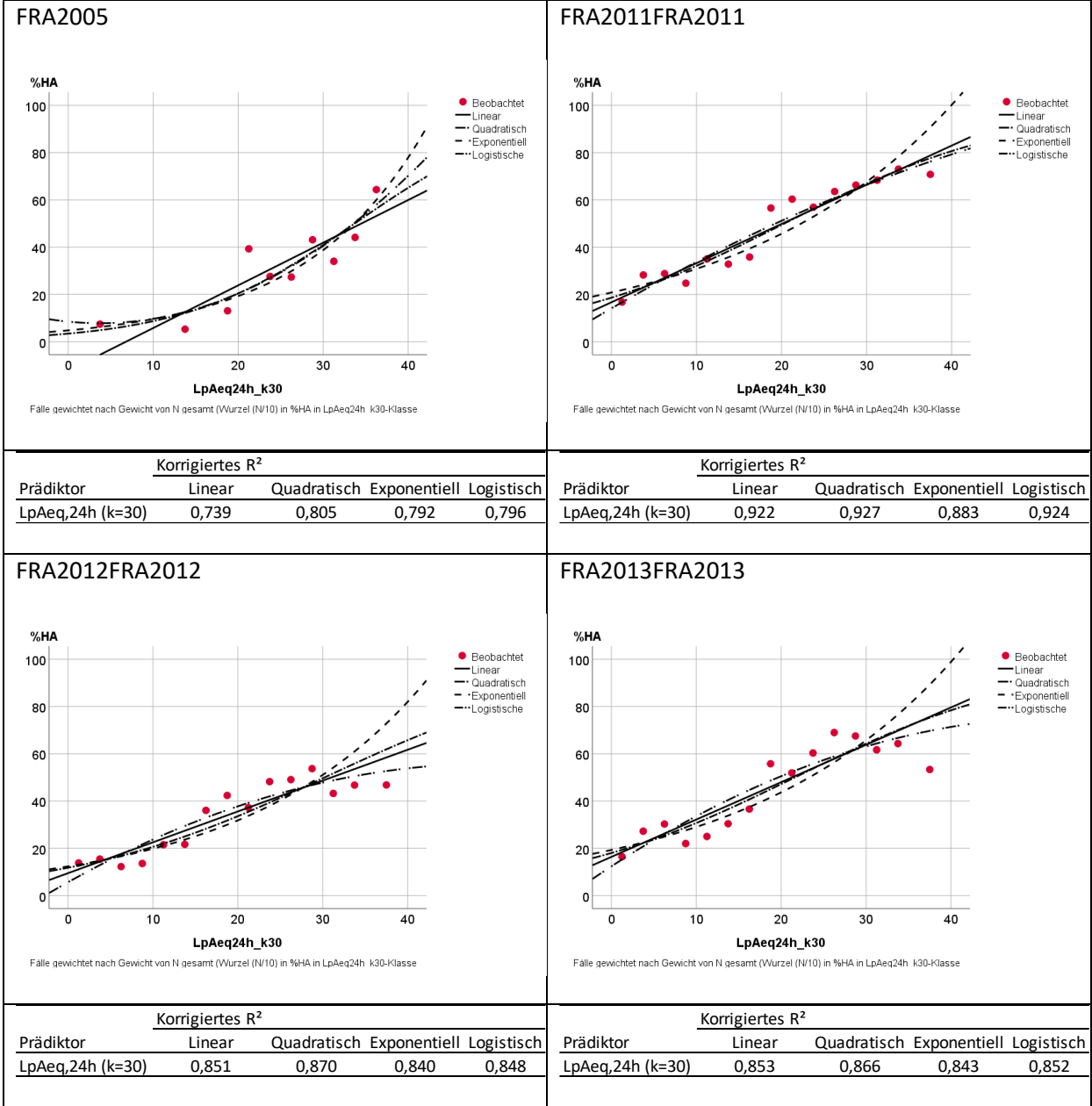


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}(k = 30)$ -Klassen

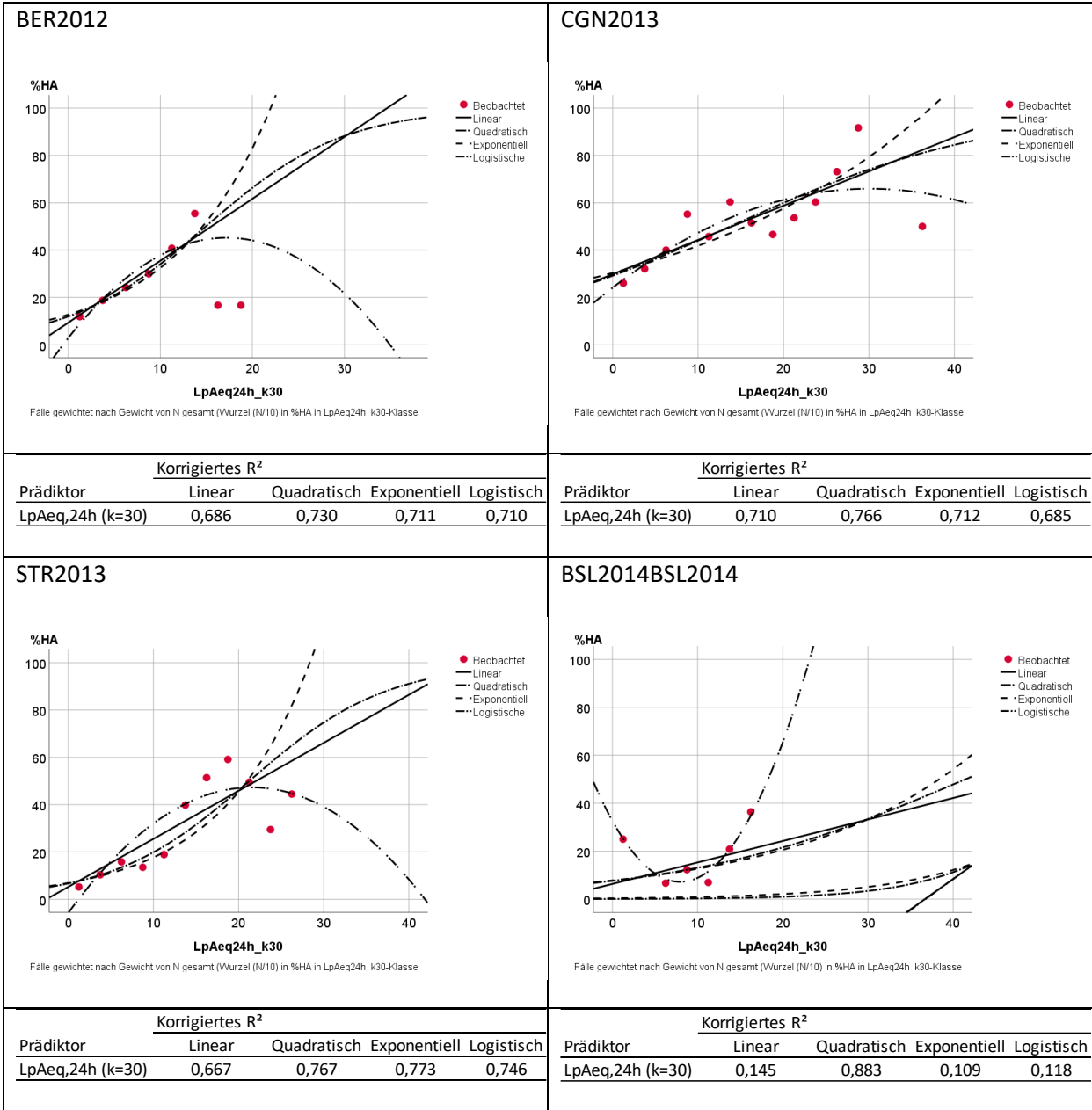


Abbildung 9-34 (fortgesetzt) - % HA nach  $L_{Aeq,24h}(k = 30)$ -Klassen



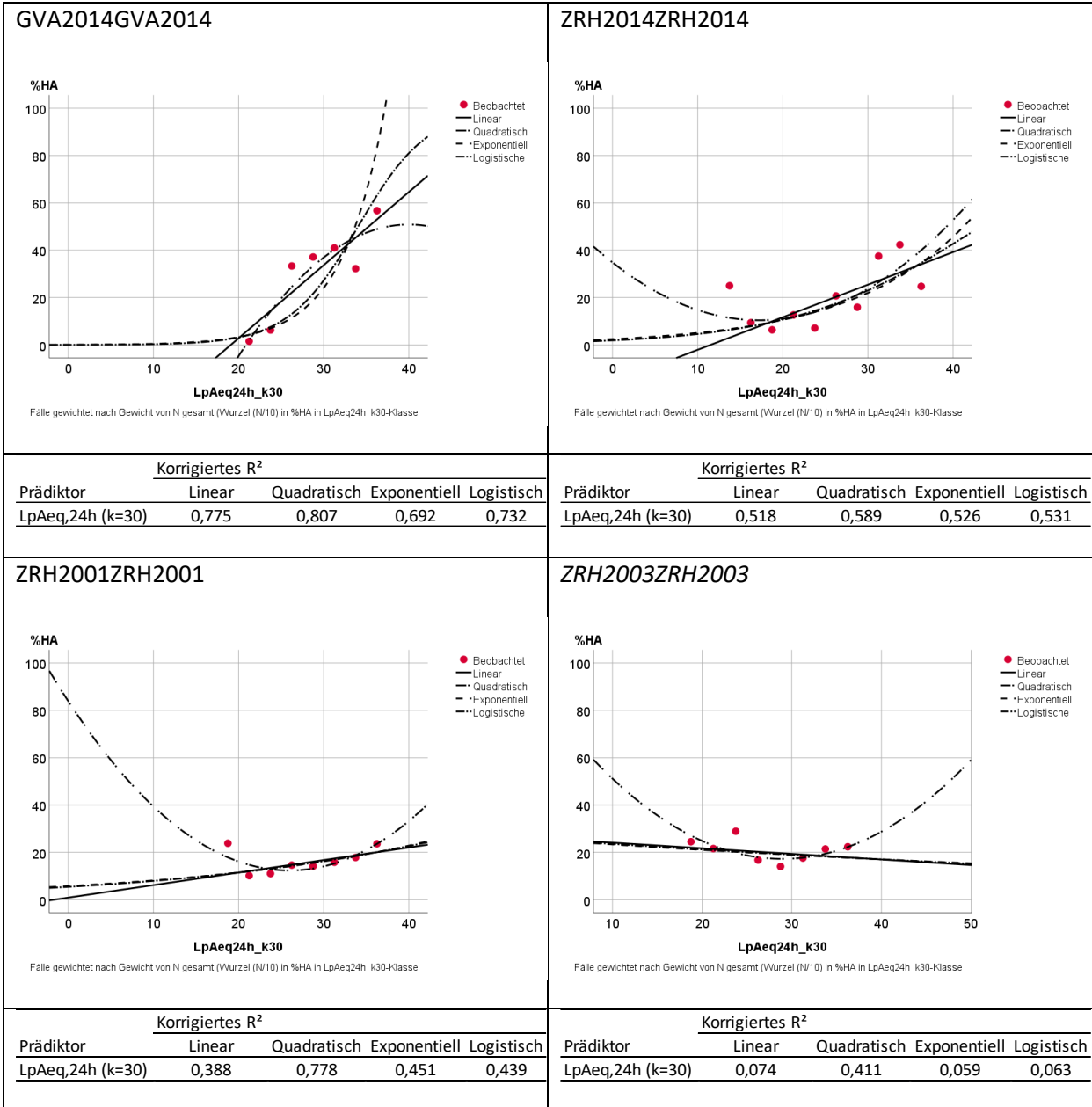


Abbildung 9-34 (fortgesetzt) - % HA nach L<sub>Aeq,24h</sub>(k = 30)-Klassen

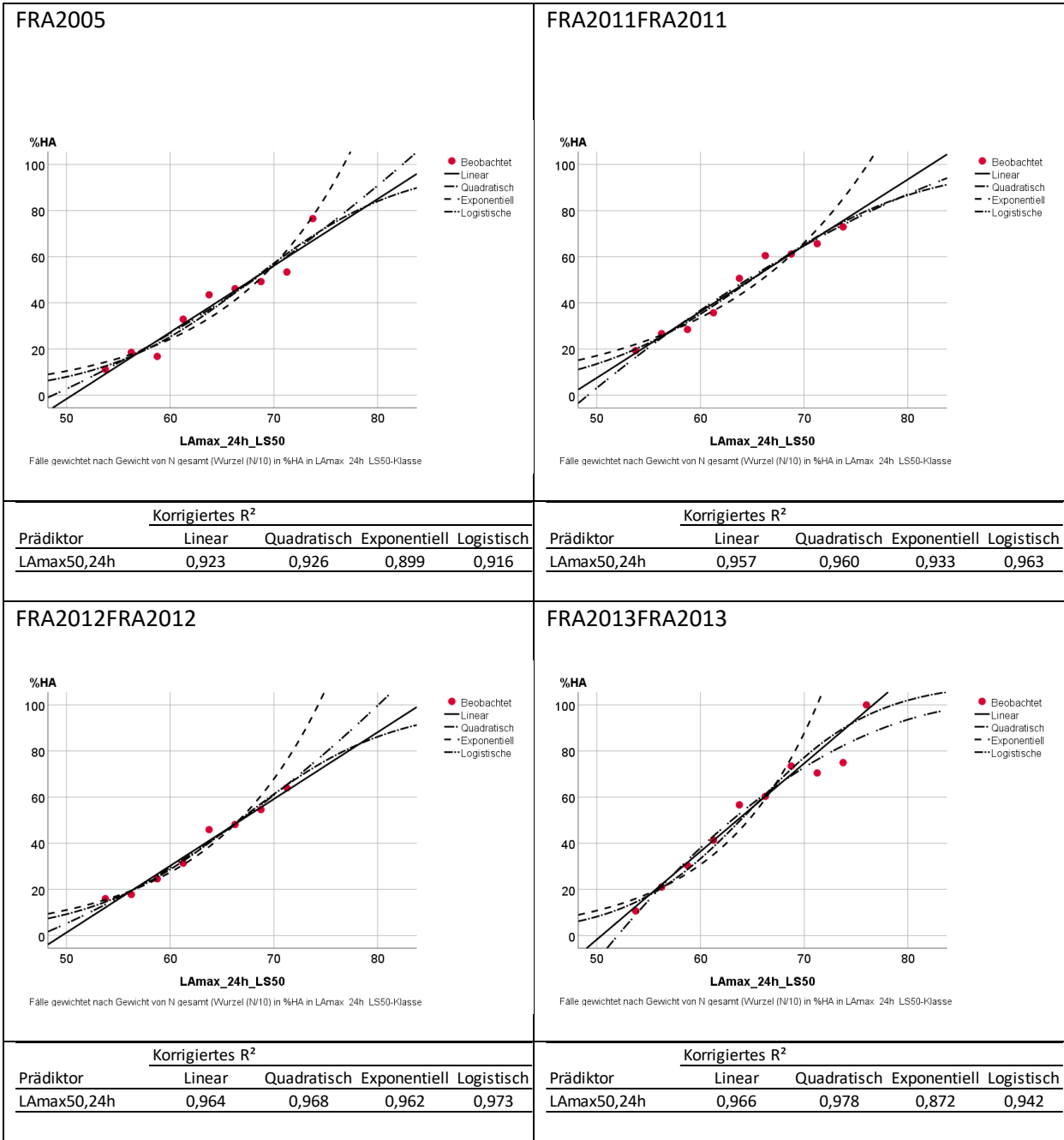


Abbildung 3-3 - % HA nach L<sub>AS,max,log,24h,50</sub>-Klassen

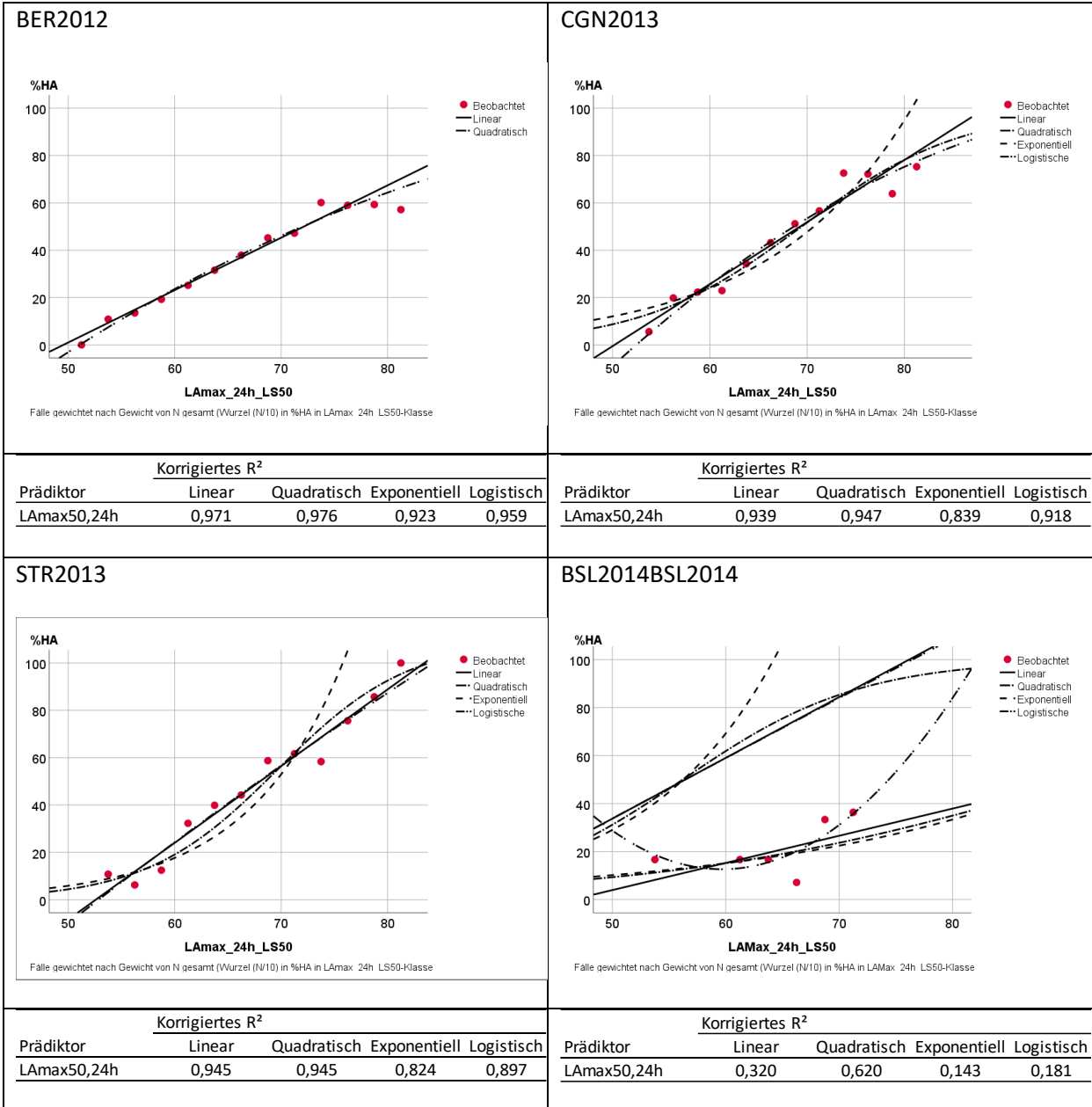


Abbildung 9-35 (fortgesetzt) - % HA nach L<sub>AS,max,log,24h,50</sub>-Klassen

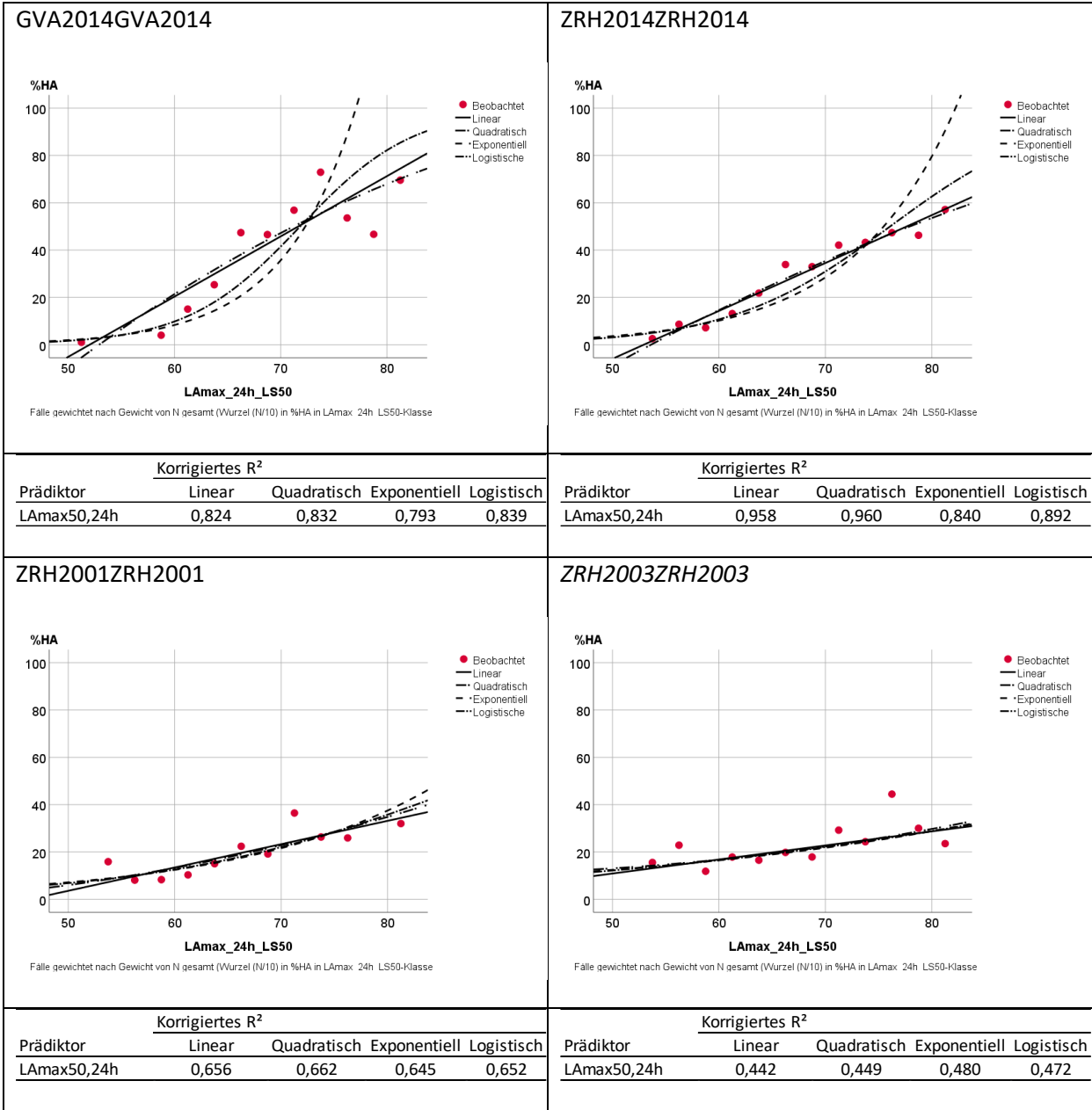


Abbildung 9-35 (fortgesetzt) - % HA nach L<sub>AS,max,log,24h,50</sub>-Klassen

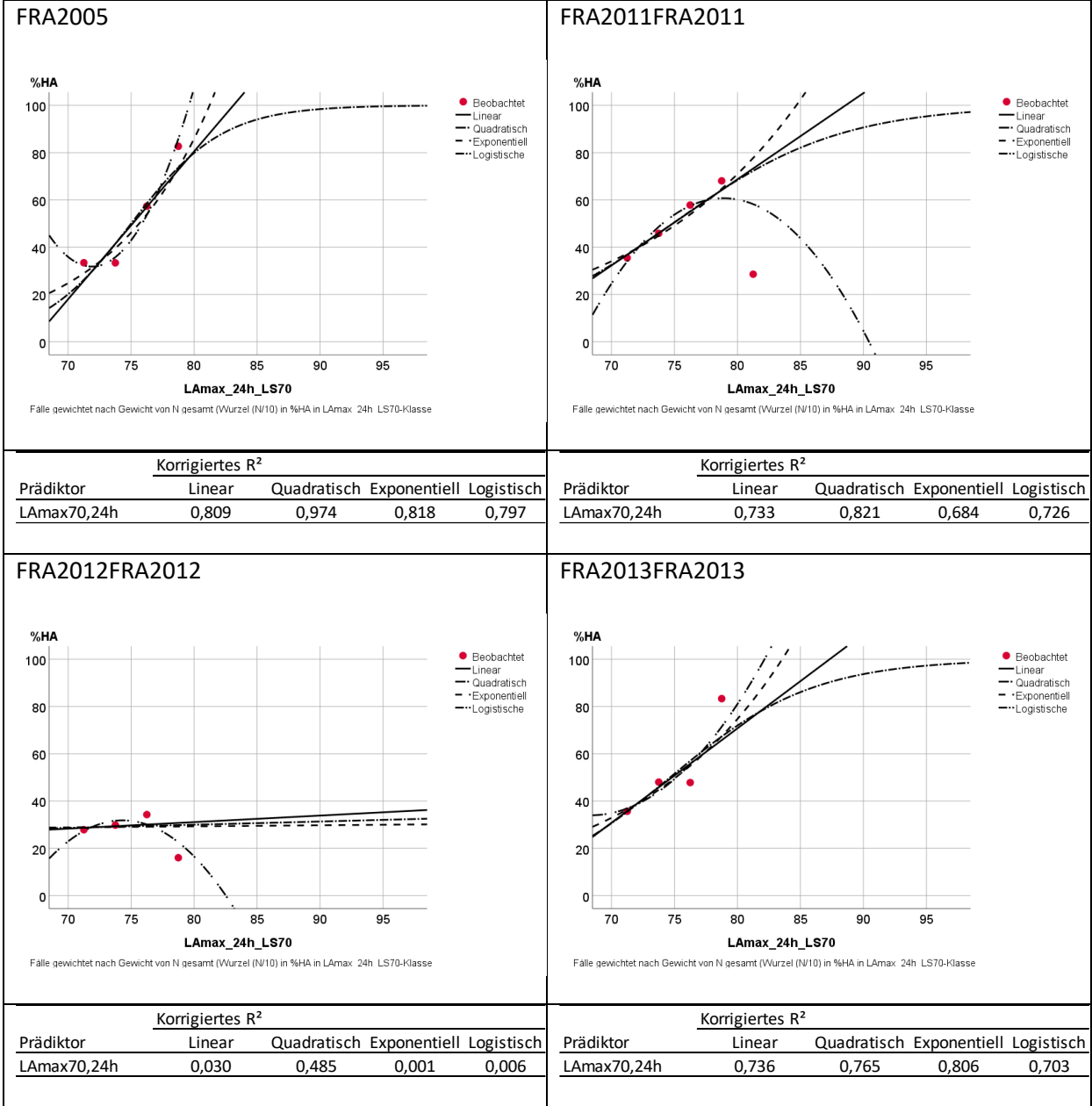
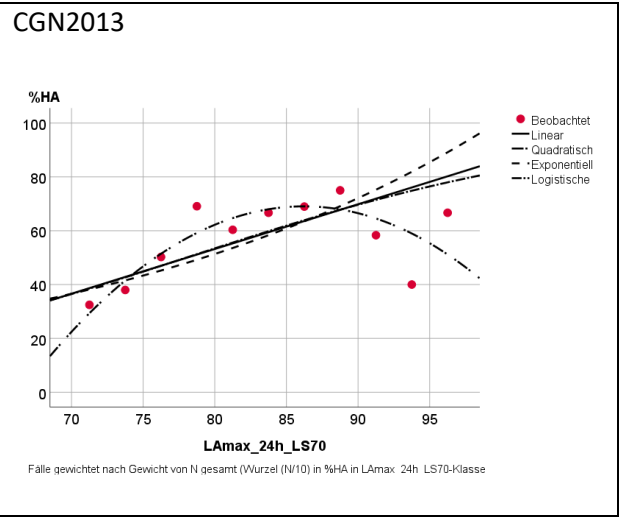
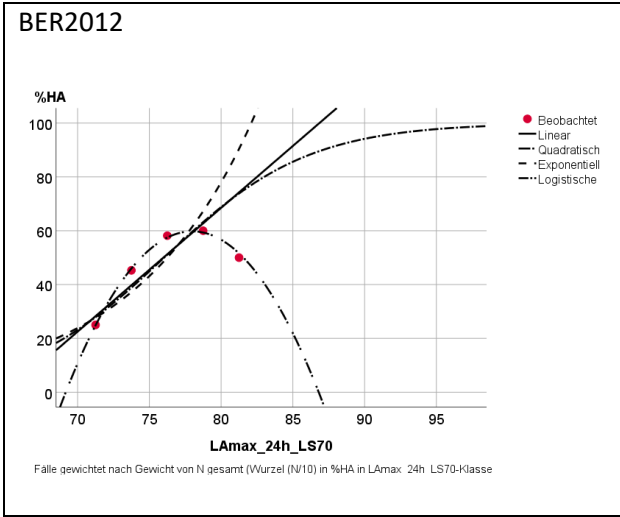


Abbildung 9-35 (fortgesetzt) - % HA nach L<sub>AS,max,log,24h,70</sub>-Klassen

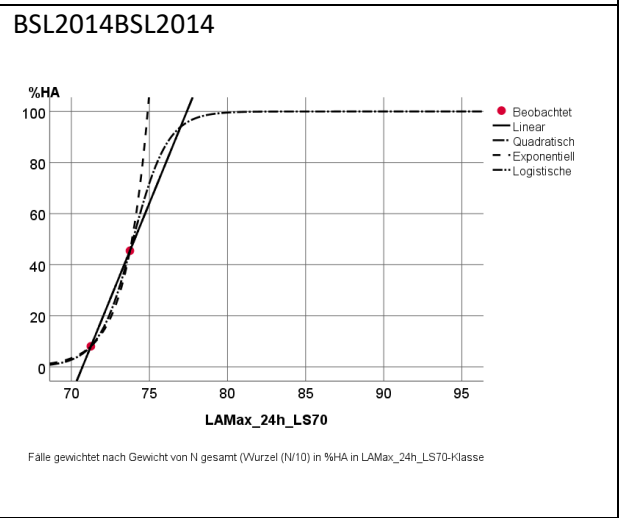
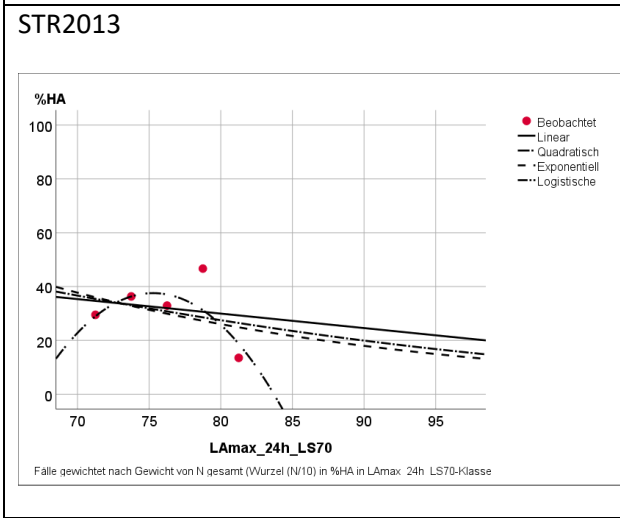


Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
LAmox70,24h	0,810	0,998	0,780	0,803

Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
LAmox70,24h	0,521	0,836	0,527	0,520



Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
LAmox70,24h	0,047	0,552	0,148	0,104

Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
LAmox70,24h	1,000	1,000	1,000	1,000

Abbildung 9-35 (fortgesetzt) - % HA nach L<sub>AS,max,log,24h,70</sub>-Klassen

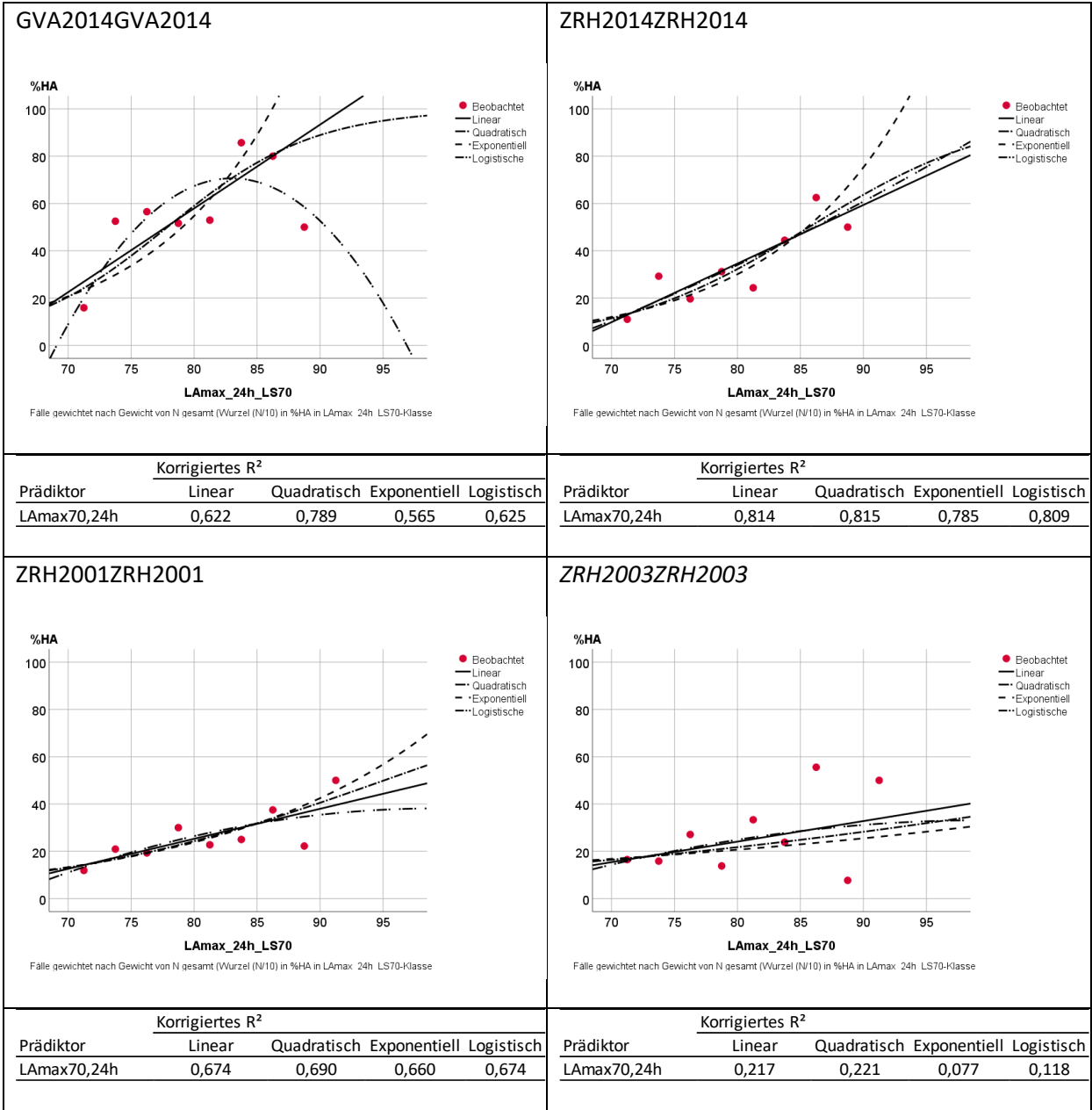


Abbildung 9-35 (fortgesetzt) - % HA nach L<sub>AS,max,log,24h,70</sub>-Klassen

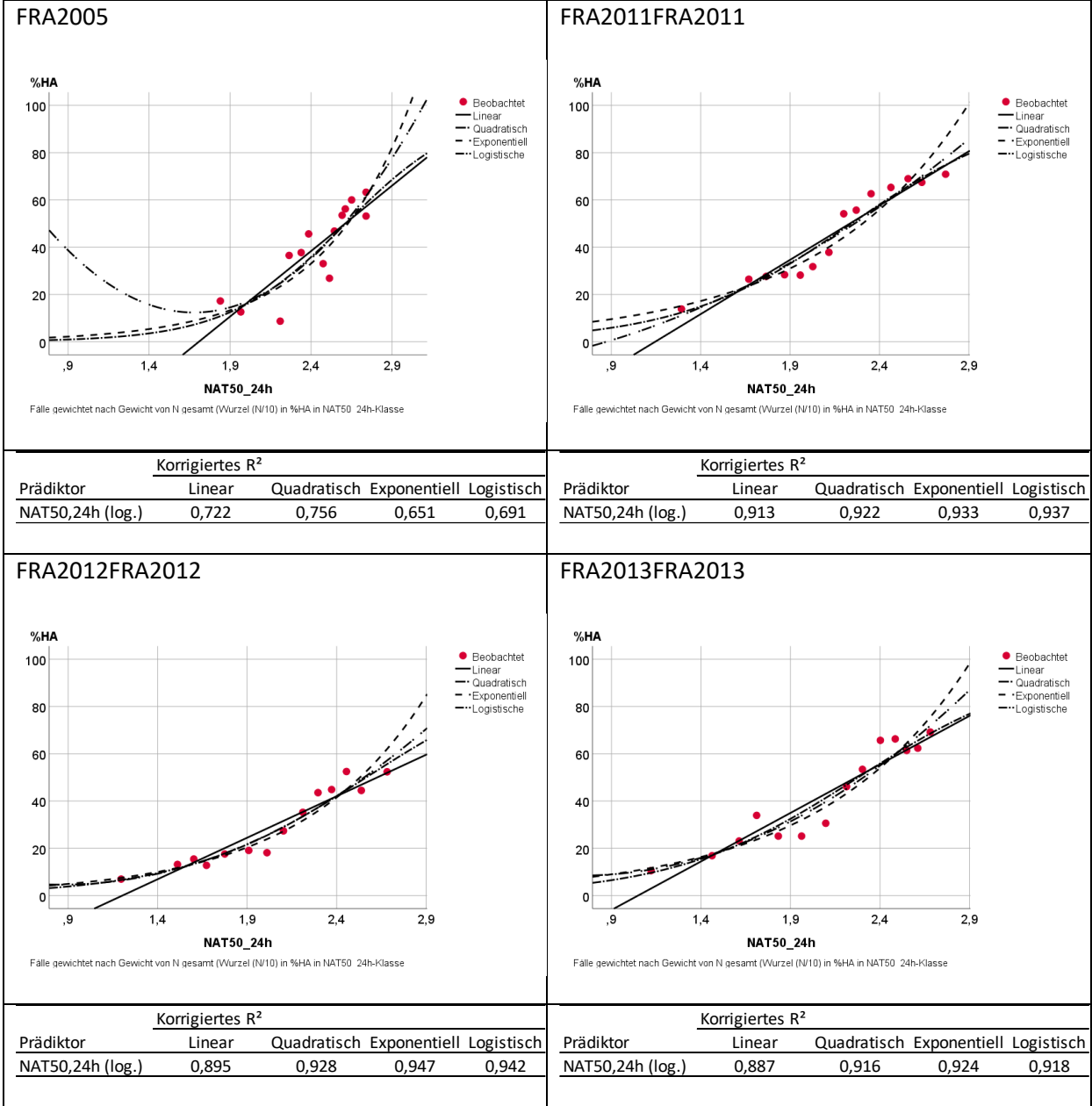


Abbildung 3-4 - % HA nach log(NAT<sub>24h,50</sub>)-Klassen



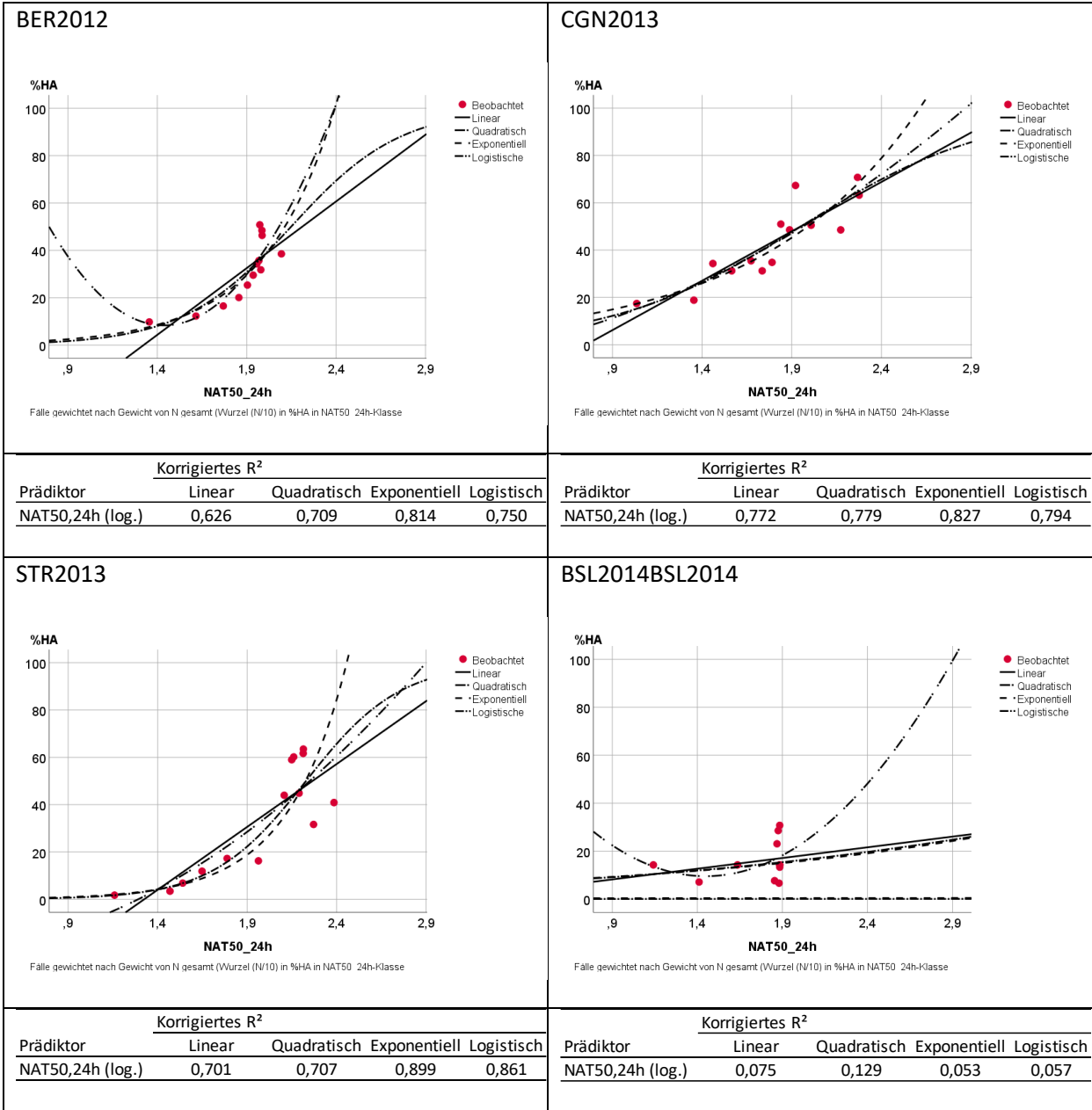


Abbildung 9-36 (fortgesetzt) - % HA nach log(NAT<sub>24h,50</sub>)-Klassen

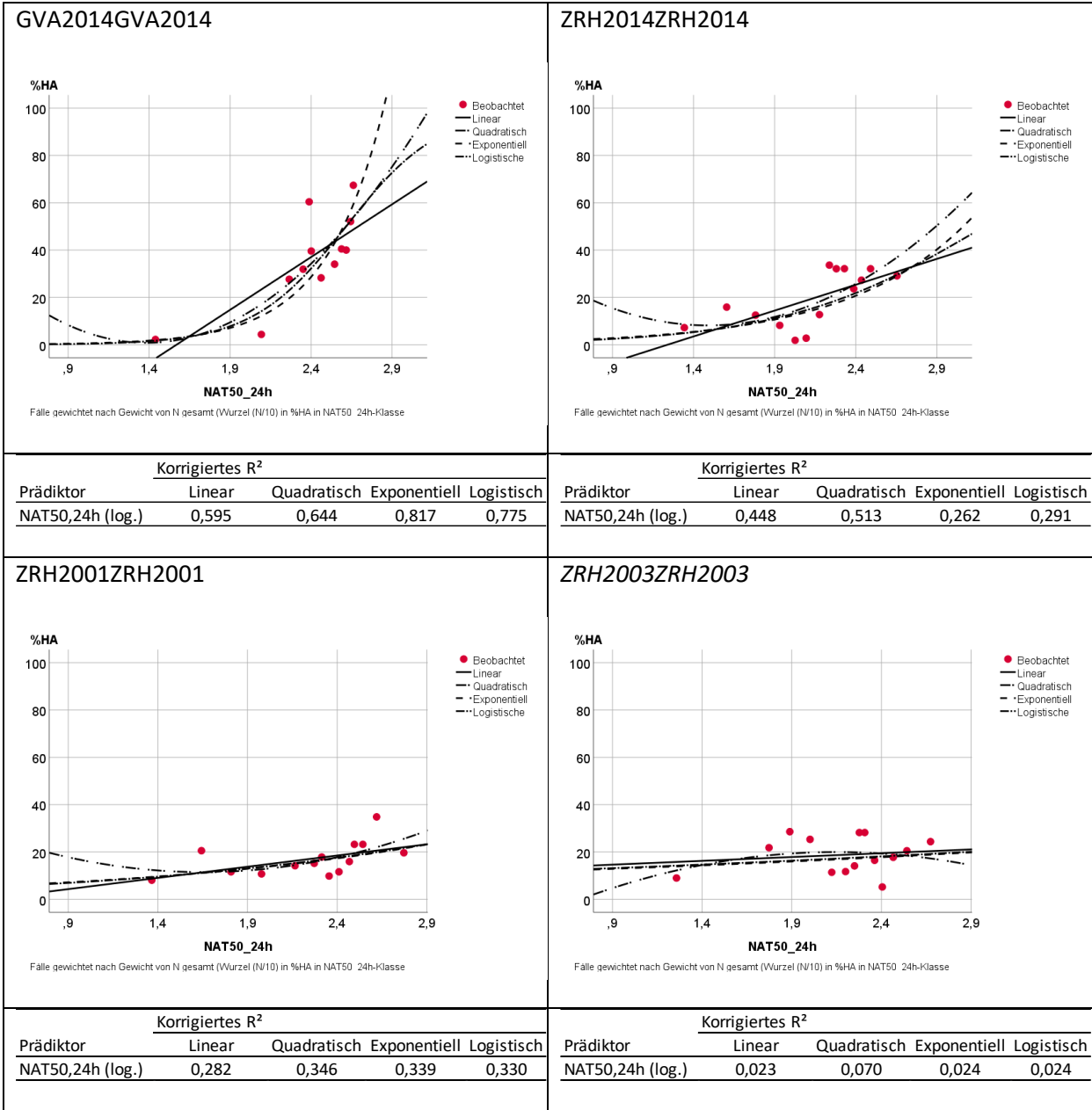


Abbildung 9-36 (fortgesetzt) - % HA nach log(NAT<sub>24h,50</sub>)-Klassen

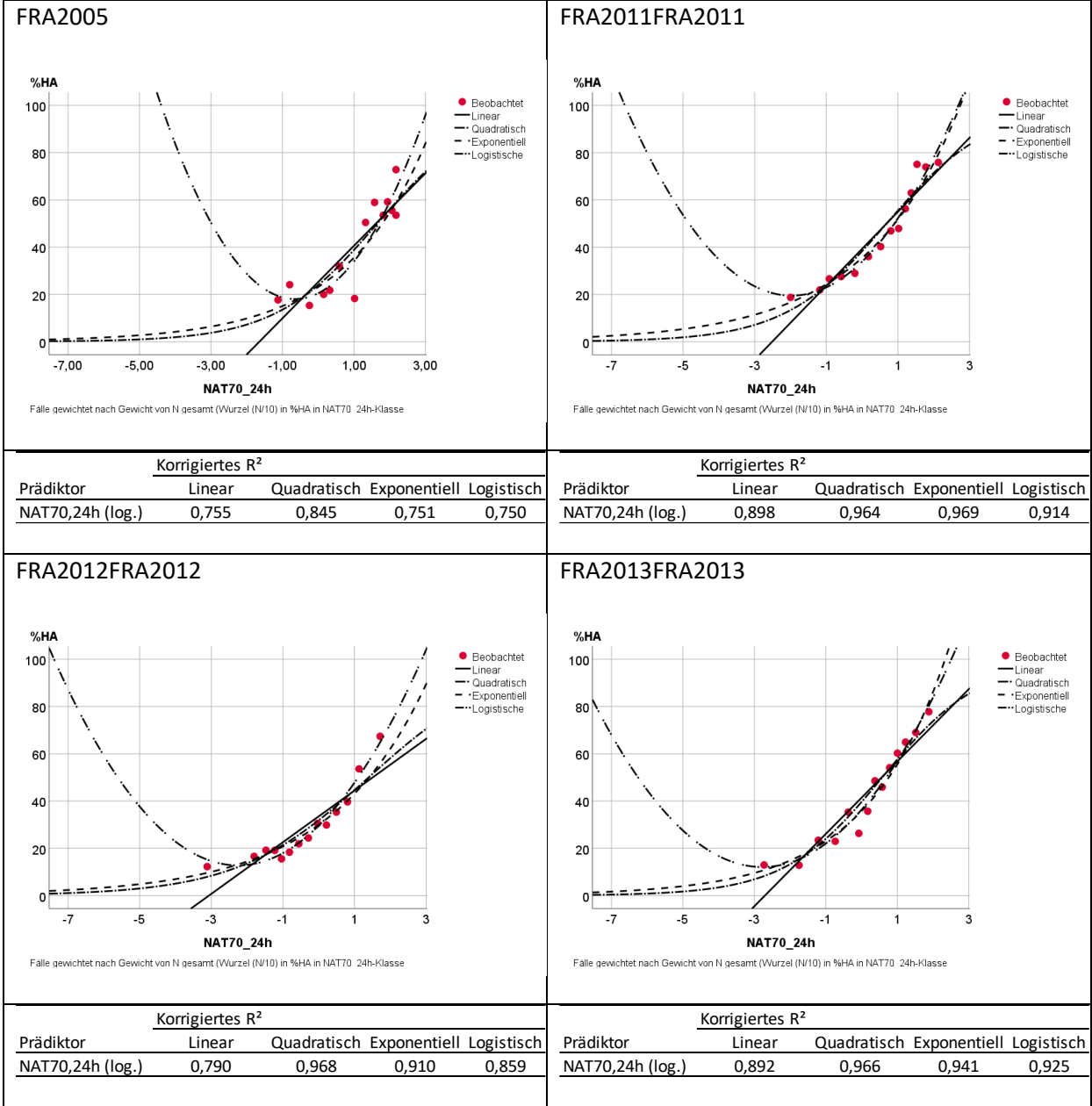


Abbildung 3-5- % HA nach  $\log(\text{NAT}_{24h,70})$ -Klassen

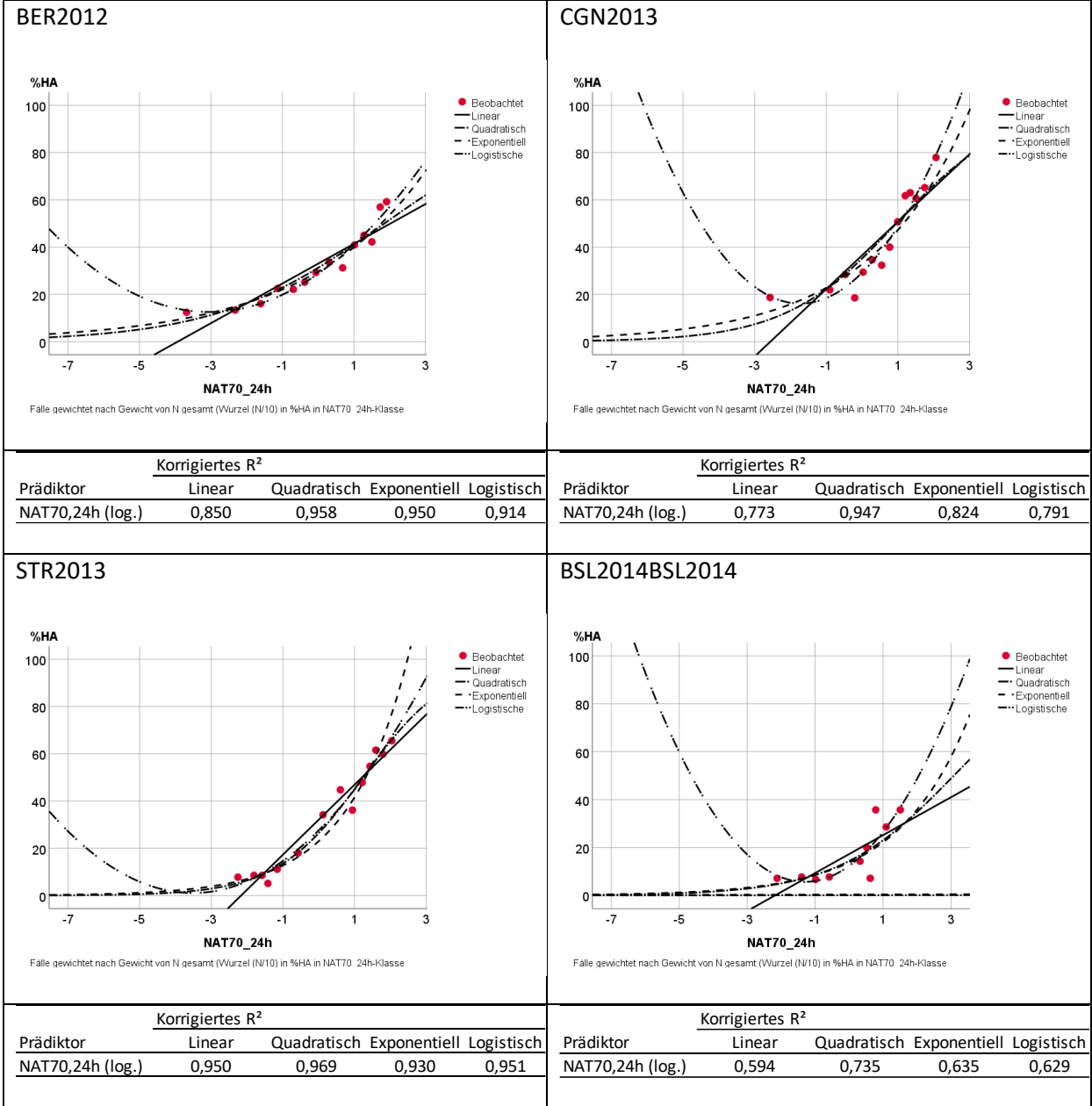
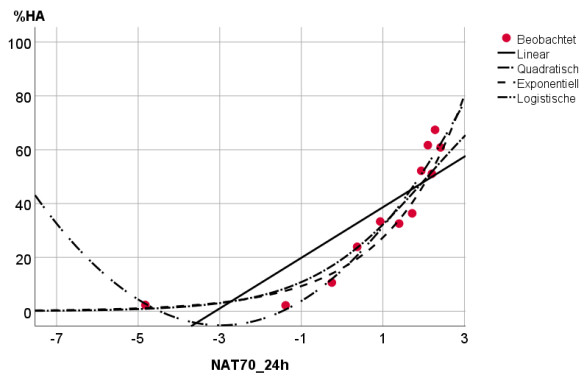
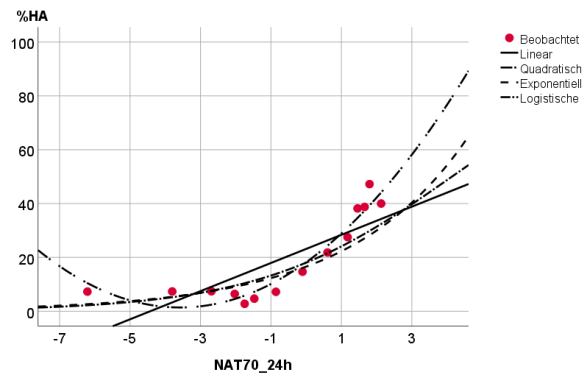


Abbildung 9-37 (fortgesetzt) - % HA nach log(NAT<sub>24h,70</sub>)-Klassen

GVA2014GVA2014



ZRH2014ZRH2014



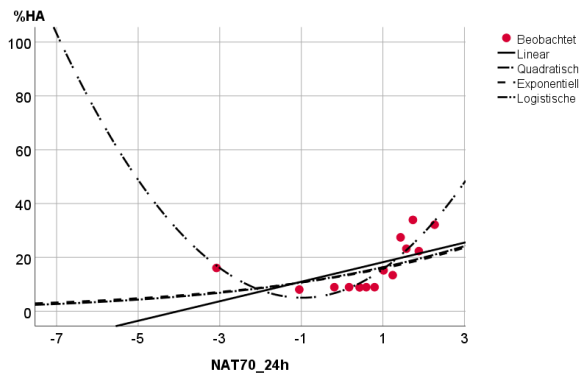
Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,24h (log.)	0,723	0,946	0,858	0,844

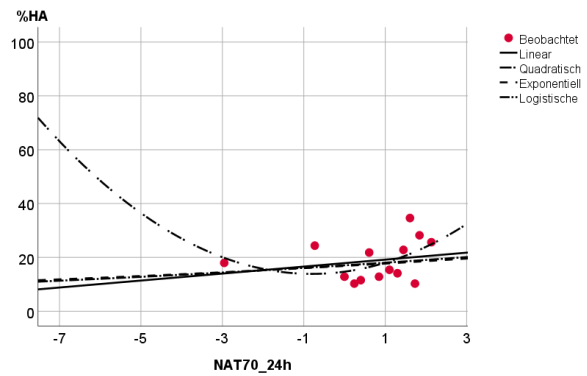
Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,24h (log.)	0,650	0,932	0,600	0,616

ZRH2001ZRH2001



ZRH2003ZRH2003



Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,24h (log.)	0,296	0,801	0,266	0,273

Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,24h (log.)	0,051	0,195	0,028	0,033

Abbildung 9-37 (fortgesetzt) - % HA nach log(NAT<sub>24h,70</sub>)-Klassen

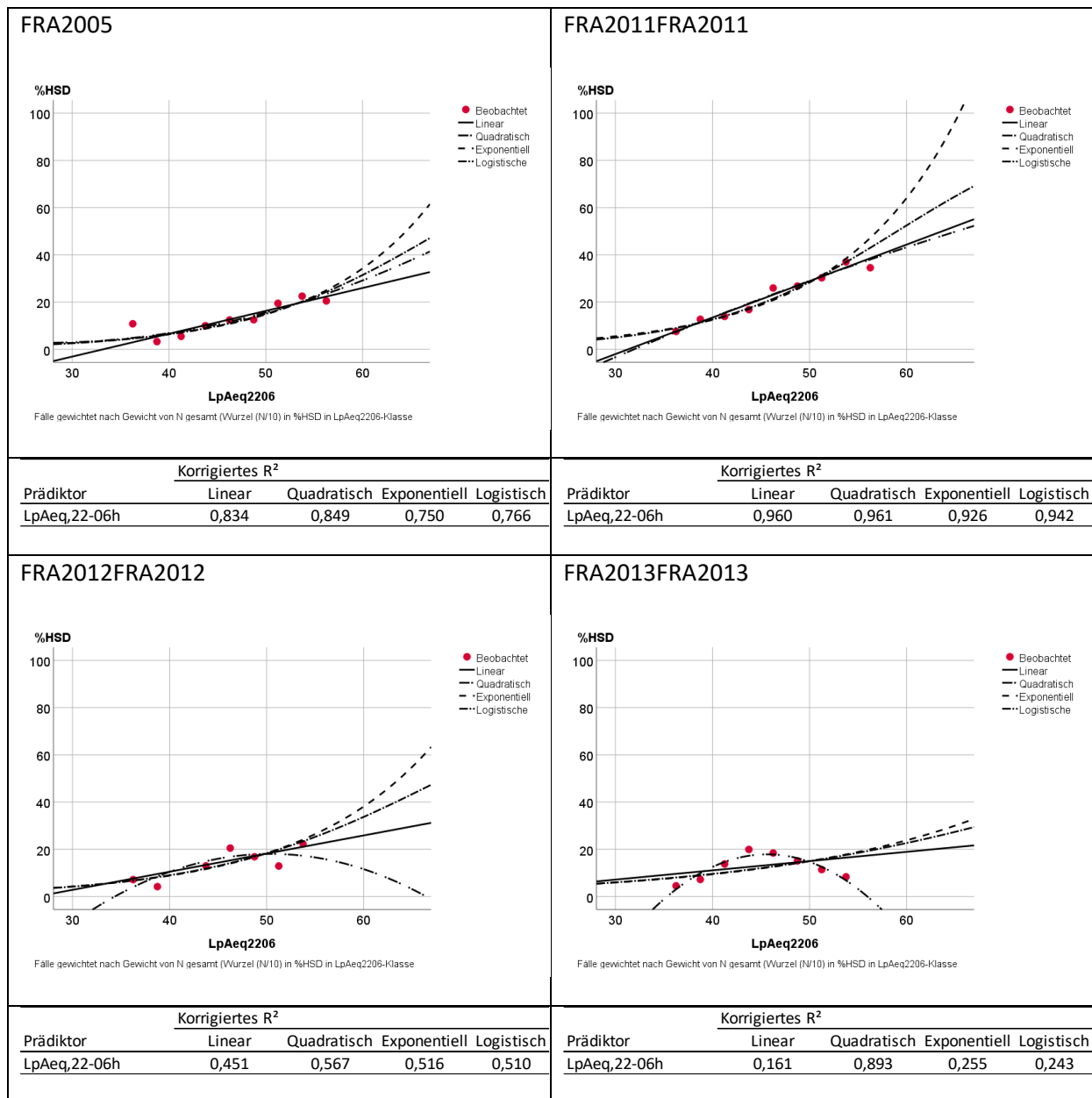


Abbildung 3-6 - % HSD nach  $L_{Aeq,22-06h}(k = 10)$ -Klassen

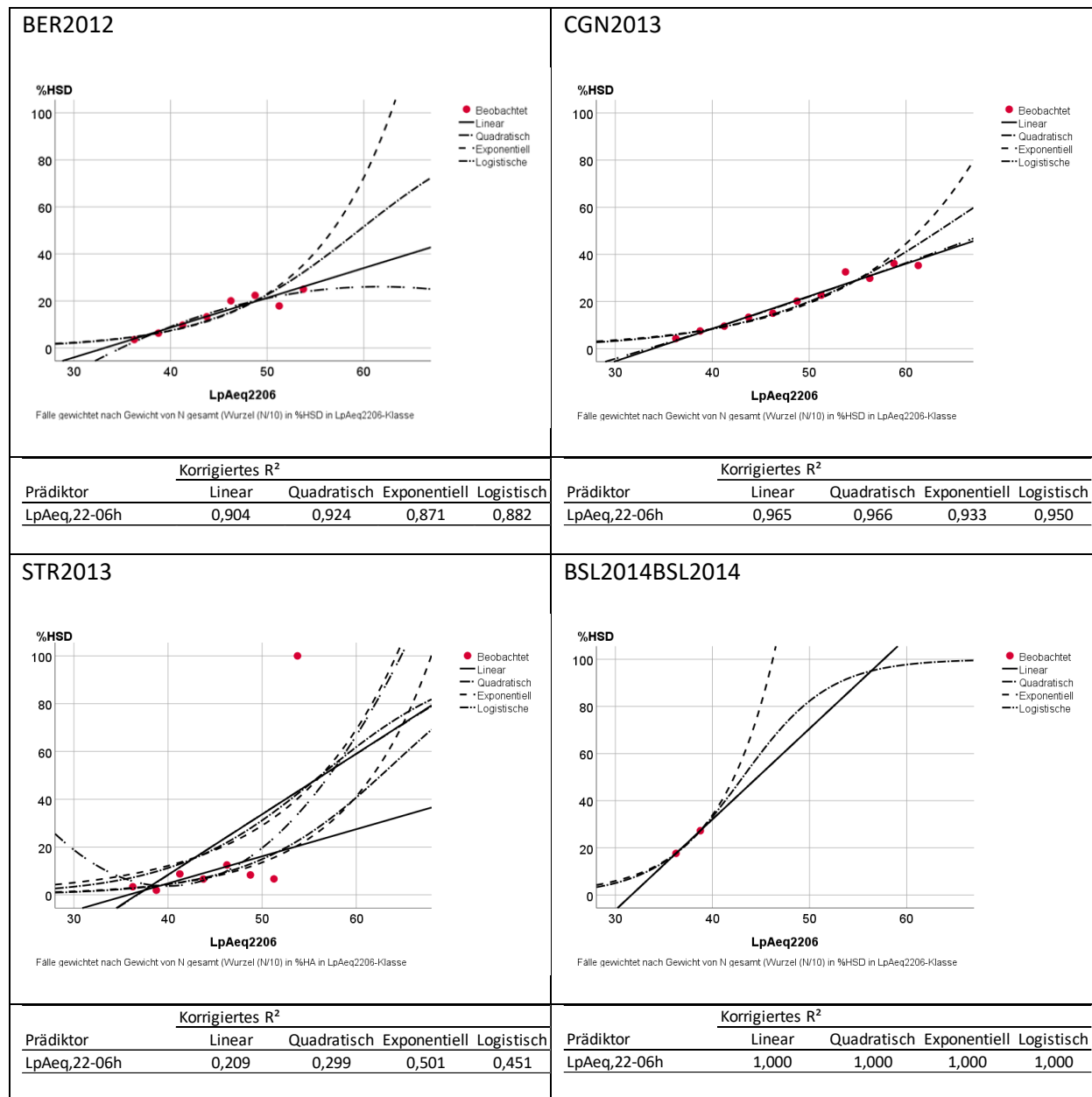


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 10)$ -Klassen

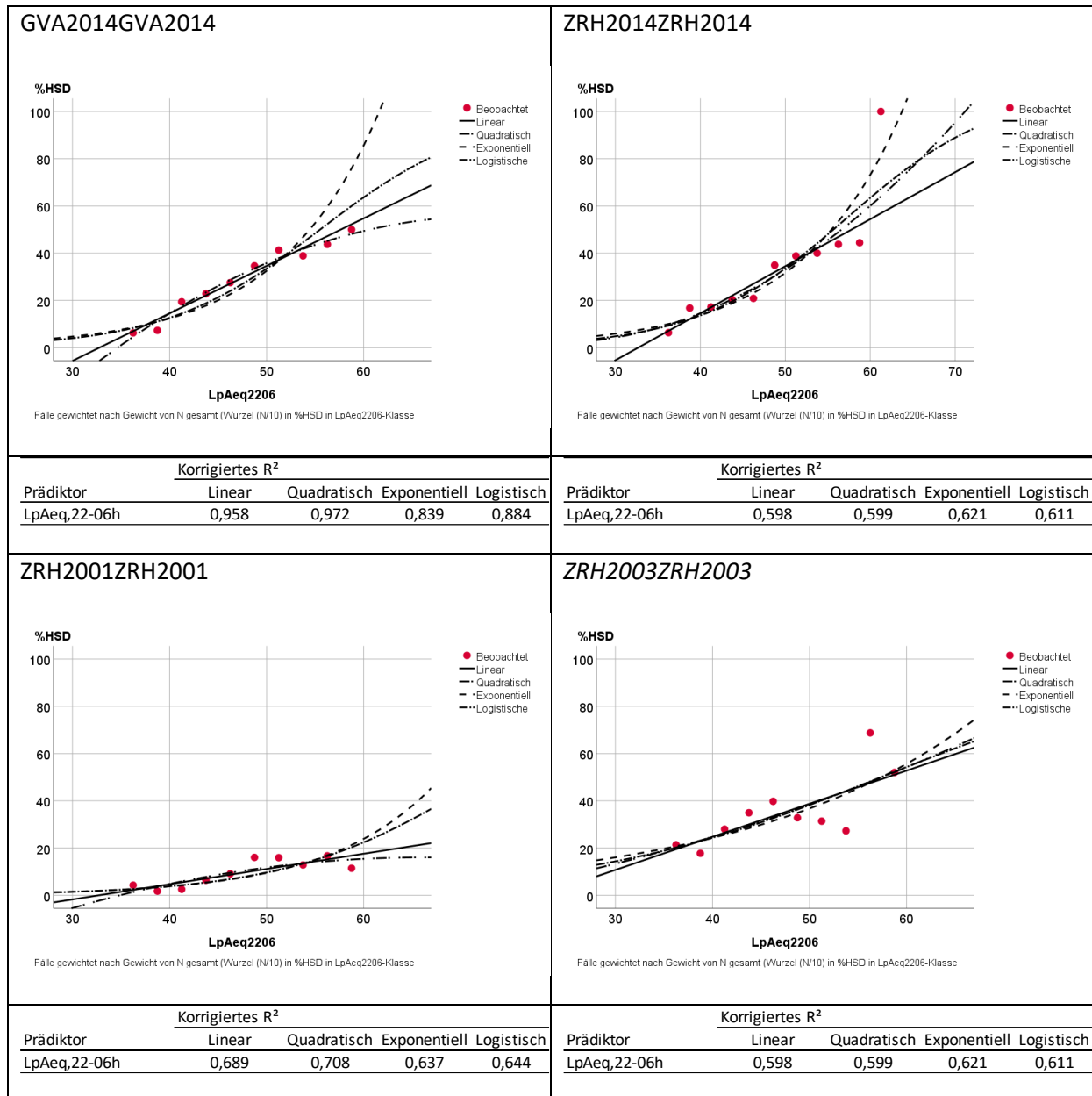


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 10)$ -Klassen



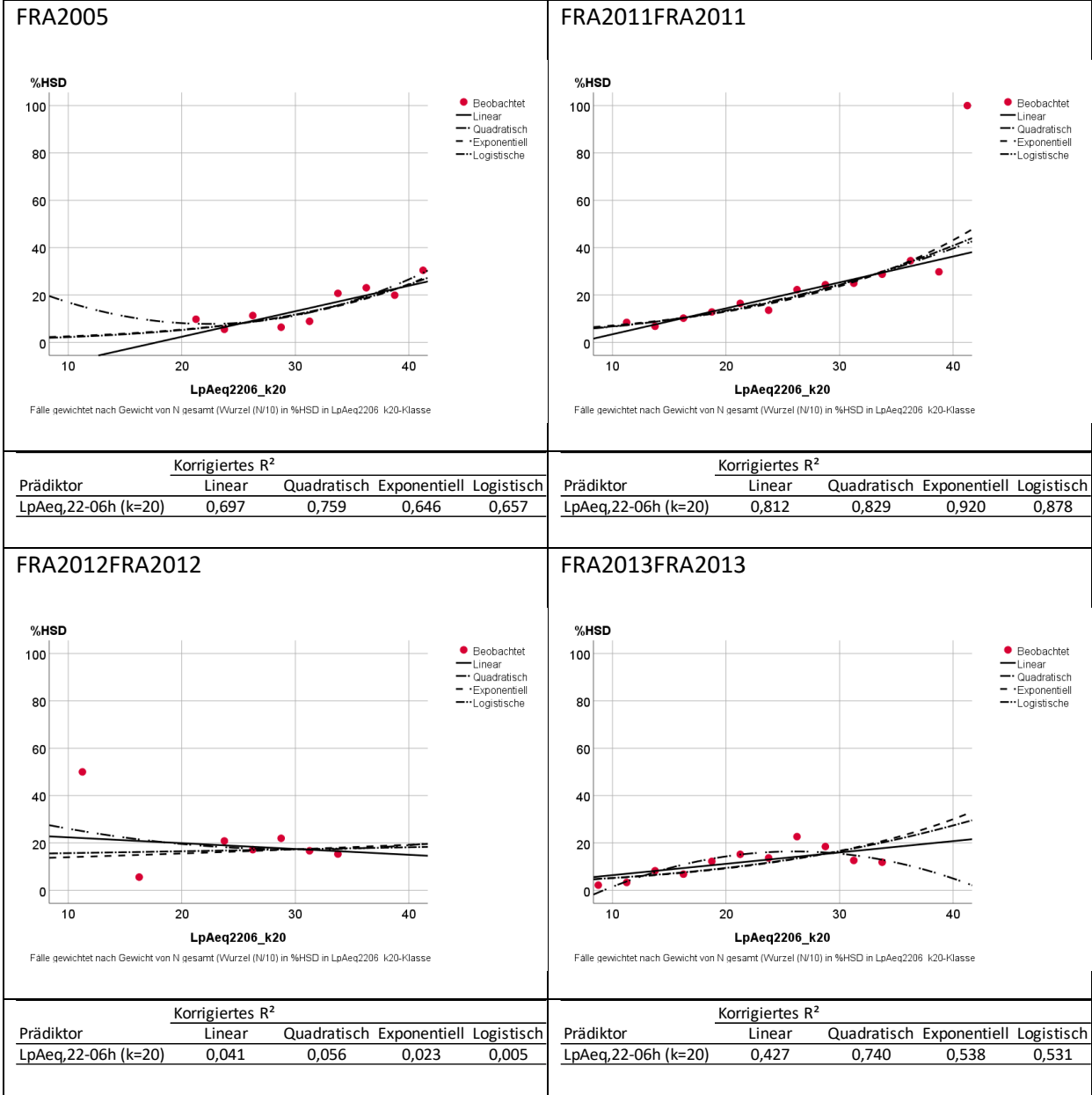


Abbildung 9-38 (fortgesetzt) - % HSD nach L<sub>Aeq,22-06h</sub>(k = 20)-Klassen

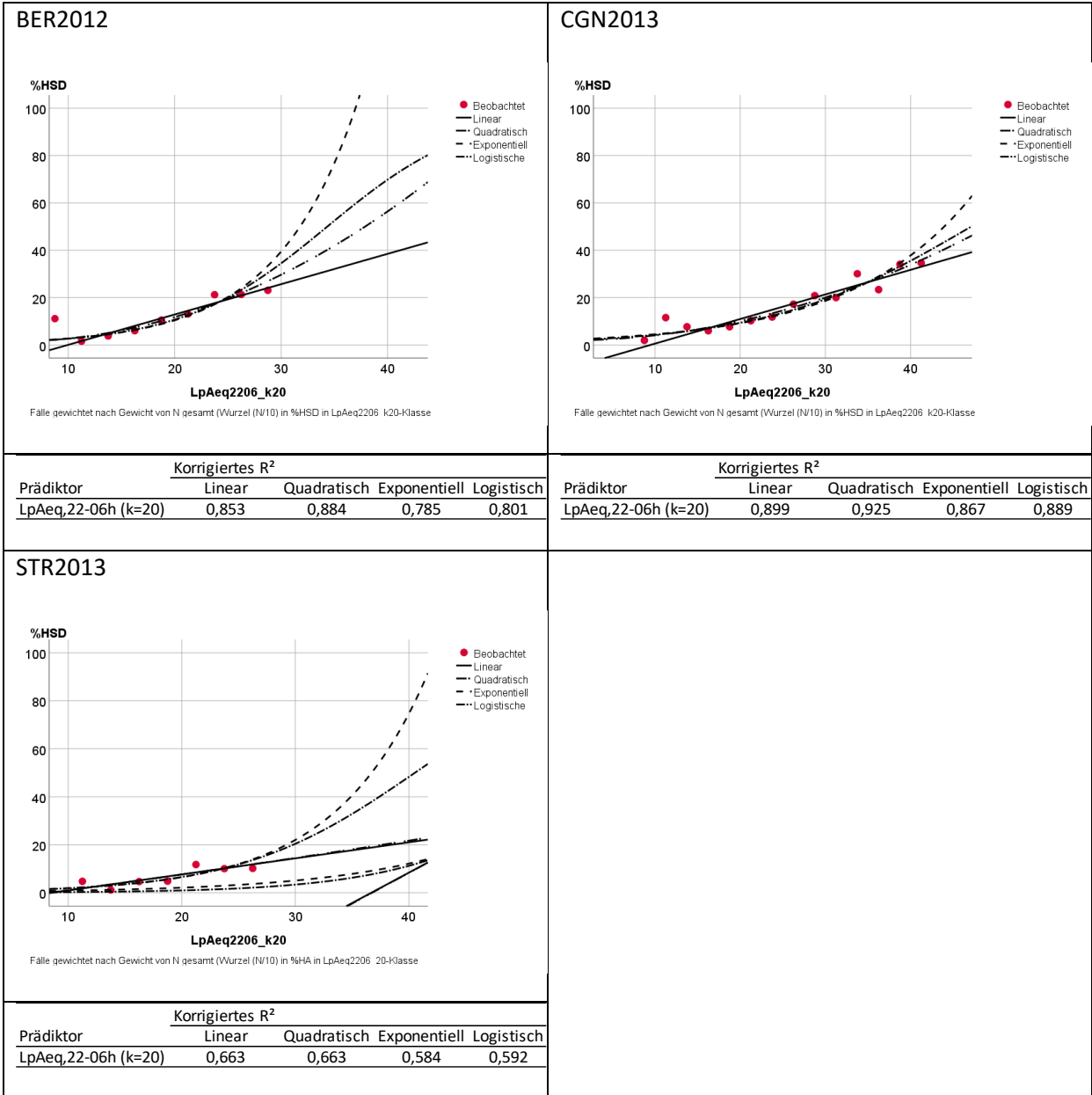


Abbildung 9-38 (fortgesetzt) - % HSD nach L<sub>Aeq,22-06h</sub>(k = 20)-Klassen

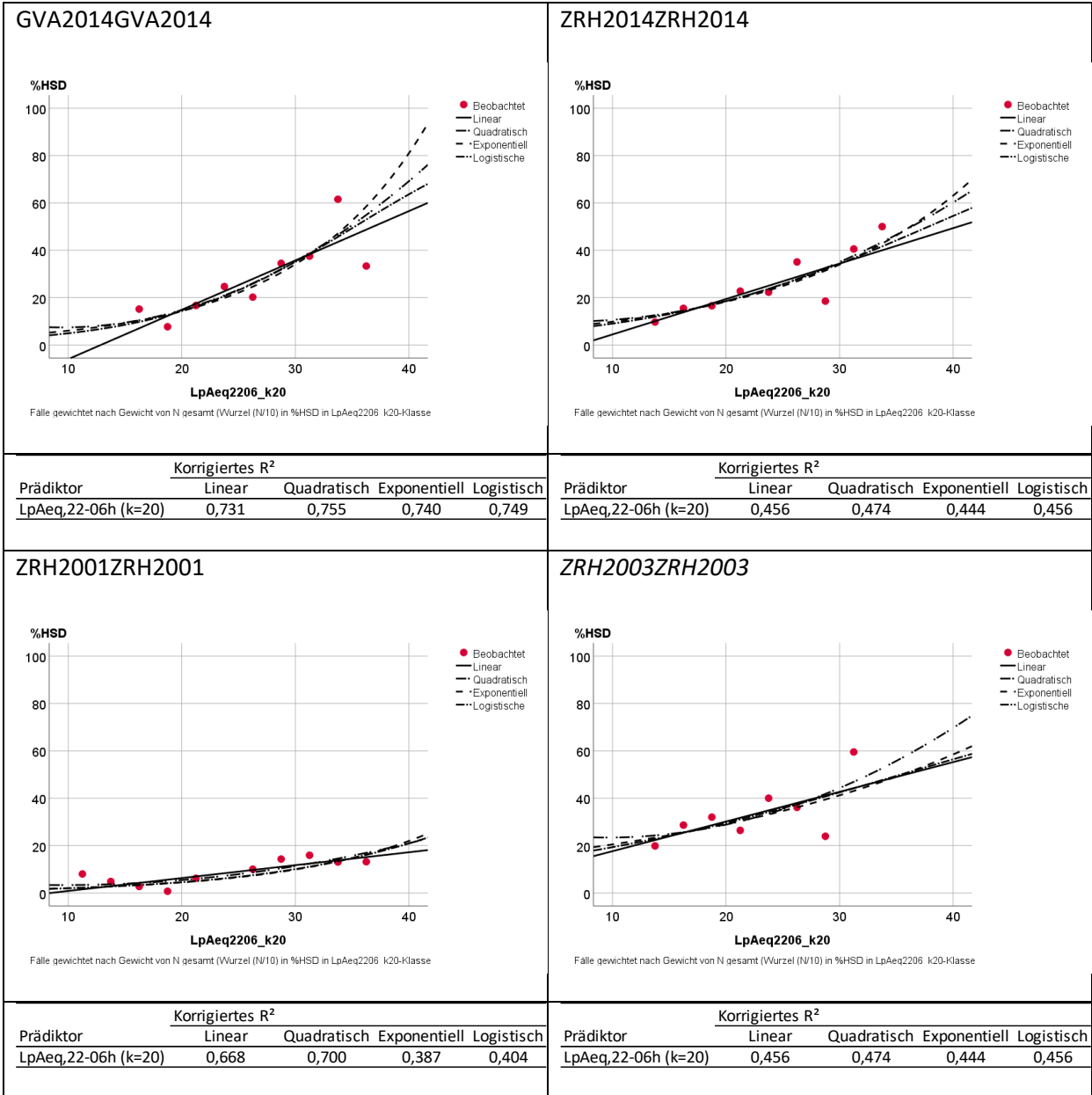


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 20)$ -Klassen

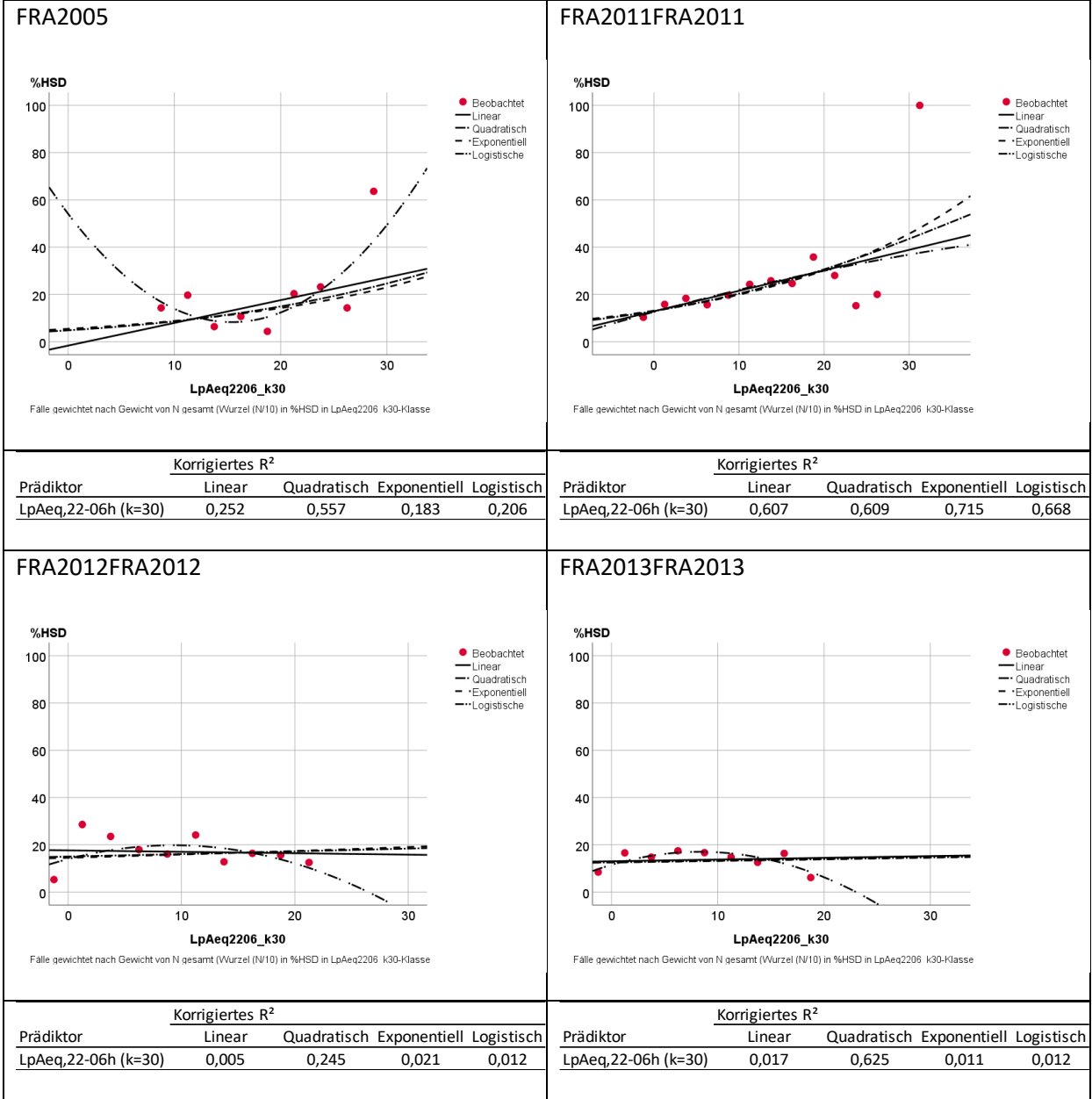


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 30)$ -Klassen

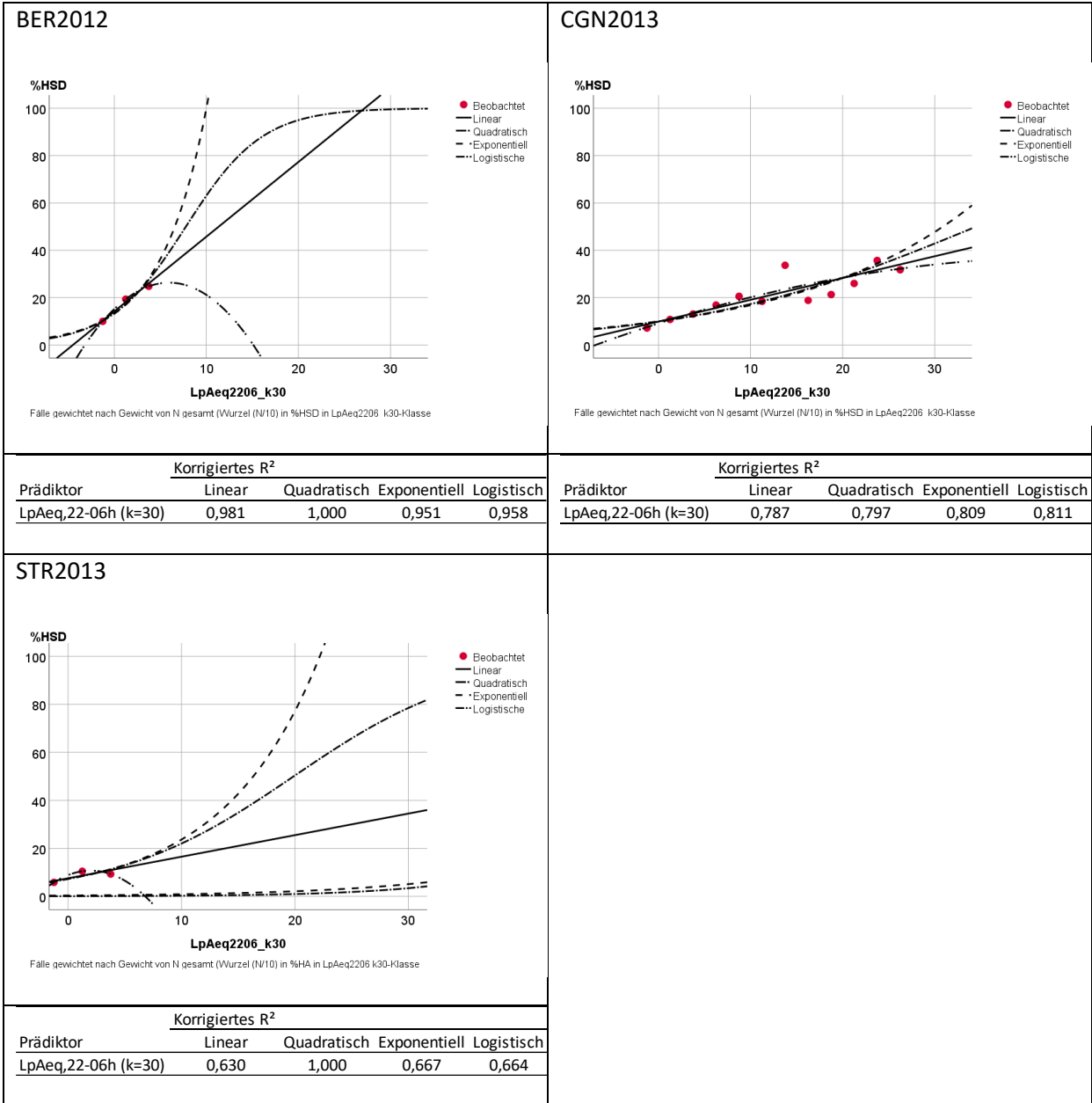


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 30)$ -Klassen

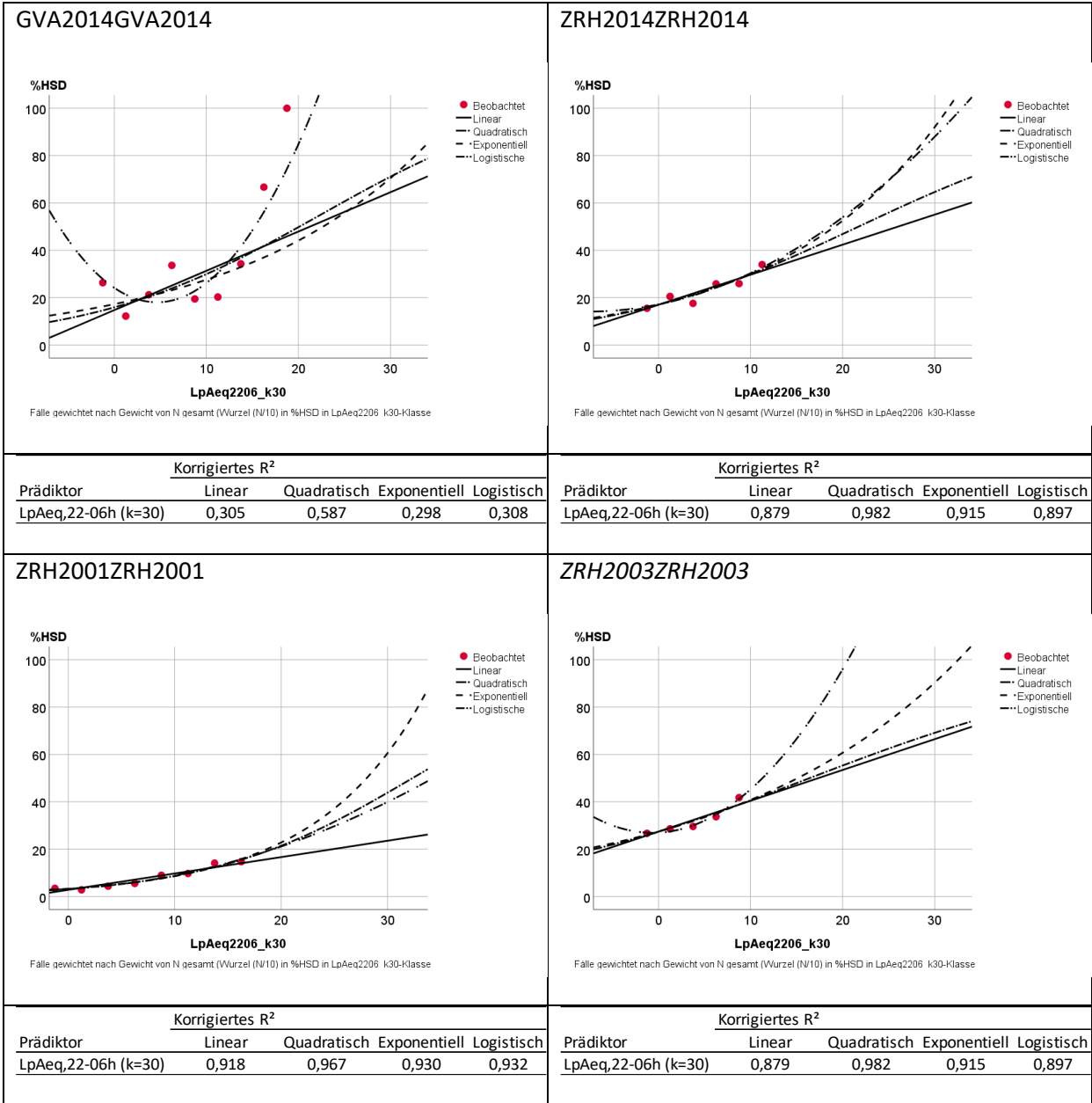


Abbildung 9-38 (fortgesetzt) - % HSD nach  $L_{Aeq,22-06h}(k = 30)$ -Klassen

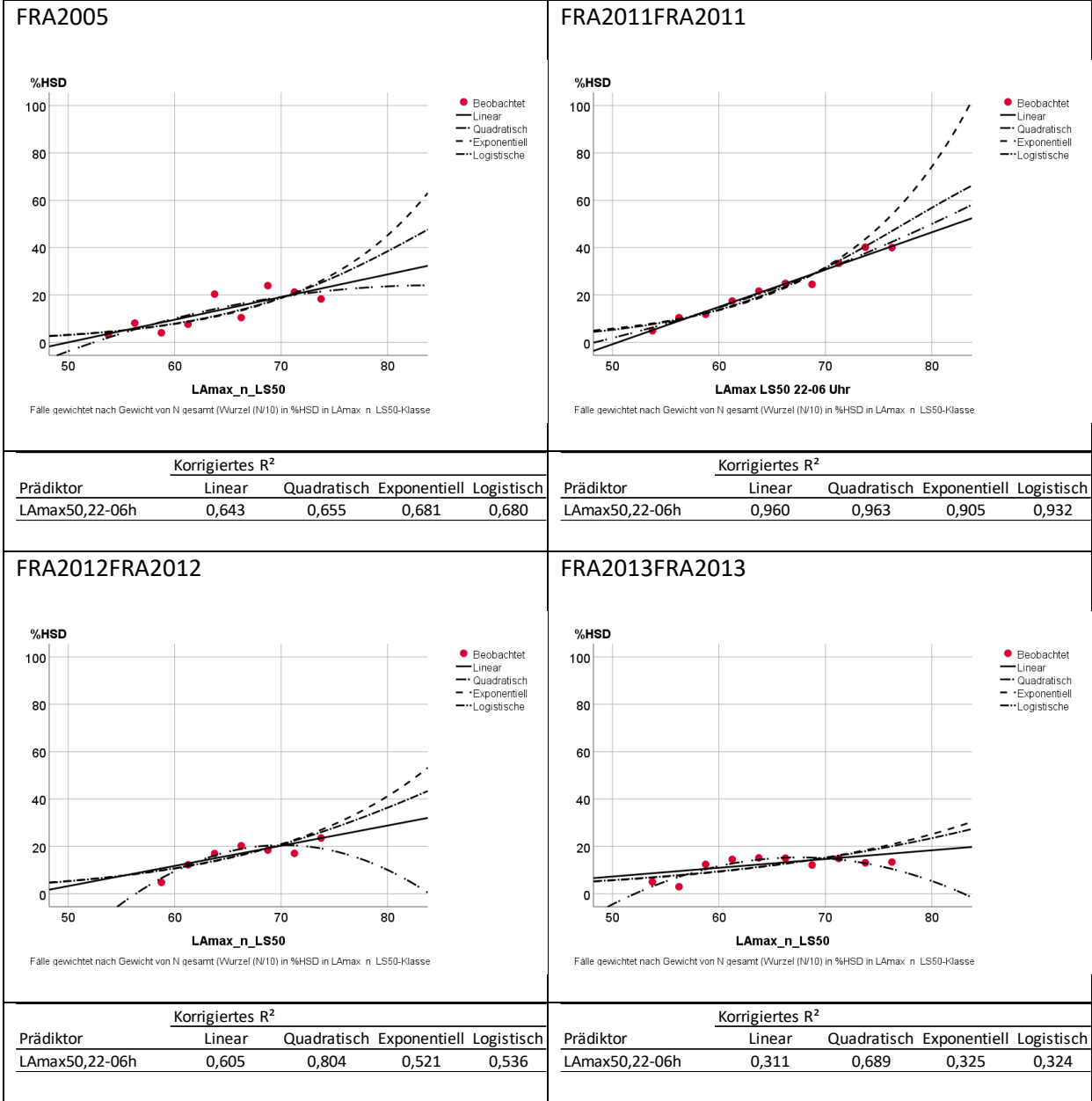


Abbildung 3-7 - % HSD nach  $L_{AS,max,log,22-06h,50}$ -Klassen

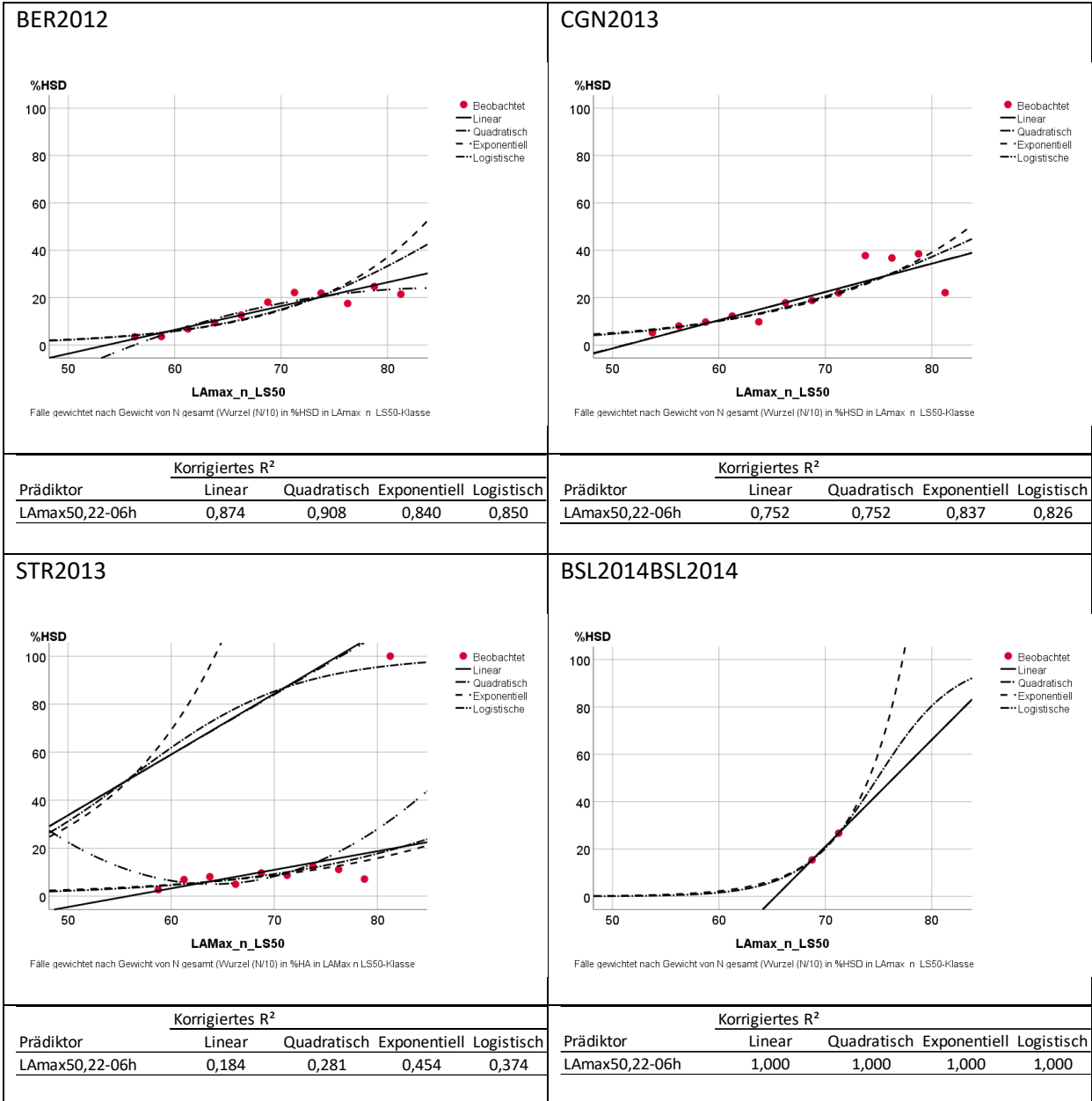


Abbildung 9-39 (fortgesetzt) - % HSD nach L<sub>AS,max,log,22-06h,50</sub>-Klassen



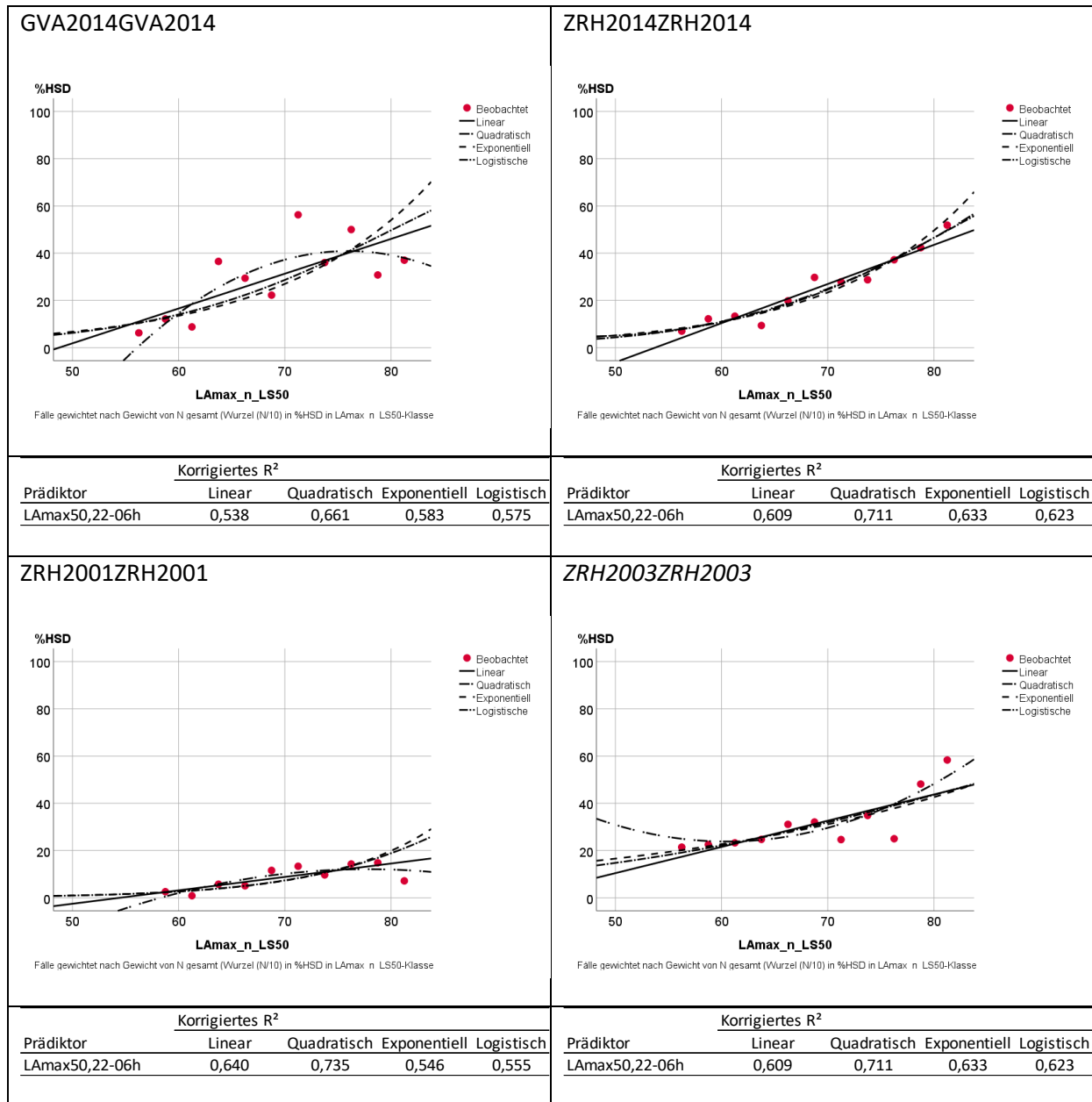


Abbildung 9-39 (fortgesetzt) - % HSD nach L<sub>AS,max,log,22-06h,50</sub>-Klassen

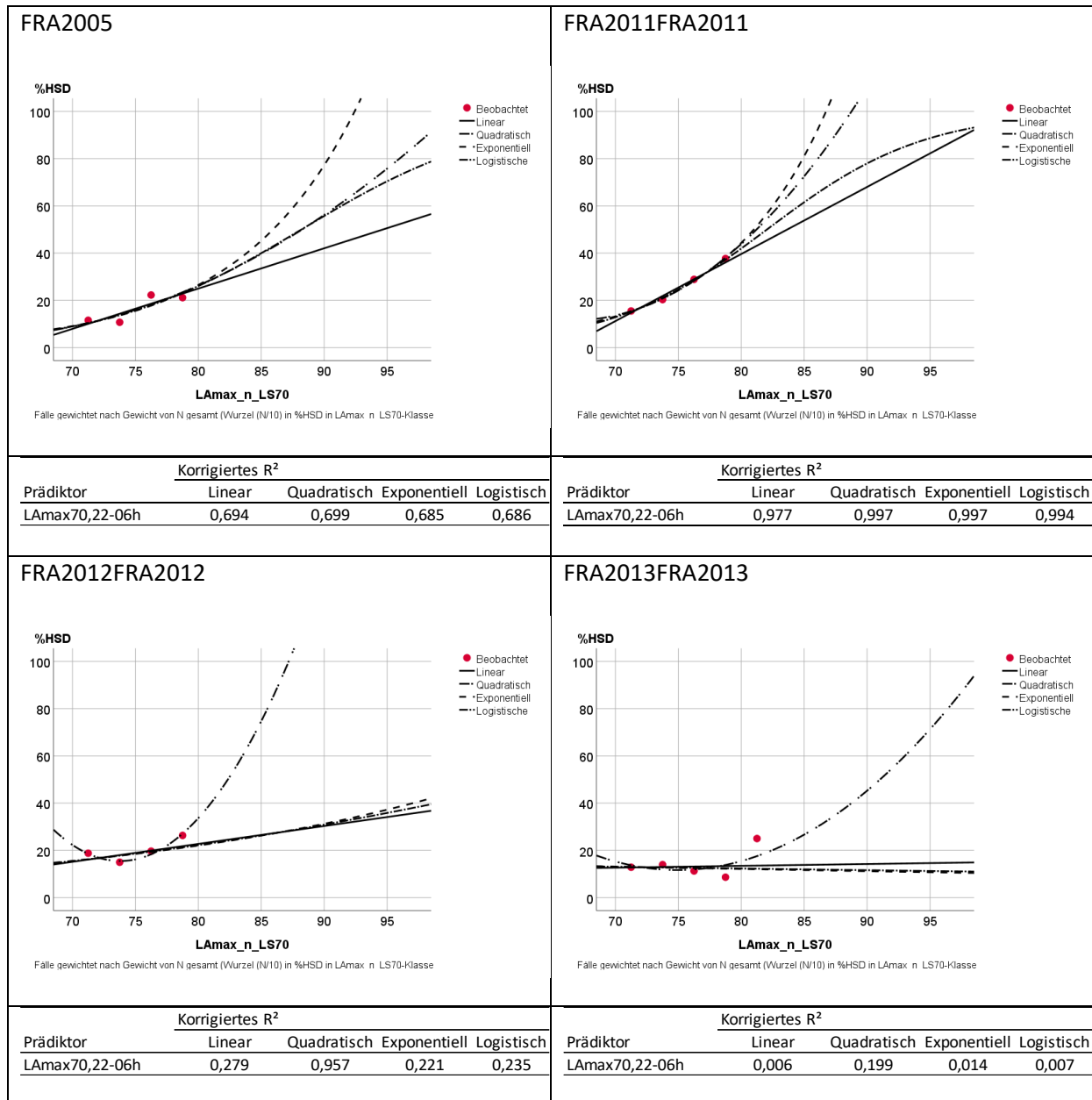


Abbildung 9-39 (fortgesetzt) - % HSD nach L<sub>AS,max,log,22-06h,70</sub>-Klassen

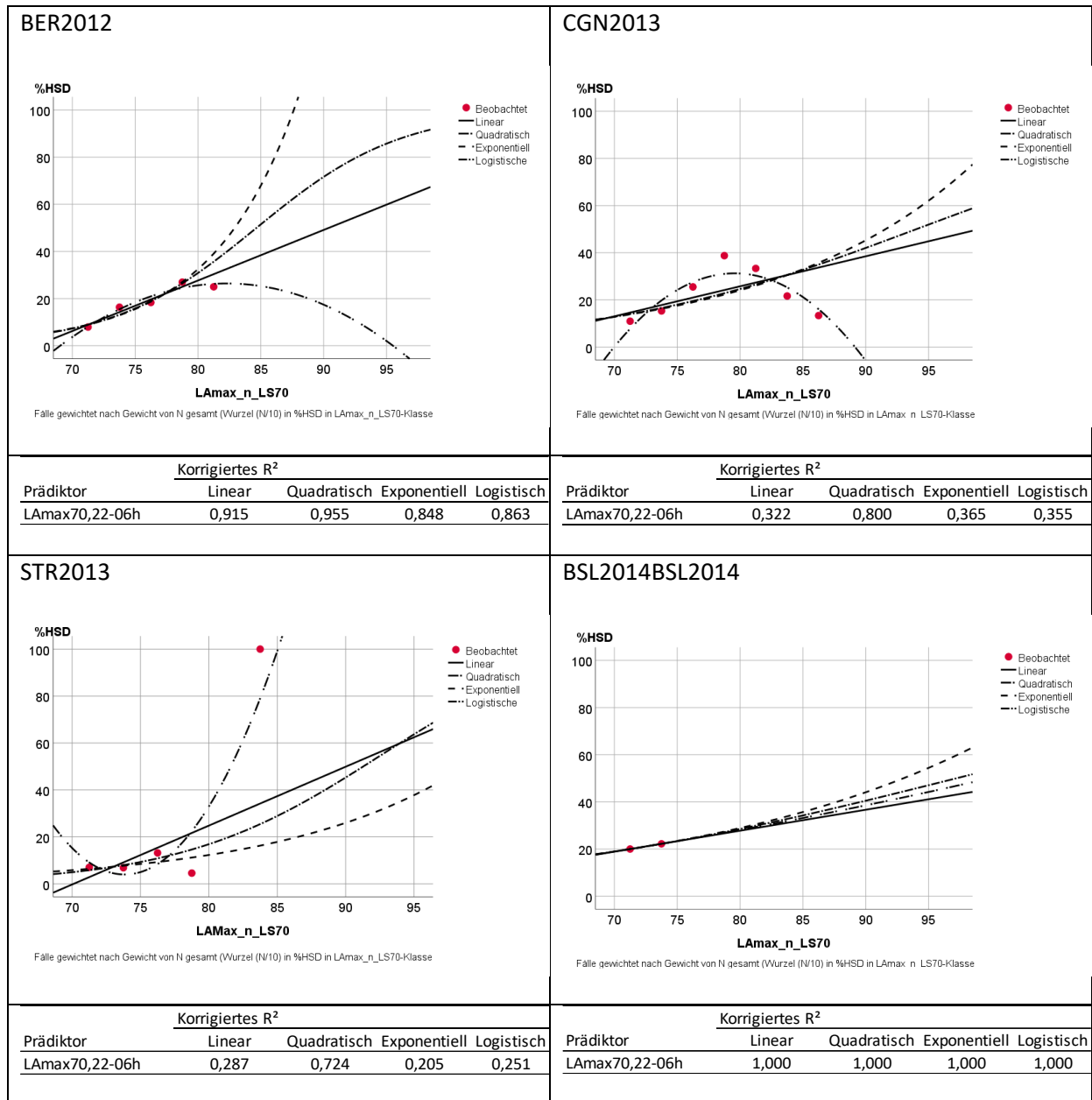


Abbildung 9-39 (fortgesetzt) - % HSD nach L<sub>AS,max,log,22-06h,70</sub>-Klassen

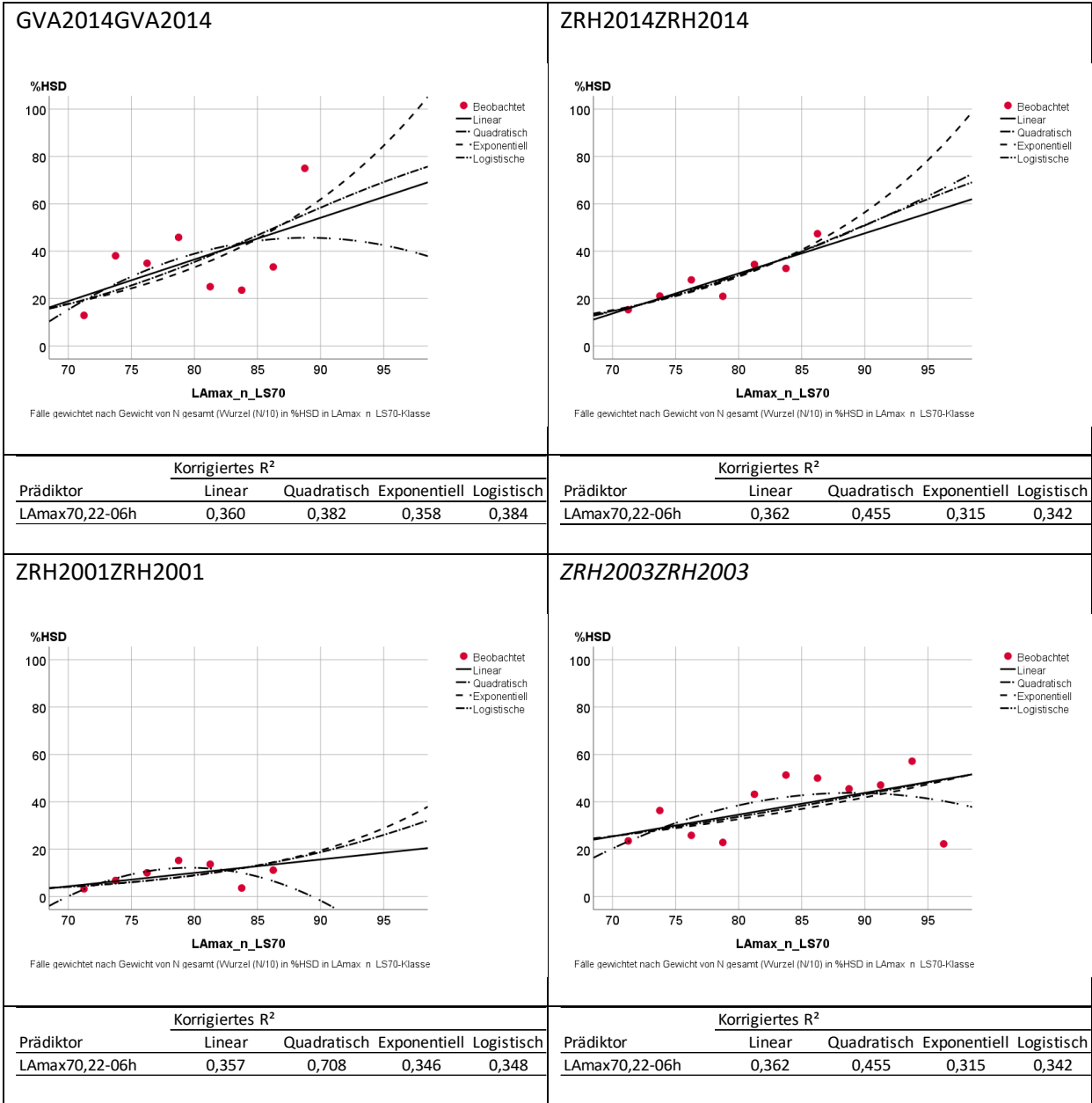


Abbildung 9-39 (fortgesetzt) - % HSD nach L<sub>AS,max,log,22-06h,70</sub>-Klassen

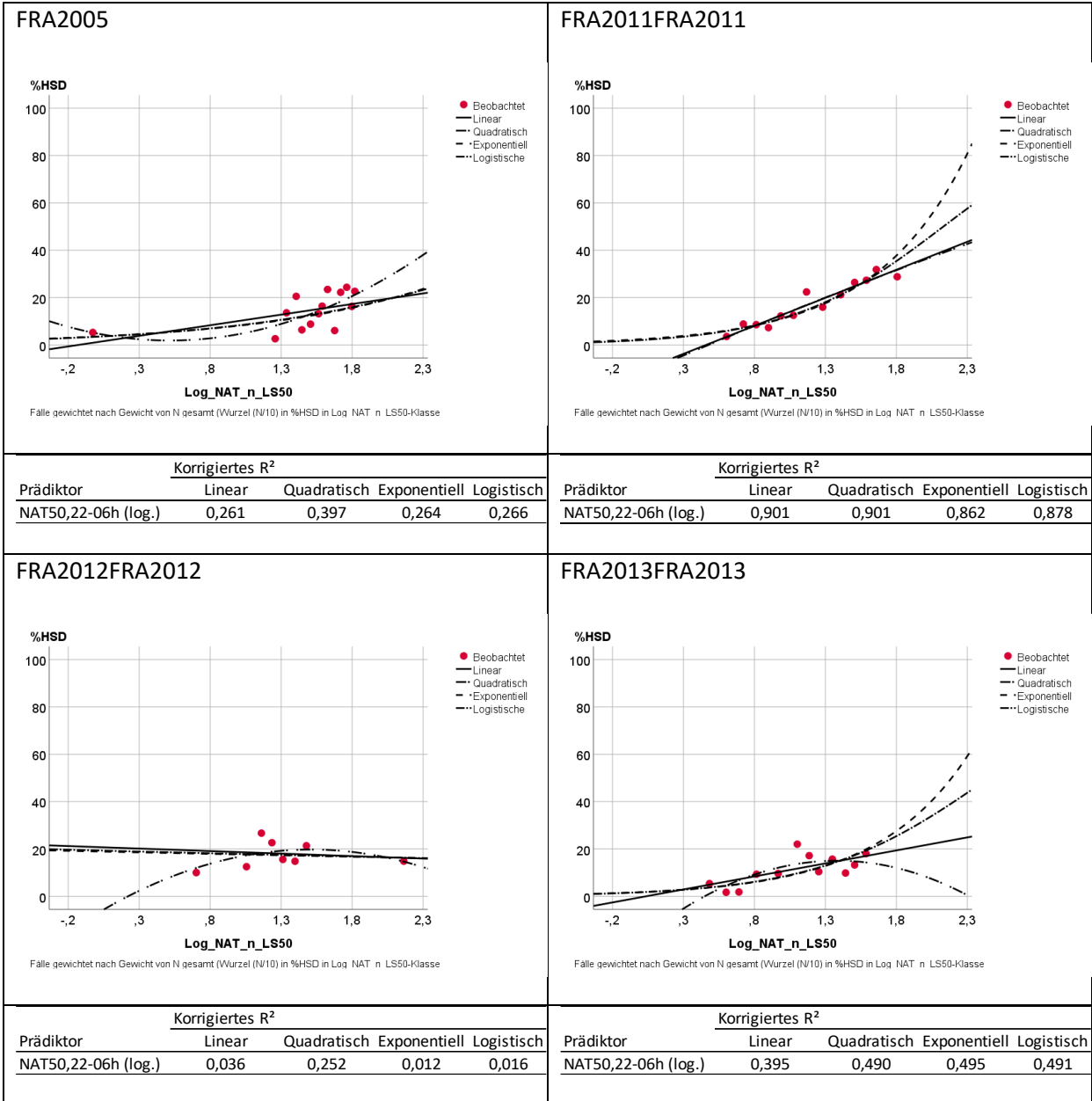


Abbildung 3-8 - % HSD nach log(NAT<sub>22-06h,50</sub>)-Klassen

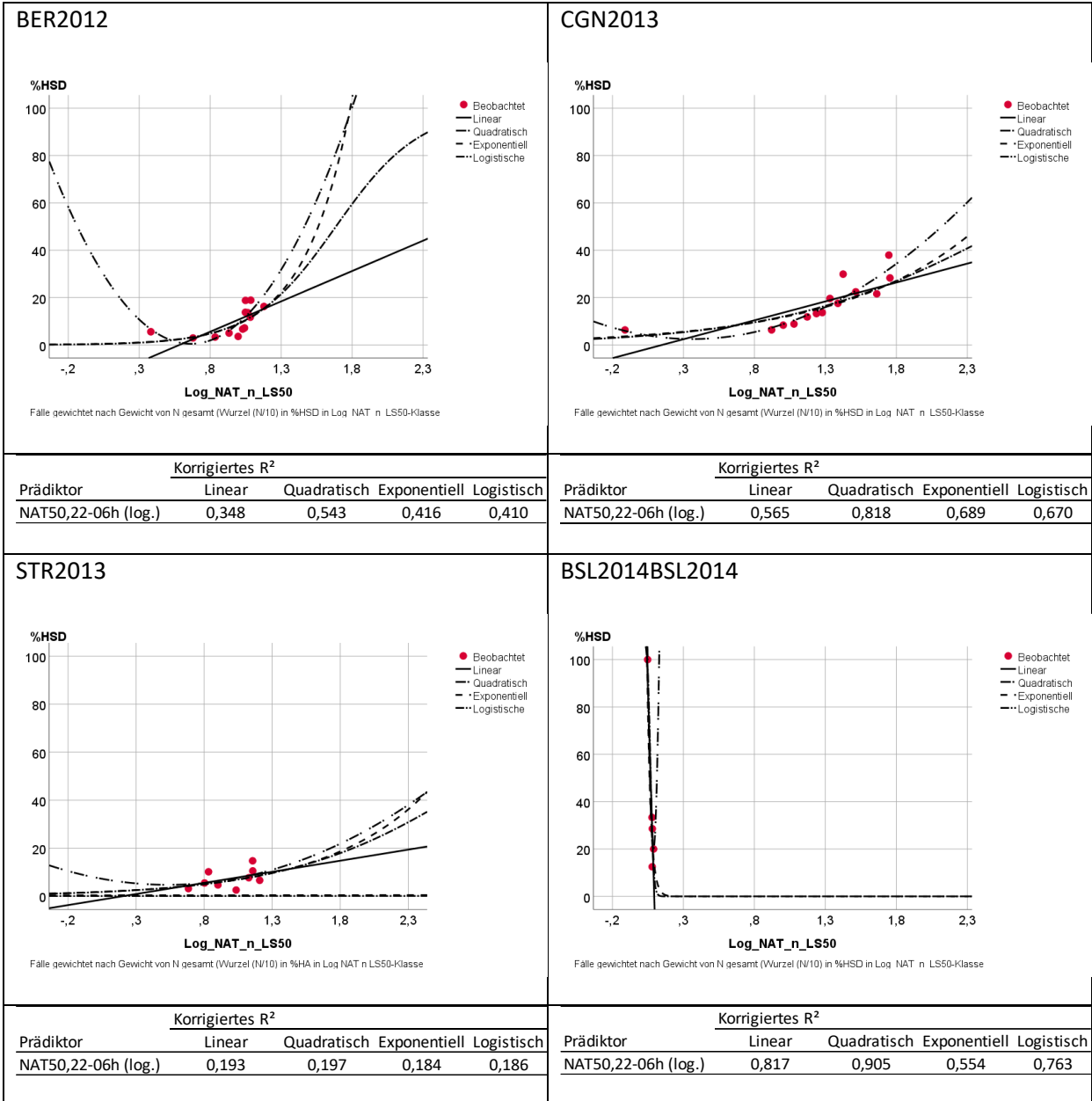


Abbildung 9-40 (fortgesetzt) - % HSD nach log(NAT<sub>22-06h,50</sub>)-Klassen

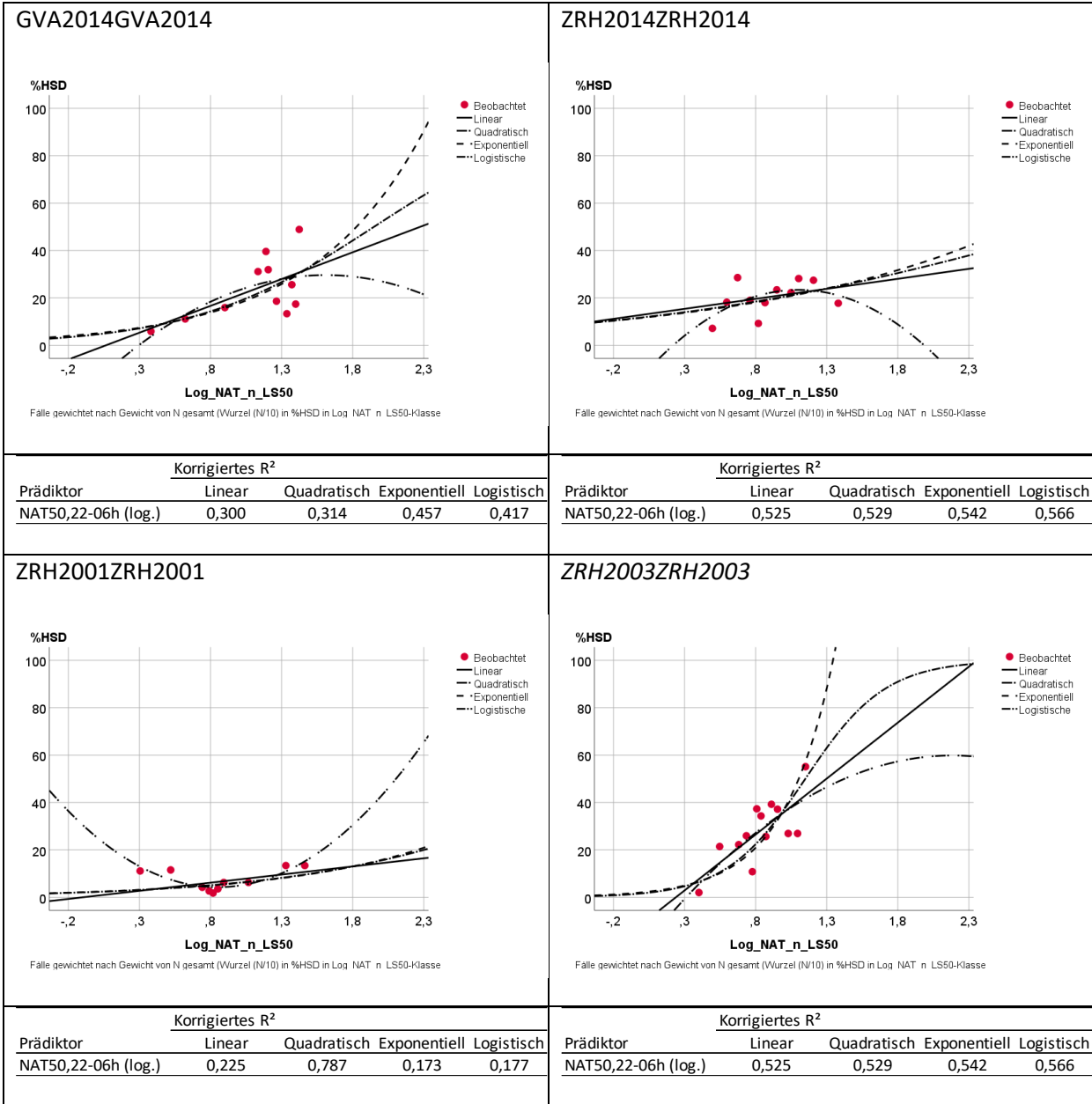


Abbildung 9-40 (fortgesetzt) - % HSD nach log(NAT<sub>22-06h,50</sub>)-Klassen

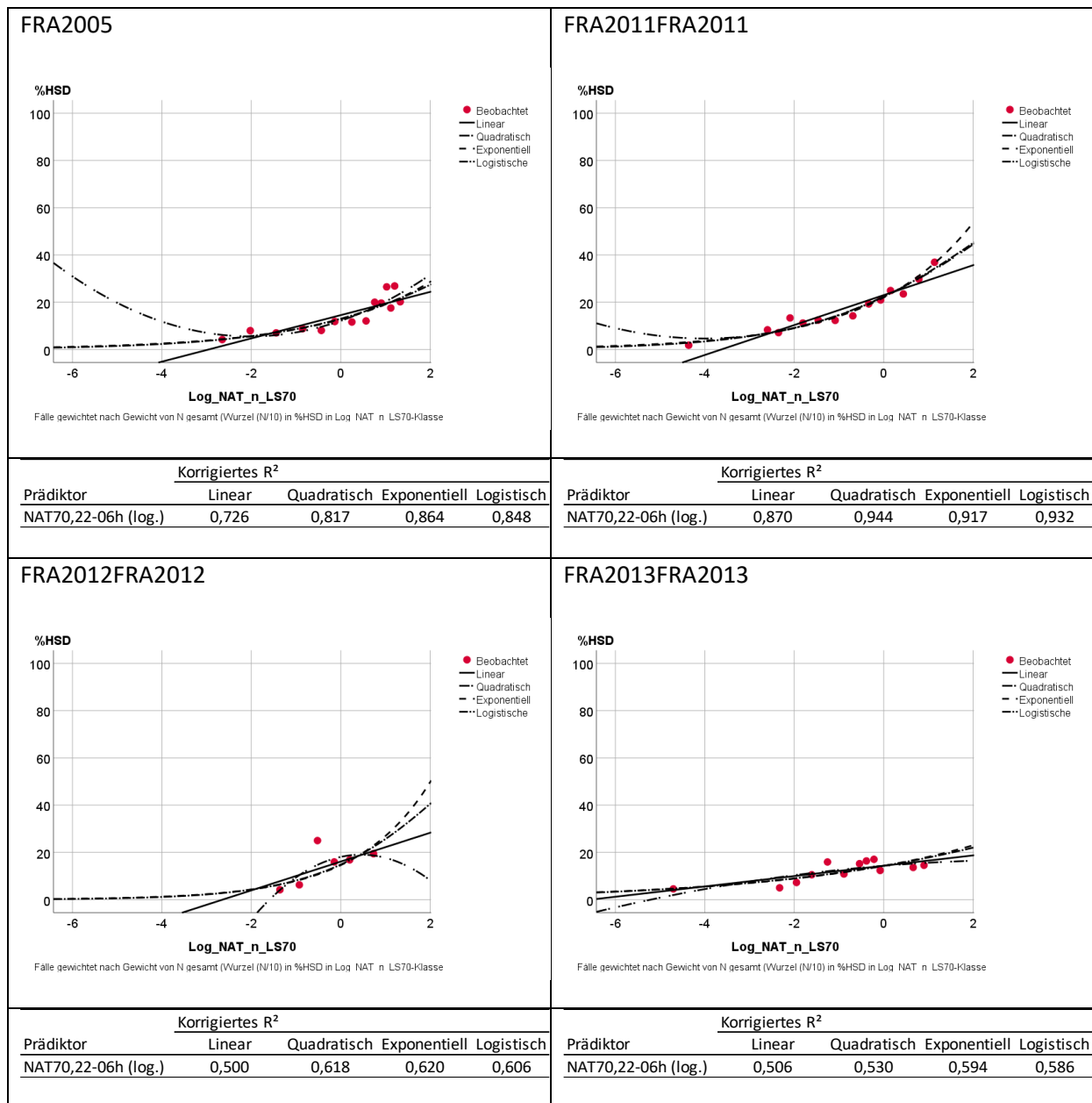


Abbildung 9-40 (fortgesetzt) - % HSD nach log(NAT<sub>22-06h,70</sub>)-Klassen



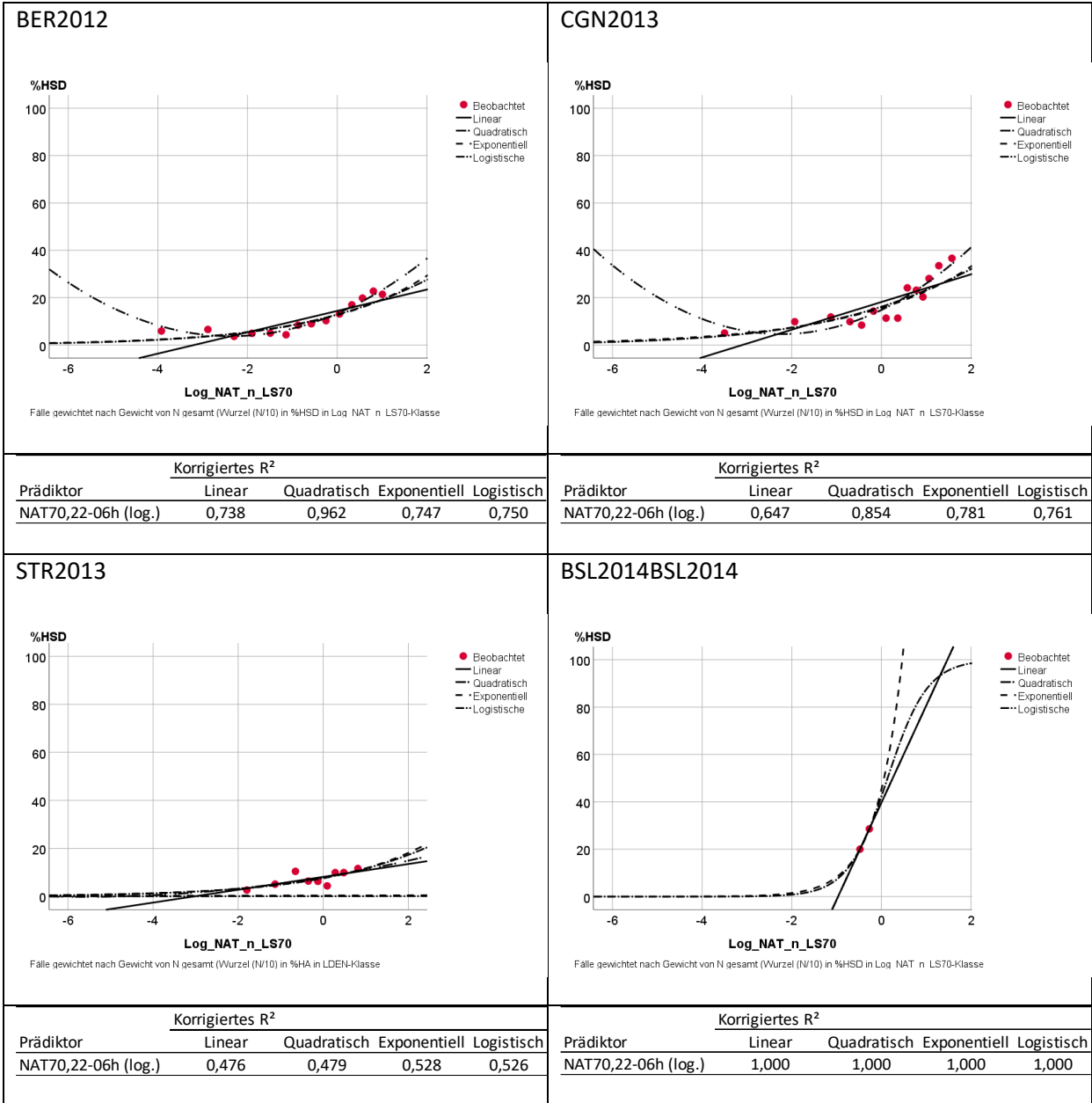
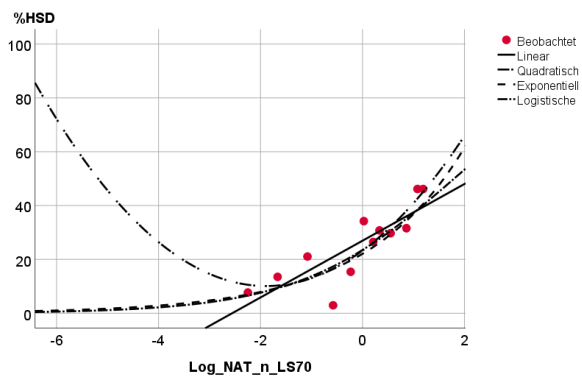


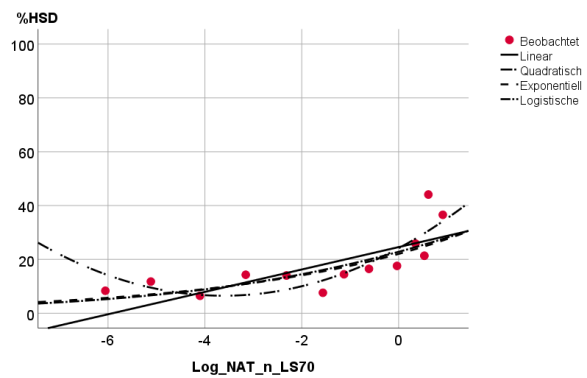
Abbildung 9-40 (fortgesetzt) - % HSD nach log(NAT<sub>22-06h,70</sub>)-Klassen

GVA2014GVA2014



Fälle gewichtet nach Gewicht von N gesamt (Wurzel (N/10)) in %HSD in Log NAT n LS70-Klasse

ZRH2014ZRH2014



Fälle gewichtet nach Gewicht von N gesamt (Wurzel (N/10)) in %HSD in Log NAT n LS70-Klasse

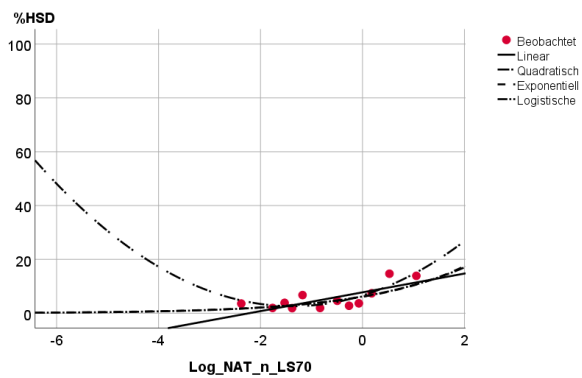
Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,22-06h (log.)	0,691	0,777	0,493	0,545

Korrigiertes R<sup>2</sup>

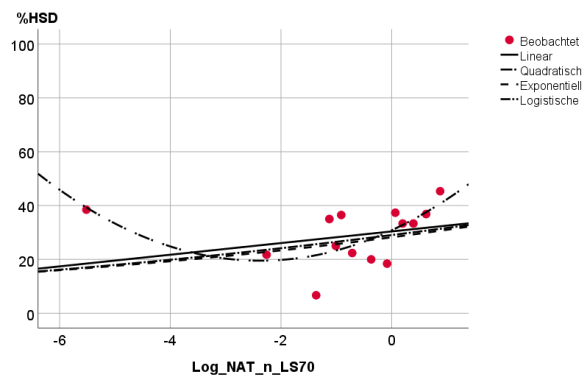
Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,22-06h (log.)	0,070	0,414	0,061	0,065

ZRH2001ZRH2001



Fälle gewichtet nach Gewicht von N gesamt (Wurzel (N/10)) in %HSD in Log NAT n LS70-Klasse

ZRH2003ZRH2003



Fälle gewichtet nach Gewicht von N gesamt (Wurzel (N/10)) in %HSD in Log NAT n LS70-Klasse

Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,22-06h (log.)	0,539	0,740	0,494	0,499

Korrigiertes R<sup>2</sup>

Prädiktor	Linear	Quadratisch	Exponentiell	Logistisch
NAT70,22-06h (log.)	0,070	0,414	0,061	0,065

Abbildung 9-40 (fortgesetzt) - % HSD nach log(NAT<sub>22-06h,70</sub>)-Klassen

## **4 Anhang D: Modellspezifikation und Ergebnisse der Mehrebenenanalysen**

In diesem Anhang werden die Ergebnisse aller 32 in dem Bericht dargestellten Mehrebenenanalysen inklusive aller Zwischenschritte wiedergegeben. Für die Berechnungen wurde das Paket *lme4* der Statistiksoftware R genutzt (Bates et al., 2015).

Die Legende für verschiedene Bezeichnungen und Variablennamen wird im folgenden Abschnitt 4.1 erläutert; im darauf folgenden Abschnitt 4.2 ist als Beispiel der Code für alle Modelle eines Mehrebenenmodells wiedergegeben. Anschließend werden ab Abschnitt 4.3 die Standard-Outputs aller durchgeführten Mehrebenenanalysen dargestellt.

### **4.1 Legende für Modellkennzeichen und Variablennamen**

Tabelle 4-1 - Kennzeichen und Variablenbezeichnungen für den Code der 32 Mehrebenenanalysen

Level 1	Modelle mit Kriterium <b>HA</b> (highly annoyed)			Modell- gruppe	Modelle mit Kriterium <b>HSD</b> (highly sleep disturbed)		
	Kenn- zeichen	Prädiktor(en)	Variablenbez. Prädiktoren		Kenn- zeichen	Prädiktor(en)	Variablenbez. Prädiktoren
	<b>ALd</b>	$L_{den}$	ZLDEN_cmc		$L_{den}$	<b>SLd</b>	$L_{den}$
<b>ALq10</b>	$L_{Aeq,24h}(k = 10)$	ZLpAeq0024_cmc	$L_{Aeq}$	<b>SLq10</b>	$L_{Aeq,22-06h}(k = 10)$	ZLpAeq2206_cmc	
<b>ALq20</b>	$L_{Aeq,24h}(k = 20)$	ZLpAeq24h_k20_cmc		<b>SLq20</b>	$L_{Aeq,22-06h}(k = 20)$	ZLpAeq2206_k20_cmc	
<b>ALq30</b>	$L_{Aeq,24h}(k = 30)$	ZLpAeq24h_k30_cmc		<b>SLq30</b>	$L_{Aeq,22-06h}(k = 30)$	ZLpAeq2206_k30_cmc	
<b>ALdN50</b>	$L_{den}$ $\log(NAT_{24h,50})$	ZLDEN_cmc	$L_{den}$ & $\log(NAT)$	<b>SLdN50</b>	$L_{den}$ $\log(NAT_{22-06h,50})$	ZLDEN_cmc	
		ZLog_NAT_24h_LS50_cmc				ZLog_NAT_n_LS50_cmc	
<b>ALdN60</b>	$L_{den}$ $\log(NAT_{24h,60})$	ZLDEN_cmc		<b>SLdN60</b>	$L_{den}$ $\log(NAT_{22-06h,60})$	ZLDEN_cmc	
		ZLog_NAT_24h_LS60_cmc				ZLog_NAT_n_LS60_cmc	
<b>ALdN70</b>	$L_{den}$ $\log(NAT_{24h,70})$	ZLDEN_cmc		<b>SLdN70</b>	$L_{den}$ $\log(NAT_{22-06h,70})$	ZLDEN_cmc	
		ZLog_NAT_24h_LS70_cmc				ZLog_NAT_n_LS70_cmc	
<b>ALdN80</b>	$L_{den}$ $\log(NAT_{24h,80})$	ZLDEN_cmc		<b>SLdN80</b>	$L_{den}$ $\log(NAT_{22-06h,80})$	ZLDEN_cmc	
		ZLog_NAT_24h_LS80_cmc				ZLog_NAT_n_LS80_cmc	
<b>ALqN50</b>	$L_{Aeq,24h}(k = 10)$ $\log(NAT_{24h,50})$	ZLpAeq0024_cmc	$L_{Aeq}$ & $\log(NAT)$	<b>SLqN50</b>	$L_{Aeq,22-06h}(k = 10)$ $\log(NAT_{22-06h,50})$	ZLpAeq2206_cmc	
		ZLog_NAT_24h_LS50_cmc				ZLog_NAT_n_LS50_cmc	
<b>ALqN60</b>	$L_{Aeq,24h}(k = 10)$ $\log(NAT_{24h,60})$	ZLpAeq0024_cmc		<b>SLqN60</b>	$L_{Aeq,22-06h}(k = 10)$ $\log(NAT_{22-06h,60})$	ZLpAeq2206_cmc	
		ZLog_NAT_24h_LS60_cmc				ZLog_NAT_n_LS60_cmc	
<b>ALqN70</b>	$L_{Aeq,24h}(k = 10)$ $\log(NAT_{24h,70})$	ZLpAeq0024_cmc		<b>SLqN70</b>	$L_{Aeq,22-06h}(k = 10)$ $\log(NAT_{22-06h,70})$	ZLpAeq2206_cmc	
		ZLog_NAT_24h_LS70_cmc				ZLog_NAT_n_LS70_cmc	
<b>ALqN80</b>	$L_{Aeq,24h}(k = 10)$ $\log(NAT_{24h,80})$	ZLpAeq0024_cmc		<b>SLqN80</b>	$L_{Aeq,22-06h}(k = 10)$ $\log(NAT_{22-06h,80})$	ZLpAeq2206_cmc	
		ZLog_NAT_24h_LS80_cmc				ZLog_NAT_n_LS80_cmc	
<b>AMN50</b>	$L_{AS,max,log,24h,50}$ $\log(NAT_{24h,50})$	ZLamax_24h_LS50	$L_{AS,max}$ & $\log(NAT)$	<b>SMN50</b>	$L_{AS,max,log,22-06h,50}$ $\log(NAT_{22-06h,50})$	ZLamax_n_LS50	
		ZLog_NAT_24h_LS50_cmc				ZLog_NAT_n_LS50_cmc	
<b>AMN60</b>	$L_{AS,max,log,24h,60}$ $\log(NAT_{24h,60})$	ZLamax_24h_LS60		<b>SMN60</b>	$L_{AS,max,log,22-06h,60}$ $\log(NAT_{22-06h,60})$	ZLamax_n_LS60	
		ZLog_NAT_24h_LS60_cmc				ZLog_NAT_n_LS60_cmc	
<b>AMN70</b>	$L_{AS,max,log,24h,70}$ $\log(NAT_{24h,70})$	ZLamax_24h_LS70		<b>SMN70</b>	$L_{AS,max,log,22-06h,70}$ $\log(NAT_{22-06h,70})$	ZLamax_n_LS70	
		ZLog_NAT_24h_LS70_cmc				ZLog_NAT_n_LS70_cmc	
<b>AMN80</b>	$L_{AS,max,log,24h,80}$ $\log(NAT_{24h,80})$	ZLamax_24h_LS80		<b>SMN80</b>	$L_{AS,max,log,22-06h,80}$ $\log(NAT_{22-06h,80})$	ZLamax_n_LS80	
		ZLog_NAT_24h_LS80_cmc				ZLog_NAT_n_LS80_cmc	

Level 2

Prädiktor	Variablenbez. Prädiktor
Anzahl Flugbewegungen pro Jahr (ganztags)	ZFlights24h_gmc
Nachtfluganteil	ZNightflightrate_gmc
5-Jahrestrend Flugbeweg. pro Jahr (ganztags)	ZTrend24h_gmc
Flottenmix	ZNoiseStarts24_gmc
Änderungsstatus	HRC_c

Prädiktor(en)	Variablenbez. Prädiktor
Anzahl Flugbewegungen pro Jahr (nachts)	ZFlights2206_gmc
Nachtfluganteil	ZNightflightrate_gmc
5-Jahrestrend Flugbeweg. pro Jahr (nachts)	ZTrend2206_gmc
Flottenmix	ZNoiseStarts24_gmc
Änderungsstatus	HRC_c

Wie aus Tabelle 4 1 ersichtlich ist, wird im R-Code für jede der 32 Mehrebenenanalysen, die sich jeweils aus unterschiedlichen Prädiktoren bzw. Prädiktorenkombinationen ergibt, ein eindeutiges Kennzeichen verwendet (siehe Spalte 1 und Spalte 5; das Kennzeichen für ein Modell mit dem Kriterium *HA* beginnt jeweils mit dem Buchstaben *A*, für ein Modell mit dem Kriterium *HSD* mit *S*).

Um die im Bericht im Abschnitt 6.4.4 („Vorgehensweise bei den Mehrebenenanalysen“) dargestellten verschiedenen Zwischenmodelle je Mehrebenenanalyse kenntlich zu machen, werden den Kennzeichen die folgenden **Präfixe** vorangestellt, deren Bedeutung im nächsten Abschnitt anhand von Beispielcode skizziert wird:

- **MO\_**: Nullmodell
- **CIM\_**: Eingeschränktes Zwischenmodell („constrained intermediate model“)
- **AIM1\_**: 1. Erweitertes Zwischenmodell („augmented intermediate model“)
- **AIM2\_**: 2. Erweitertes Zwischenmodell
- **FM\_**: Vollständiges Modell („full model“)

Insoweit gemittelte Prädiktoren für die Analysen verwendet werden, werden den Variablennamen der neu gebildeten Variablen folgende **Suffixe** hintangestellt:

- **\_cmc**: für Klassen-zentrierte Variablen („cluster mean centered“; nach Substraktion des Klassen- bzw. Stichproben-bezogenen Mittelwerts des jeweiligen Prädiktors) – bei Variablen der 1. Ebene (akustische Variablen)
- **\_gmc**: für am allgemeinen Mittelwert zentrierte Variablen („grand mean centered“; nach Substraktion des Gesamtmittelwerts über alle Klassen bzw. Stichproben vom jeweiligen Prädiktor) – bei Variablen der 2. Ebene (Stichprobencharakteristika)

## 4.2 Beispielcode für die verschiedenen Modelle einer Mehrebenenanalyse

### 4.2.1 MO: Nullmodell

In einem Nullmodell werden keine Prädiktoren, sondern nur die Level der 2. Ebene definiert. Dieses Modell dient der Berechnung der Homogenität des Kriteriums innerhalb der Stichproben und des Intraklassenkoeffizienten (ICC).

Beispielcode für das Nullmodell mit den Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$  (M0\_ALdN50):

```
M0_ALdN50 <-
  glmer(HA ~ (1 | Airport3), data = dat, family = "binomial")
# modell(parameter) berechnen

summary(M0_ALdN50)
# werte der modellparameter ausgeben

#-----#

icc <- M0_ALdN50@theta[1] ^ 2 / (M0_ALdN50@theta[1] ^ 2 +
  (3.14159 ^ 2 / 3))
# icc bilden
```

```
icc
# icc ausgeben
```

#### 4.2.2 CIM: Eingeschränktes Zwischenmodell („constrained intermediate model“)

Mit einem eingeschränkten Zwischenmodell wird die unerklärte Varianz der Effekte der 1. Ebene ermittelt, also das Ausmaß, in dem der Einfluss der akustischen Variablen eines Modells zwischen den Stichproben variiert. Dieses Modell enthält jeweils:

- alle Level 1-Prädiktoren
- alle Level 2-Prädiktoren
- alle\* Intra~~k~~lassen- Interaktionen (Level 1 mit Level 1 sowie Level 2 mit Level 2)  
\*Hinweis: mit "alle" sind alle gemeint, die untersucht werden sollen, und nicht alle grundsätzlich möglichen
- *keine* Interklassen-Interaktionen

Beispielcode für das eingeschränkte Zwischenmodell mit den Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$  (CIM\_ALdN50):

```
CIM_ALdN50 <-
  glmer(
    HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc +
      ZFlights24h_gmc + ZNightflightrate_gmc +
      ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c +
      (1 |
        Airport3) + ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc,
    data = dat,
    family = "binomial"
  )
```

#### 4.2.3 AIM1 und AIM2: Erweiterte Zwischenmodelle („augmented intermediate models“)

Die erweiterten Zwischenmodelle *AIM1* und *AIM2* entsprechen dem eingeschränkten Zwischenmodell CIM, das jeweils um den Residualterm des eines Level-1-Prädiktors erweitert wurde (bei Mehrebenenanalysen mit 2 Level-1-Prädiktoren wird für jeden der beiden Level-1-Prädiktoren ein separates AIM spezifiziert). Dieser zusätzliche Term reflektiert die Varianz des jeweiligen Level-1-Prädiktors zwischen den Klassen der 2. Ebene, also die Zwischen-Stichproben-Varianz des untersuchten Level-1-Prädiktors.

Beispielcode für die erweiterten Zwischenmodelle mit den Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$  (AIM1\_ALdN50, AIM2\_ALdN50):

```
AIM1_ALdN50 <-
  glmer(
    HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
      ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
      HRC_c + (1 + ZLDEN_cmc ||
                Airport3) +
                ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc,
    data = dat,
    family = "binomial"
  )
```

(...)

```
AIM1_ALdN50 <-
  glmer(
    HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
      ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
      HRC_c + (1 + ZLog_NAT_24h_LS50_cmc ||
                Airport3) +
                ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc,
    data = dat,
    family = "binomial"
  )
```

Vor der Spezifikation des vollständigen Modells werden die Modelle AIM1 und AIM2 in einem Chi-Quadrat-Differenzentest jeweils gegen das CIM getestet. Da der Unterschied zwischen einem AIM und dem CIM in der Hinzunahme des Parameters für den Residualterm eines Level-1-Prädiktors besteht, entspricht dieser Vergleichstest der Überprüfung, ob diese Hinzunahme die Anpassungsgüte signifikant verbessert. Sollte das nicht der Fall sein, würde darauf im vollständigen Modell verzichtet.

Beispielcode für die Chi-Quadrat-Differenzentests des eingeschränkten Zwischenmodells mit den Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$  (CIM\_ALdN50) gegen die beiden entsprechenden erweiterten Zwischenmodelle (AIM1\_ALdN50, AIM2\_ALdN50):

```
anova(CIM_ALdN50, AIM1_ALdN50)
anova(CIM_ALdN50, AIM2_ALdN50)
```

#### 4.2.4 FM: Vollständiges Modell („full model“)

Das vollständige Modell enthält dieselben Parameter wie das eingeschränkte Zwischenmodell sowie zusätzlich, sofern sie sich bei den vorherigen Schritten als signifikant erwiesen haben (siehe oben) den Residualterm eines oder beider Level-1-Prädiktoren. Darüber hinaus werden im vollständigen Modell auch die relevanten Interklassen-Interaktionen spezifiziert (Interaktionen zwischen Level 1-Prädiktoren mit Level 2-Prädiktoren).



Beispielcode für das vollständige Modell mit den Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$  (FM\_ALdN50):

```
FM_ALdN50 <-
  glmer(
    HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
      ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
      HRC_c + (1 + ZLDEN_cmc ||
              Airport3) +
      (1 + ZLog_NAT_24h_LS50_cmc ||
              Airport3) +
      ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc +
      ZLDEN_cmc:ZFlights24h_gmc +
      ZLDEN_cmc:ZNightflightrate_gmc +
      ZLDEN_cmc:ZTrend24h_gmc +
      ZLDEN_cmc:ZNoiseStarts24_gmc +
      ZLDEN_cmc:HRC_c +
      ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc +
      ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc +
      ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc +
      ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc +
      ZLog_NAT_24h_LS50_cmc:HRC_c,

    data = dat,
    family = "binomial"
  )
```

### 4.3 Modell ALdN50 (akustische Prädiktoren $L_{den}$ und $\log(NAT_{24h,50})$ )

#### 4.3.1 M0\_ALdN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALdN50@theta[1] ^ 2 / (M0_ALdN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALdN50)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALdN50)
$Airport3
  (Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.3.2 CIM\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS50_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29408.3 29489.5 -14694.1 29388.3   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-3.0812 -0.7555 -0.4000  0.8470 11.2375
```

```
Random effects:
```

```
Groups   Name          Variance Std.Dev.
Airport3 (Intercept) 0.1936   0.44
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.22952	0.17525	-1.310	0.1903
ZLDEN_cmc	0.88227	0.02504	35.231	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.04142	0.02581	-1.605	0.1086
ZFlights24h_gmc	-0.04027	0.57869	-0.070	0.9445
ZNightflightrate_gmc	0.01066	0.21115	0.050	0.9597
ZTrend24h_gmc	-0.18265	0.10577	-1.727	0.0842 .
ZNoiseStarts24_gmc	0.73886	0.47924	1.542	0.1231
HRC_c	-0.88908	0.51634	-1.722	0.0851 .
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.18297	0.02045	-8.947	<2e-16 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.003							
ZL_NAT_24_L	-0.015	-0.741						
ZFlights24h_	0.263	0.000	-0.002					
ZNightflight_	0.006	0.005	-0.005	0.663				
ZTrnd24h_gm	-0.040	-0.005	0.003	0.211	0.249			
ZNsStrts24_	0.037	0.004	0.000	-0.892	-0.756	-0.182		
HRC_c	-0.540	0.003	-0.004	-0.422	0.107	-0.106	0.045	
ZLDEN_:ZL_N	-0.056	-0.210	0.229	-0.016	-0.018	0.003	0.014	-0.007

```
> performance::icc(CIM_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.056
```

```
Conditional ICC: 0.044
```

```
> performance::r2(CIM_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.256
```

```
Marginal R2: 0.212
```

```
> screenreg(CIM_ALdN50)
```

```
=====
```

```

                                Model 1
-----
(Intercept)                    -0.23
                                (0.18)
ZLDEN_cmc                       0.88 ***
                                (0.03)
ZLog_NAT_24h_LS50_cmc          -0.04
                                (0.03)
ZFlights24h_gmc                -0.04
                                (0.58)
ZNightflightrate_gmc           0.01
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.74
                                (0.48)
HRC_c                           -0.89
                                (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.18 ***
                                (0.02)
-----
AIC                             29408.28
BIC                             29489.54
Log Likelihood                  -14694.14
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALdn50)
$Airport3
  (Intercept)
1 -0.27414283
1.1 0.19080375
1.2 -0.36151938
1.3 0.59300200
2 0.53073686
3 0.05102876
4 0.16529827
91 -0.76295531
92 0.58067268
93 -0.58461851
94 0.10995996
95 -0.22394136

```

with conditional variances for "Airport3"

**4.3.3 AIM1\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
  ZLog_NAT_24h_LS50_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29333.1 29422.5 -14655.6 29311.1   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.9295 -0.7470 -0.4083  0.8319  7.9795
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18987 0.4357
Airport3.1  ZLDEN_cmc    0.04344 0.2084
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.24207	0.17363	-1.394	0.1633
ZLDEN_cmc	0.87260	0.06763	12.903	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.11725	0.02842	-4.125	3.7e-05 ***
ZFlights24h_gmc	-0.07307	0.57179	-0.128	0.8983
ZNightflightrate_gmc	0.01548	0.20868	0.074	0.9409
ZTrend24h_gmc	-0.18810	0.10488	-1.793	0.0729 .
ZNoiseStarts24_gmc	0.69790	0.47348	1.474	0.1405
HRC_c	-0.74596	0.51059	-1.461	0.1440
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.19398	0.02118	-9.159	< 2e-16 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	-0.003							
ZL_NAT_24_L	-0.023	-0.243						
ZFlights24h_	0.262	0.005	-0.003					
ZNightflight_	0.006	0.004	-0.003	0.661				
ZTrnd24h_gm	-0.041	-0.012	0.004	0.208	0.248			
ZNsStrts24_	0.038	-0.002	0.001	-0.892	-0.755	-0.180		
HRC_c	-0.539	0.002	0.000	-0.423	0.107	-0.104	0.045	
ZLDEN_:ZL_N	-0.061	-0.069	0.270	-0.014	-0.015	0.006	0.010	-0.003

```
> performance::icc(AIM1_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.235
```

```
Marginal R2: 0.190
```

```
> screenreg(AIM1_ALdN50)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.24
                                (0.17)
ZLDEN_cmc                      0.87 ***
                                (0.07)
ZLog_NAT_24h_LS50_cmc         -0.12 ***
                                (0.03)
ZFlights24h_gmc               -0.07
                                (0.57)
ZNightflightrate_gmc          0.02
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.10)
ZNoiseStarts24_gmc            0.70
                                (0.47)
HRC_c                          -0.75
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                                (0.02)
-----
AIC                             29333.12
BIC                             29422.51
Log Likelihood                  -14655.56
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLDEN_cmc        0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN50)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.25609175  0.18485137
1.1 0.20376101  0.11837399
1.2 -0.40143978  0.30344819
1.3 0.58848280  0.07740807
2 0.52224465 -0.13798683
3 0.05339558 -0.05660192
4 0.16091969  0.01067765
91 -0.75426043 -0.02411694
92 0.56205801  0.12604476
93 -0.56001334  0.02548160
94 0.11915208 -0.17996543
95 -0.21012935 -0.46795414

```

with conditional variances for "Airport3"

**4.3.4 AIM2\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLog_NAT_24h_LS50_cmc ||
  Airport3) + ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29351.4 29440.8 -14664.7 29329.4   24982
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-3.3418 -0.7525 -0.3927  0.8399  9.7677
```

Random effects:

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.18735  0.4328
Airport3.1  ZLog_NAT_24h_LS50_cmc    0.05063  0.2250
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.22838    0.17278  -1.322  0.18623
ZLDEN_cmc      0.90501    0.02543  35.584 < 2e-16 ***
ZLog_NAT_24h_LS50_cmc -0.20868    0.07962  -2.621  0.00877 **
ZFlights24h_gmc -0.03199    0.57128  -0.056  0.95535
ZNightflightrate_gmc 0.01414    0.20803   0.068  0.94582
ZTrend24h_gmc -0.18755    0.10418  -1.800  0.07184 .
ZNoiseStarts24_gmc 0.69983    0.47265   1.481  0.13870
HRC_c         -0.85522    0.50992  -1.677  0.09351 .
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19049    0.02094  -9.099 < 2e-16 ***
---
```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```
(Intr) ZLDEN_c ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLDEN_cmc    0.007
ZL_NAT_24_L -0.015 -0.301
ZFlights24h_ 0.264 -0.001  0.002
ZNightflight_ 0.007  0.004  0.002  0.663
ZTrnd24h_gm -0.039 -0.007 -0.003  0.211  0.249
ZNsStrts24_ 0.036  0.005 -0.003 -0.892 -0.756 -0.182
HRC_c       -0.541  0.000  0.003 -0.424  0.105 -0.107  0.047
ZLDEN_:ZL_N -0.061 -0.226  0.132 -0.013 -0.015  0.007  0.010 -0.005
```

convergence code: 0

Model failed to converge with max|grad| = 0.00402352 (tol = 0.002, component 1)

```
> performance::icc(AIM2_ALdN50)
# Intraclass Correlation Coefficient
```

Adjusted ICC: 0.054

Conditional ICC: 0.044

```
> performance::r2(AIM2_ALdN50)
```

```
# R2 for Mixed Models
```

Conditional R2: 0.228



Marginal R2: 0.184  
> screenreg(AIM2\_ALdN50)

```
=====
                                Model 1
-----
(Intercept)                    -0.23
                                (0.17)
ZLDEN_cmc                       0.91 ***
                                (0.03)
ZLog_NAT_24h_LS50_cmc          -0.21 **
                                (0.08)
ZFlights24h_gmc                -0.03
                                (0.57)
ZNightflightrate_gmc           0.01
                                (0.21)
ZTrend24h_gmc                  -0.19
                                (0.10)
ZNoiseStarts24_gmc             0.70
                                (0.47)
HRC_c                           -0.86
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                                (0.02)
-----
AIC                               29351.45
BIC                               29440.84
Log Likelihood                   -14664.72
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)         0.19
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.05
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(AIM2\_ALdN50)

```
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1   -0.26439285    0.274199372
1.1  0.20606788    0.173345805
1.2 -0.39795005    0.302844996
1.3  0.59722893    0.081970135
2    0.51681012   -0.219859339
3    0.05080681   -0.043272867
4    0.16377979   -0.037013686
91   -0.74068586   -0.133848905
92    0.55347351    0.131545642
93   -0.55447946   -0.196613465
94    0.11491685   -0.004288171
95   -0.21657766   -0.360245027
```

with conditional variances for "Airport3"

**4.3.5 Vergleichstests ALdN50****4.3.5.1 > anova(CIM\_ALdN50, AIM1\_ALdN50)**

Models:

CIM\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN50	10	29408	29490	-14694	29388			
AIM1_ALdN50	11	29333	29423	-14656	29311	77.155	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.3.5.2 > anova(CIM\_ALdN50, AIM2\_ALdN50)**

Models:

CIM\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN50	10	29408	29490	-14694	29388			
AIM2_ALdN50	11	29351	29441	-14665	29329	58.831	1	1.718e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.3.6 FM\_ALdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 +  
ZLDEN\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS50\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT  
\_24h\_LS50\_cmc + ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc + ZLDEN\_c  
mc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS50  
\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS50  
\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS50\_cmc  
:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29317.7	29504.6	-14635.8	29271.7	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.2647	-0.7453	-0.4069	0.8321	7.5061

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.095239	0.30861
Airport3.1	ZLDEN_cmc	0.001275	0.03571
Airport3.2	(Intercept)	0.099519	0.31547
Airport3.3	ZLog_NAT_24h_LS50_cmc	0.003934	0.06273

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.246234	0.176107	-1.398	0.162051
ZLDEN_cmc	1.052600	0.040435	26.032	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.210070	0.057558	-3.650	0.000263 ***
ZFlights24h_gmc	-0.096823	0.582934	-0.166	0.868081
ZNightflightrate_gmc	0.010690	0.212080	0.050	0.959798
ZTrend24h_gmc	-0.187128	0.106115	-1.763	0.077825 .
ZNoiseStarts24_gmc	0.705931	0.482220	1.464	0.143216
HRC_c	-0.739157	0.518522	-1.426	0.154010
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.192062	0.021333	-9.003	< 2e-16 ***
ZLDEN_cmc:ZFlights24h_gmc	0.384475	0.141898	2.710	0.006738 **
ZLDEN_cmc:ZNightflightrate_gmc	0.005104	0.046411	0.110	0.912433
ZLDEN_cmc:ZTrend24h_gmc	0.007486	0.028594	0.262	0.793482
ZLDEN_cmc:ZNoiseStarts24_gmc	-0.006679	0.119652	-0.056	0.955483
ZLDEN_cmc:HRC_c	-0.696429	0.136070	-5.118	3.09e-07 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.214872	0.231822	-0.927	0.353988
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	0.016039	0.070382	0.228	0.819735
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	0.033709	0.038849	0.868	0.385564
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.200086	0.182913	1.094	0.274003
ZLog_NAT_24h_LS50_cmc:HRC_c	0.330910	0.193481	1.710	0.087211 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

```
unable to evaluate scaled gradient
Model failed to converge: degenerate Hessian with 1 negative eigenvalues
```

```
> performance::icc(FM_ALdN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.028
Conditional ICC: 0.022
> performance::r2(FM_ALdN50)
# R2 for Mixed Models
```

```
Conditional R2: 0.235
Marginal R2: 0.213
> screenreg(FM_ALdN50)
```

```
=====
Model 1
-----
(Intercept)                -0.25
                           (0.18)
ZLDEN_cmc                   1.05 ***
                           (0.04)
ZLog_NAT_24h_LS50_cmc     -0.21 ***
                           (0.06)
ZFlights24h_gmc           -0.10
                           (0.58)
ZNightflightrate_gmc      0.01
                           (0.21)
ZTrend24h_gmc             -0.19
                           (0.11)
ZNoiseStarts24_gmc        0.71
                           (0.48)
HRC_c                     -0.74
                           (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                           (0.02)
ZLDEN_cmc:ZFlights24h_gmc 0.38 **
                           (0.14)
ZLDEN_cmc:ZNightflightrate_gmc 0.01
                           (0.05)
ZLDEN_cmc:ZTrend24h_gmc   0.01
                           (0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc -0.01
                           (0.12)
ZLDEN_cmc:HRC_c           -0.70 ***
                           (0.14)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.21
                           (0.23)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc 0.02
                           (0.07)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc 0.03
                           (0.04)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.20
                           (0.18)
ZLog_NAT_24h_LS50_cmc:HRC_c 0.33
                           (0.19)
-----
AIC                        29317.66
BIC                        29504.57
```

```

Log Likelihood                -14635.83
Num. obs.                    24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.10
Var: Airport3.1 ZLDEN_cmc    0.00
Var: Airport3.2 (Intercept)  0.10
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc 0.00

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_ALdN50)

```

```

$Airport3

```

```

      (Intercept)      ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1      -0.13764767 -0.006684116 -0.14383383      -0.012630031
1.1    0.10456337 -0.025069148  0.10926266      -0.040722499
1.2   -0.19019084  0.034539950 -0.19873839       0.093449536
1.3    0.29341213  0.003150246  0.30659864      -0.035820261
2       0.24507221 -0.008694335  0.25608624      -0.009314680
3       0.02664926  0.001303461  0.02784693       0.003413723
4       0.08663970  0.014920950  0.09053345       0.025433096
91    -0.36495940  0.001118897 -0.38136139      -0.010113474
92     0.28472816  0.009804713  0.29752440       0.024283812
93    -0.29361345 -0.019504703 -0.30680901      -0.035142304
94     0.06110904  0.003934514  0.06385540       0.014912737
95    -0.10626083 -0.010760373 -0.11103640      -0.021400993

```

```

with conditional variances for "Airport3"

```

## 4.4 Modell ALdN60 (akustische Prädiktoren $L_{den}$ und $\log(NAT_{24h,60})$ )

### 4.4.1 MO\_A LdN60

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

Scaled residuals:

```
      Min      1Q  Median      3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

Random effects:

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALdN60@theta[1] ^ 2 / (MO_ALdN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALdN60)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALdN60)
$Airport3
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.4.2 CIM\_ALdN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
  LS60_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29381.5 29462.8 -14680.8 29361.5   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.3764 -0.7578 -0.3986   0.8550 14.7488
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1903   0.4363
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.254138	0.173784	-1.462	0.1436
ZLDEN_cmc	0.676780	0.033361	20.287	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.212910	0.034960	6.090	1.13e-09 ***
ZFlights24h_gmc	-0.074102	0.572003	-0.130	0.8969
ZNightflightrate_gmc	-0.008741	0.208957	-0.042	0.9666
ZTrend24h_gmc	-0.180332	0.104876	-1.719	0.0855 .
ZNoiseStarts24_gmc	0.760189	0.473786	1.604	0.1086
HRC_c	-0.915052	0.512274	-1.786	0.0741 .
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.122558	0.019239	-6.370	1.89e-10 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.015							
ZL_NAT_24_L	-0.023	-0.863						
ZFlights24h_	0.262	0.000	-0.001					
ZNightflight_	0.005	0.002	-0.001	0.661				
ZTrnd24h_gm	-0.040	-0.001	-0.002	0.210	0.248			
ZNsStrts24_	0.039	0.004	-0.001	-0.891	-0.755	-0.181		
HRC_c	-0.539	0.000	-0.001	-0.422	0.108	-0.106	0.043	
ZLDEN_:ZL_N	-0.064	-0.253	0.243	-0.010	-0.010	-0.001	0.008	-0.003

```
> performance::icc(CIM_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.043
```

```
> performance::r2(CIM_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.259
```

```
Marginal R2: 0.216
```

```
> screenreg(CIM_ALdN60)
```

```
=====
```



```

                                Model 1
-----
(Intercept)                    -0.25
                                (0.17)
ZLDEN_cmc                      0.68 ***
                                (0.03)
ZLog_NAT_24h_LS60_cmc         0.21 ***
                                (0.03)
ZFlights24h_gmc               -0.07
                                (0.57)
ZNightflightrate_gmc          -0.01
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.76
                                (0.47)
HRC_c                          -0.92
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.12 ***
                                (0.02)
-----
AIC                             29381.53
BIC                             29462.80
Log Likelihood                  -14680.77
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALdn60)
$Airport3
  (Intercept)
1 -0.26832463
1.1 0.20379301
1.2 -0.37661518
1.3 0.58749087
2 0.53880863
3 0.04797849
4 0.14647510
91 -0.75622950
92 0.57089209
93 -0.56989241
94 0.09929634
95 -0.20906865

```

with conditional variances for "Airport3"

**4.4.3 AIM1\_ALdN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
  ZLog_NAT_24h_LS60_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29341.8 29431.2 -14659.9 29319.8   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5757 -0.7500 -0.4088  0.8385 10.3515
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18712 0.4326
Airport3.1  ZLDEN_cmc   0.03715 0.1927
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.269499   0.172633  -1.561 0.11850
ZLDEN_cmc       0.717748   0.068287 10.511 < 2e-16 ***
ZLog_NAT_24h_LS60_cmc 0.122841   0.041834  2.936 0.00332 **
ZFlights24h_gmc -0.118525   0.570811  -0.208 0.83551
ZNightflightrate_gmc -0.002867   0.207955  -0.014 0.98900
ZTrend24h_gmc  -0.184411   0.104165  -1.770 0.07666 .
ZNoiseStarts24_gmc 0.728444   0.472691  1.541 0.12330
HRC_c          -0.753903   0.506986  -1.487 0.13701
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.137358  0.020537  -6.688 2.26e-11 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
      (Intr) ZLDEN_c ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLDEN_cmc    0.008
ZL_NAT_24_L -0.038 -0.438
ZFlights24h_ 0.263 0.006 -0.006
ZNightflight_ 0.007 0.004 -0.001 0.664
ZTrnd24h_gm -0.040 -0.009 -0.002 0.209 0.249
ZNsStrts24_ 0.036 -0.004 0.004 -0.893 -0.757 -0.181
HRC_c        -0.539 0.001 0.004 -0.422 0.105 -0.104 0.047
ZLDEN_:ZL_N -0.072 -0.161 0.340 -0.009 -0.008 0.001 0.006 0.000
```

```
> performance::icc(AIM1_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.043
```

```
> performance::r2(AIM1_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.244
```

```
Marginal R2: 0.201
```

```
> screenreg(AIM1_ALdN60)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.27
                                (0.17)
ZLDEN_cmc                       0.72 ***
                                (0.07)
ZLog_NAT_24h_LS60_cmc          0.12 **
                                (0.04)
ZFlights24h_gmc                -0.12
                                (0.57)
ZNightflightrate_gmc          -0.00
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.73
                                (0.47)
HRC_c                          -0.75
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.14 ***
                                (0.02)
-----
AIC                             29341.79
BIC                             29431.18
Log Likelihood                  -14659.90
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLDEN_cmc        0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN60)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.26372549  0.175381313
1.1 0.21580896  0.061465633
1.2 -0.39727816  0.199323200
1.3 0.58388380  0.015109861
2 0.53063769 -0.063089168
3 0.04930167 -0.046561495
4 0.14807738  0.041246471
91 -0.74502451 -0.006028837
92 0.55258925  0.183473137
93 -0.55357680  0.073265564
94 0.11019889 -0.202391222
95 -0.20342627 -0.449494752

```

with conditional variances for "Airport3"

**4.4.4 AIM2\_ALdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS60\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29344.9	29434.3	-14661.5	29322.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9241	-0.7505	-0.4043	0.8409	9.7117

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17713	0.4209
Airport3.1	ZLog_NAT_24h_LS60_cmc	0.05196	0.2279

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.262798	0.168495	-1.560	0.1188
ZLDEN_cmc	0.721292	0.036221	19.914	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.094694	0.084150	1.125	0.2605
ZFlights24h_gmc	-0.068042	0.557729	-0.122	0.9029
ZNightflightrate_gmc	0.001528	0.202640	0.008	0.9940
ZTrend24h_gmc	-0.181092	0.101546	-1.783	0.0745 .
ZNoiseStarts24_gmc	0.701200	0.461260	1.520	0.1285
HRC_c	-0.825549	0.497059	-1.661	0.0967 .
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.130542	0.020492	-6.370	1.88e-10 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.028							
ZL_NAT_24_L	-0.031	-0.472						
ZFlights24h_	0.264	-0.001	0.001					
ZNghtflght_	0.006	-0.001	0.006	0.663				
ZTrnd24h_gm	-0.038	-0.003	-0.009	0.210	0.249			
ZNsStrts24_	0.035	0.006	-0.004	-0.893	-0.757	-0.182		
HRC_c	-0.542	-0.007	0.011	-0.425	0.104	-0.106	0.048	
ZLDEN_:ZL_N	-0.077	-0.324	0.197	-0.008	-0.005	0.003	0.004	0.004

> performance::icc(AIM2\_ALdN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.041

> performance::r2(AIM2\_ALdN60)

# R2 for Mixed Models

Conditional R2: 0.236

Marginal R2: 0.195

> screenreg(AIM2\_ALdN60)

```

=====
                                Model 1
-----
(Intercept)                    -0.26
                                (0.17)
ZLDEN_cmc                      0.72 ***
                                (0.04)
ZLog_NAT_24h_LS60_cmc         0.09
                                (0.08)
ZFlights24h_gmc               -0.07
                                (0.56)
ZNightflightrate_gmc          0.00
                                (0.20)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.70
                                (0.46)
HRC_c                          -0.83
                                (0.50)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.13 ***
                                (0.02)
-----
AIC                             29344.94
BIC                             29434.33
Log Likelihood                  -14661.47
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1   -0.26498037      0.27828826
1.1  0.22498991      0.08458122
1.2 -0.40524822      0.19076788
1.3  0.58393521      0.05849529
2    0.53147778     -0.12679447
3    0.04401007     -0.06562849
4    0.13827019      0.09332774
91  -0.71640948     -0.09668881
92   0.51003687      0.27792403
93  -0.51538664     -0.12393806
94   0.10366595     -0.14586975
95  -0.20029525     -0.46103210

```

with conditional variances for "Airport3"

**4.4.5 Vergleichstests ALdN60****4.4.5.1 > anova(CIM\_ALdN60, AIM1\_ALdN60)**

Models:

CIM\_ALdN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN60: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN60	10	29382	29463	-14681	29362			
AIM1_ALdN60	11	29342	29431	-14660	29320	41.74	1	1.043e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.4.5.2 > anova(CIM\_ALdN60, AIM2\_ALdN60)**

Models:

CIM\_ALdN60:

AIM2\_ALdN60:

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN60	10	29382	29463	-14681	29362			
AIM2_ALdN60	11	29345	29434	-14662	29323	38.595	1	5.216e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.4.6 FM\_ALdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS60\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS60\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS60\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29326.8	29513.7	-14640.4	29280.8	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.0587	-0.7446	-0.4103	0.8360	8.9874

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.033e-03	6.350e-02
Airport3.1	ZLDEN_cmc	4.533e-09	6.733e-05
Airport3.2	(Intercept)	1.849e-01	4.299e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	3.953e-03	6.287e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.270287	0.173061	-1.562	0.1183
ZLDEN_cmc	0.850774	0.048748	17.452	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.093064	0.067410	1.381	0.1674
ZFlights24h_gmc	-0.101040	0.568379	-0.178	0.8589
ZNightflightrate_gmc	-0.004096	0.207638	-0.020	0.9843
ZTrend24h_gmc	-0.182385	0.104541	-1.745	0.0811 .
ZNoiseStarts24_gmc	0.705306	0.470791	1.498	0.1341
HRC_c	-0.772817	0.506738	-1.525	0.1272
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.128692	0.020628	-6.239	4.41e-10 ***
ZLDEN_cmc:ZFlights24h_gmc	0.282616	0.178405	1.584	0.1132
ZLDEN_cmc:ZNightflightrate_gmc	-0.016850	0.058524	-0.288	0.7734
ZLDEN_cmc:ZTrend24h_gmc	0.029720	0.036117	0.823	0.4106
ZLDEN_cmc:ZNoiseStarts24_gmc	0.016696	0.147698	0.113	0.9100
ZLDEN_cmc:HRC_c	-0.748125	0.149804	-4.994	5.91e-07 ***
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.222745	0.266386	-0.836	0.4031
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.025653	0.086981	-0.295	0.7681
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	0.001644	0.047785	0.034	0.9726
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.259617	0.216837	1.197	0.2312
ZLog_NAT_24h_LS60_cmc:HRC_c	0.236303	0.219093	1.079	0.2808

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALdN60)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.001
Conditional ICC: 0.001
> performance::r2(FM_ALdN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.221
Marginal R2: 0.221
> screenreg(FM_ALdN60)
```

```
=====
Model 1
-----
(Intercept)                -0.27
                             (0.17)
ZLDEN_cmc                   0.85 ***
                             (0.05)
ZLog_NAT_24h_LS60_cmc      0.09
                             (0.07)
ZFlights24h_gmc           -0.10
                             (0.57)
ZNightflightrate_gmc      -0.00
                             (0.21)
ZTrend24h_gmc             -0.18
                             (0.10)
ZNoiseStarts24_gmc        0.71
                             (0.47)
HRC_c                      -0.77
                             (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.13 ***
                             (0.02)
ZLDEN_cmc:ZFlights24h_gmc 0.28
                             (0.18)
ZLDEN_cmc:ZNightflightrate_gmc -0.02
                             (0.06)
ZLDEN_cmc:ZTrend24h_gmc   0.03
                             (0.04)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.02
                             (0.15)
ZLDEN_cmc:HRC_c           -0.75 ***
                             (0.15)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc -0.22
                             (0.27)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.03
                             (0.09)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc 0.00
                             (0.05)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc 0.26
                             (0.22)
ZLog_NAT_24h_LS60_cmc:HRC_c 0.24
                             (0.22)
-----
AIC                        29326.83
BIC                        29513.74
Log Likelihood             -14640.42
```



```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.18
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN60)
$Airport3
  (Intercept)    ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.005806999 -9.587849e-09 -0.26617842    4.610806e-03
1.1 0.004828784 -4.267031e-08  0.22133950   -7.459863e-02
1.2 -0.008529003  7.741877e-08 -0.39094835    7.459479e-02
1.3 0.012456120 -2.011200e-08  0.57095764    8.958691e-05
2  0.011011010 -3.985996e-08  0.50471741   -2.522267e-02
3  0.001082306  5.277394e-09  0.04961021    7.112279e-03
4  0.003293861  3.647692e-08  0.15098243    3.739068e-02
91 -0.015845785  2.817353e-09 -0.72633148   -8.486689e-03
92  0.012053211  4.305350e-08  0.55248928    2.966270e-02
93 -0.012265307 -5.165211e-08 -0.56221127   -4.304001e-02
94  0.002437607  1.419951e-08  0.11173385    1.432870e-02
95 -0.004322133 -2.215170e-08 -0.19811587   -2.138757e-02

with conditional variances for "Airport3"

```

## 4.5 Modell ALdN70 (akustische Prädiktoren $L_{den}$ und $\log(NAT_{24h,70})$ )

### 4.5.1 MO\_ALdN70

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

Scaled residuals:

```
      Min      1Q  Median      3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

Random effects:

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALdN70@theta[1] ^ 2 / (MO_ALdN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALdN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALdN70)
$Airport3
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.5.2 CIM\_ALdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS70_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29402.0 29483.3 -14691.0 29382.0   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.4807 -0.7556 -0.4028  0.8484  9.0231
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1926   0.4388
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.26462	0.17508	-1.511	0.1307
ZLDEN_cmc	0.69105	0.03333	20.735	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.20071	0.03412	5.882	4.04e-09 ***
ZFlights24h_gmc	-0.09231	0.57825	-0.160	0.8732
ZNightflightrate_gmc	-0.01437	0.21080	-0.068	0.9456
ZTrend24h_gmc	-0.18070	0.10551	-1.713	0.0868 .
ZNoiseStarts24_gmc	0.77173	0.47881	1.612	0.1070
HRC_c	-0.92461	0.51576	-1.793	0.0730 .
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.09933	0.01929	-5.149	2.62e-07 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNgght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.029							
ZL_NAT_24_L	-0.038	-0.862						
ZFlights24h_	0.263	0.008	-0.011					
ZNightflight_	0.006	0.001	0.000	0.663				
ZTrnd24h_gm	-0.039	0.005	-0.008	0.211	0.249			
ZNsStrts24_	0.036	-0.004	0.008	-0.893	-0.757	-0.182		
HRC_c	-0.541	-0.016	0.017	-0.422	0.106	-0.107	0.046	
ZLDEN_:ZL_N	-0.078	-0.324	0.304	-0.017	-0.006	-0.008	0.015	0.018

```
> performance::icc(CIM_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.044
```

```
> performance::r2(CIM_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.256
```

```
Marginal R2: 0.212
```

```
> screenreg(CIM_ALdN70)
```

```
=====
```

```

                                Model 1
-----
(Intercept)                    -0.26
                                (0.18)
ZLDEN_cmc                      0.69 ***
                                (0.03)
ZLog_NAT_24h_LS70_cmc         0.20 ***
                                (0.03)
ZFlights24h_gmc               -0.09
                                (0.58)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.11)
ZNoiseStarts24_gmc           0.77
                                (0.48)
HRC_c                          -0.92
                                (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                                (0.02)
-----
AIC                             29401.99
BIC                             29483.26
Log Likelihood                  -14691.00
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALdN70)
$Airport3
  (Intercept)
1 -0.25453318
1.1 0.19937246
1.2 -0.38026985
1.3 0.57536440
2 0.54132844
3 0.05101694
4 0.14680843
91 -0.77359510
92 0.58536544
93 -0.56946762
94 0.10229091
95 -0.20908427

```

with conditional variances for "Airport3"

**4.5.3 AIM1\_ALdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
  ZLog_NAT_24h_LS70_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29347.2 29436.6 -14662.6 29325.2   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.2258 -0.7477 -0.4113  0.8384  6.4457
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18872 0.4344
Airport3.1  ZLDEN_cmc    0.03782 0.1945
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28301	0.17384	-1.628	0.1035
ZLDEN_cmc	0.66732	0.06891	9.684	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.17399	0.03519	4.944	7.64e-07 ***
ZFlights24h_gmc	-0.12412	0.57746	-0.215	0.8298
ZNightflightrate_gmc	-0.01064	0.20944	-0.051	0.9595
ZTrend24h_gmc	-0.18360	0.10467	-1.754	0.0794 .
ZNoiseStarts24_gmc	0.72949	0.47729	1.528	0.1264
HRC_c	-0.78571	0.51279	-1.532	0.1255
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.10109	0.01994	-5.069	3.99e-07 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.008							
ZL_NAT_24_L	-0.035	-0.441						
ZFlights24h_	0.266	0.007	-0.009					
ZNghtflght_	0.008	0.004	-0.002	0.665				
ZTrnd24h_gm	-0.038	-0.007	-0.006	0.211	0.250			
ZNsStrts24_	0.032	-0.005	0.009	-0.894	-0.758	-0.182		
HRC_c	-0.543	-0.003	0.011	-0.426	0.101	-0.106	0.052	
ZLDEN_:ZL_N	-0.078	-0.171	0.315	-0.012	-0.004	-0.004	0.010	0.015

```
> performance::icc(AIM1_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.238
```

```
Marginal R2: 0.194
```

```
> screenreg(AIM1_ALdN70)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.28
                                (0.17)
ZLDEN_cmc                      0.67 ***
                                (0.07)
ZLog_NAT_24h_LS70_cmc         0.17 ***
                                (0.04)
ZFlights24h_gmc               -0.12
                                (0.58)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc           0.73
                                (0.48)
HRC_c                          -0.79
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                                (0.02)
-----
AIC                             29347.24
BIC                             29436.63
Log Likelihood                  -14662.62
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
Var: Airport3.1 ZLDEN_cmc       0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN70)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.24183629  0.19753665
1.1  0.21491104  0.08273027
1.2 -0.41324877  0.22401801
1.3  0.56829032  0.08055619
2   0.53658071 -0.10806605
3   0.05199178 -0.03760891
4   0.14087827  0.03329473
91 -0.76420317 -0.01602152
92  0.56460518  0.12750613
93 -0.54505253  0.04163937
94  0.11076111 -0.19943020
95 -0.19618186 -0.44498055

```

with conditional variances for "Airport3"

**4.5.4 AIM2\_ALdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS70\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29361.4	29450.8	-14669.7	29339.4	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.4285	-0.7552	-0.4043	0.8416	7.8339

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.20029	0.4475
Airport3.1	ZLog_NAT_24h_LS70_cmc	0.04894	0.2212

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28627	0.17885	-1.601	0.1095
ZLDEN_cmc	0.73067	0.03549	20.588	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.14822	0.07691	1.927	0.0540 .
ZFlights24h_gmc	-0.14108	0.59059	-0.239	0.8112
ZNightflightrate_gmc	-0.01122	0.21496	-0.052	0.9584
ZTrend24h_gmc	-0.19382	0.10784	-1.797	0.0723 .
ZNoiseStarts24_gmc	0.75353	0.48889	1.541	0.1232
HRC_c	-0.77694	0.52653	-1.476	0.1401
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.11366	0.02018	-5.632	1.79e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.030							
ZL_NAT_24_L	-0.026	-0.434						
ZFlights24h_	0.263	0.006	0.000					
ZNightflight_	0.005	0.002	0.003	0.662				
ZTrnd24h_gm	-0.039	0.003	-0.017	0.207	0.248			
ZNsStrts24_	0.036	-0.004	0.000	-0.893	-0.756	-0.179		
HRC_c	-0.542	-0.011	0.010	-0.423	0.107	-0.105	0.047	
ZLDEN_:ZL_N	-0.077	-0.368	0.169	-0.013	-0.004	-0.003	0.011	0.015

> performance::icc(AIM2\_ALdN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM2\_ALdN70)

# R2 for Mixed Models

Conditional R2: 0.253

Marginal R2: 0.208

> screenreg(AIM2\_ALdN70)



```

=====
                                Model 1
-----
(Intercept)                    -0.29
                                (0.18)
ZLDEN_cmc                       0.73 ***
                                (0.04)
ZLog_NAT_24h_LS70_cmc          0.15
                                (0.08)
ZFlights24h_gmc                -0.14
                                (0.59)
ZNightflightrate_gmc           -0.01
                                (0.21)
ZTrend24h_gmc                  -0.19
                                (0.11)
ZNoiseStarts24_gmc             0.75
                                (0.49)
HRC_c                           -0.78
                                (0.53)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.11 ***
                                (0.02)
-----
AIC                             29361.43
BIC                             29450.82
Log Likelihood                  -14669.72
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.24939277  0.19480093
1.1 0.21103417 -0.01492785
1.2 -0.40319300  0.14012661
1.3 0.57459238  0.18520643
2  0.57144042 -0.13719402
3  0.05325687 -0.07235942
4  0.14026160  0.02240773
91 -0.79503527  0.10912087
92 0.58050828  0.15456681
93 -0.55861500  0.08720504
94 0.11501786 -0.13761161
95 -0.20128649 -0.56438060

```

with conditional variances for "Airport3"

**4.5.5 Vergleichstests ALdN70****4.5.5.1 > anova(CIM\_ALdN70, AIM1\_ALdN70)**

Models:

CIM\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN70	10	29402	29483	-14691	29382			
AIM1_ALdN70	11	29347	29437	-14663	29325	56.749	1	4.95e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.5.5.2 > anova(CIM\_ALdN70, AIM2\_ALdN70)**

Models:

CIM\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN70	10	29402	29483	-14691	29382			
AIM2_ALdN70	11	29361	29451	-14670	29339	42.562	1	6.848e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.5.6 FM\_ALdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS70\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS70\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS70\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29319.6	29506.5	-14636.8	29273.6	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3450	-0.7475	-0.4124	0.8481	8.4673

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	1.038e-01	0.3221917
Airport3.1	ZLDEN_cmc	2.413e-08	0.0001553
Airport3.2	(Intercept)	1.019e-01	0.3192099
Airport3.3	ZLog_NAT_24h_LS70_cmc	4.910e-03	0.0700691

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.31421	0.18083	-1.738	0.0823 .
ZLDEN_cmc	0.73251	0.05493	13.336	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.29776	0.06500	4.581	4.63e-06 ***
ZFlights24h_gmc	-0.19627	0.59676	-0.329	0.7422
ZNightflightrate_gmc	-0.01702	0.21752	-0.078	0.9376
ZTrend24h_gmc	-0.19663	0.10908	-1.803	0.0715 .
ZNoiseStarts24_gmc	0.77897	0.49469	1.575	0.1153
HRC_c	-0.70524	0.52992	-1.331	0.1832
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.09075	0.02049	-4.429	9.45e-06 ***
ZLDEN_cmc:ZFlights24h_gmc	-0.14934	0.22896	-0.652	0.5142
ZLDEN_cmc:ZNightflightrate_gmc	-0.10792	0.07777	-1.388	0.1653
ZLDEN_cmc:ZTrend24h_gmc	-0.08046	0.04685	-1.717	0.0859 .
ZLDEN_cmc:ZNoiseStarts24_gmc	0.45898	0.18665	2.459	0.0139 *
ZLDEN_cmc:HRC_c	-0.31601	0.19514	-1.619	0.1054
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.48359	0.25237	1.916	0.0553 .
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.13024	0.09409	1.384	0.1663
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.13548	0.05442	2.489	0.0128 *
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.40474	0.21479	-1.884	0.0595 .
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.34596	0.23778	-1.455	0.1457

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

Model failed to converge with max|grad| = 0.00419699 (tol = 0.002, component 1)

```
> performance::icc(FM_ALdN70)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.031
Conditional ICC: 0.024
> performance::r2(FM_ALdN70)
# R2 for Mixed Models
```

```
Conditional R2: 0.249
Marginal R2: 0.225
> screenreg(FM_ALdN70)
```

```
=====
Model 1
-----
(Intercept)                -0.31
                             (0.18)
ZLDEN_cmc                   0.73 ***
                             (0.05)
ZLog_NAT_24h_LS70_cmc      0.30 ***
                             (0.07)
ZFlights24h_gmc            -0.20
                             (0.60)
ZNightflightrate_gmc       -0.02
                             (0.22)
ZTrend24h_gmc              -0.20
                             (0.11)
ZNoiseStarts24_gmc         0.78
                             (0.49)
HRC_c                       -0.71
                             (0.53)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.09 ***
                             (0.02)
ZLDEN_cmc:ZFlights24h_gmc  -0.15
                             (0.23)
ZLDEN_cmc:ZNightflightrate_gmc -0.11
                             (0.08)
ZLDEN_cmc:ZTrend24h_gmc    -0.08
                             (0.05)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.46 *
                             (0.19)
ZLDEN_cmc:HRC_c            -0.32
                             (0.20)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc 0.48
                             (0.25)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc 0.13
                             (0.09)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc 0.14 *
                             (0.05)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc -0.40
                             (0.21)
ZLog_NAT_24h_LS70_cmc:HRC_c -0.35
                             (0.24)
-----
AIC                          29319.60
BIC                          29506.50
Log Likelihood                -14636.80
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.10
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.10
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN70)
$Airport3
  (Intercept)      ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.13267675 -8.683131e-08 -0.13023233 -0.004046739
1.1 0.10636320 -4.175531e-07 0.10440358 -0.089560904
1.2 -0.20173579 7.834775e-07 -0.19801903 0.048801965
1.3 0.29448984 -2.379993e-07 0.28906418 0.054556565
2 0.28435040 -8.322271e-08 0.27911155 -0.053396513
3 0.02907578 2.324416e-08 0.02854009 0.010197758
4 0.08023826 2.180504e-07 0.07875996 0.066626263
91 -0.40860749 -3.966893e-08 -0.40107934 0.008339502
92 0.29526277 1.078049e-07 0.28982287 0.017322145
93 -0.29701378 -2.431305e-07 -0.29154162 -0.052949206
94 0.06657902 1.196304e-07 0.06535238 0.025190643
95 -0.10586331 -1.790813e-07 -0.10391289 -0.038275231

```

with conditional variances for "Airport3"

## 4.6 Modell ALdN80 (akustische Prädiktoren $L_{den}$ und $\log(NAT_{24h,80})$ )

### 4.6.1 MO\_ALdN80

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALdN80@theta[1] ^ 2 / (MO_ALdN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALdN80)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALdN80)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.6.2 CIM\_ALdN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS80_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29445.0 29526.2 -14712.5 29425.0   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5781 -0.7487 -0.4142  0.8545 10.3320
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1866   0.432
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.244955	0.172373	-1.421	0.1553
ZLDEN_cmc	0.874894	0.024491	35.724	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.002420	0.024035	-0.101	0.9198
ZFlights24h_gmc	-0.028130	0.569652	-0.049	0.9606
ZNightflightrate_gmc	-0.007698	0.207814	-0.037	0.9705
ZTrend24h_gmc	-0.174225	0.103935	-1.676	0.0937 .
ZNoiseStarts24_gmc	0.708593	0.471984	1.501	0.1333
HRC_c	-0.955871	0.508573	-1.880	0.0602 .
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.124185	0.018273	-6.796	1.07e-11 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.000							
ZL_NAT_24_L	0.000	-0.716						
ZFlights24h_	0.264	0.005	-0.006					
ZNghtflght_	0.006	0.004	-0.002	0.663				
ZTrnd24h_gm	-0.039	0.002	-0.005	0.211	0.249			
ZNsStrts24_	0.036	-0.005	0.008	-0.892	-0.757	-0.181		
HRC_c	-0.541	-0.002	-0.001	-0.421	0.107	-0.106	0.044	
ZLDEN_:ZL_N	-0.063	-0.111	-0.058	-0.023	-0.010	-0.008	0.027	0.010

```
> performance::icc(CIM_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.043
```

```
> performance::r2(CIM_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.250
```

```
Marginal R2: 0.208
```

```
> screenreg(CIM_ALdN80)
```

```
=====
```



```

                                Model 1
-----
(Intercept)                    -0.24
                                (0.17)
ZLDEN_cmc                      0.87 ***
                                (0.02)
ZLog_NAT_24h_LS80_cmc         -0.00
                                (0.02)
ZFlights24h_gmc               -0.03
                                (0.57)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.17
                                (0.10)
ZNoiseStarts24_gmc           0.71
                                (0.47)
HRC_c                          -0.96
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.12 ***
                                (0.02)
-----

```

```

-----
AIC                             29444.99
BIC                             29526.25
Log Likelihood                  -14712.49
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALdn80)
```

```

$Airport3
  (Intercept)
1  -0.23444611
1.1 0.21331270
1.2 -0.40380871
1.3 0.55180663
2   0.54017881
3   0.05044384
4   0.13034258
91 -0.77118878
92  0.57487458
93 -0.54264566
94  0.09958943
95 -0.19387942

```

with conditional variances for "Airport3"

**4.6.3 AIM1\_ALdN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
  ZLog_NAT_24h_LS80_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29387.3 29476.6 -14682.6 29365.3   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.2438 -0.7413 -0.4133  0.8433  7.0226
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18747 0.4330
Airport3.1  ZLDEN_cmc   0.04215 0.2053
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.282451	0.172795	-1.635	0.1021
ZLDEN_cmc	0.819472	0.068103	12.033	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	0.020062	0.024891	0.806	0.4202
ZFlights24h_gmc	-0.086450	0.571246	-0.151	0.8797
ZNightflightrate_gmc	-0.003066	0.208075	-0.015	0.9882
ZTrend24h_gmc	-0.179136	0.104271	-1.718	0.0858 .
ZNoiseStarts24_gmc	0.682713	0.472944	1.444	0.1489
HRC_c	-0.779915	0.509577	-1.531	0.1259
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.109889	0.018913	-5.810	6.23e-09 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	-0.005							
ZL_NAT_24_L	0.000	-0.303						
ZFlights24h_	0.264	0.005	-0.002					
ZNightflight_	0.006	0.005	-0.002	0.663				
ZTrnd24h_gm	-0.039	-0.009	-0.003	0.209	0.248			
ZNsStrts24_	0.035	-0.004	0.003	-0.892	-0.756	-0.181		
HRC_c	-0.542	0.002	-0.001	-0.423	0.106	-0.105	0.046	
ZLDEN_:ZL_N	-0.060	-0.077	-0.006	-0.016	-0.009	-0.005	0.020	0.006

```
> performance::icc(AIM1_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.236
```

```
Marginal R2: 0.192
```

```
> screenreg(AIM1_ALdN80)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.28
                                (0.17)
ZLDEN_cmc                       0.82 ***
                                (0.07)
ZLog_NAT_24h_LS80_cmc          0.02
                                (0.02)
ZFlights24h_gmc                -0.09
                                (0.57)
ZNightflightrate_gmc          -0.00
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.68
                                (0.47)
HRC_c                          -0.78
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.11 ***
                                (0.02)
-----
AIC                             29387.26
BIC                             29476.65
Log Likelihood                  -14682.63
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLDEN_cmc        0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN80)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.22661306  0.201928601
1.1  0.22529695  0.063007788
1.2 -0.43226723  0.218324572
1.3  0.55269718  0.046610827
2   0.53868115 -0.076528217
3   0.05257142 -0.074494134
4   0.12923353  0.077437281
91 -0.76929903 -0.005809774
92  0.56548601  0.155520226
93 -0.53158135  0.077166560
94  0.10900872 -0.223448794
95 -0.18513153 -0.479508653

```

with conditional variances for "Airport3"

**4.6.4 AIM2\_ALdN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS80\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS80\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29418.4	29507.8	-14698.2	29396.4	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.4141	-0.7519	-0.4129	0.8488	9.4591

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19656	0.4434
Airport3.1	ZLog_NAT_24h_LS80_cmc	0.02208	0.1486

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.264685	0.176601	-1.499	0.1339
ZLDEN_cmc	0.898223	0.025566	35.134	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.008778	0.053519	-0.164	0.8697
ZFlights24h_gmc	-0.069293	0.582193	-0.119	0.9053
ZNightflightrate_gmc	-0.004526	0.212314	-0.021	0.9830
ZTrend24h_gmc	-0.185803	0.106711	-1.741	0.0817 .
ZNoiseStarts24_gmc	0.698123	0.481874	1.449	0.1474
HRC_c	-0.831481	0.519748	-1.600	0.1096
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.134630	0.018921	-7.115	1.12e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.000						
ZL_NAT_24_L	-0.006	-0.362					
ZFlights24h_	0.264	0.002	0.005				
ZNghtflight_	0.007	0.003	0.003	0.661			
ZTrnd24h_gm	-0.039	0.001	-0.016	0.209	0.248		
ZNsStrts24_	0.036	-0.003	-0.003	-0.892	-0.755	-0.180	
HRC_c	-0.540	0.000	0.003	-0.423	0.106	-0.105	0.046
ZLDEN_:ZL_N	-0.057	-0.147	-0.025	-0.018	-0.010	-0.005	0.023

> performance::icc(AIM2\_ALdN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(AIM2\_ALdN80)

# R2 for Mixed Models

Conditional R2: 0.256

Marginal R2: 0.212

> screenreg(AIM2\_ALdN80)

```

=====
                                Model 1
-----
(Intercept)                    -0.26
                                (0.18)
ZLDEN_cmc                      0.90 ***
                                (0.03)
ZLog_NAT_24h_LS80_cmc         -0.01
                                (0.05)
ZFlights24h_gmc               -0.07
                                (0.58)
ZNightflightrate_gmc          -0.00
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.11)
ZNoiseStarts24_gmc            0.70
                                (0.48)
HRC_c                          -0.83
                                (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.13 ***
                                (0.02)
-----
AIC                             29418.39
BIC                             29507.78
Log Likelihood                  -14698.20
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1   -0.22671126      0.11975747
1.1  0.21767837     -0.02022653
1.2 -0.41947500      0.10312588
1.3  0.55075062      0.08400298
2    0.56565005     -0.11051792
3    0.05346905     -0.16561890
4    0.12427507      0.03497302
91   -0.80093506      0.12786803
92   0.58908873      0.09930657
93   -0.54793403      0.08422839
94   0.10775644     -0.07687853
95  -0.18576438     -0.29737607

```

with conditional variances for "Airport3"

**4.6.5 Vergleichstests ALdN80****4.6.5.1 > anova(CIM\_ALdN80, AIM1\_ALdN80)**

Models:

CIM\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN80	10	29445	29526	-14712	29425			
AIM1_ALdN80	11	29387	29477	-14683	29365	59.728	1	1.089e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.6.5.2 > anova(CIM\_ALdN80, AIM2\_ALdN80)**

Models:

CIM\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN80	10	29445	29526	-14712	29425			
AIM2_ALdN80	11	29418	29508	-14698	29396	28.592	1	8.936e-08 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### 4.6.6 FM\_ALdN80

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS80\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS80\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS80\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29369.2	29556.1	-14661.6	29323.2	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.2857	-0.7392	-0.4191	0.8433	8.4505

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.005957	0.07718
Airport3.1	ZLDEN_cmc	0.003419	0.05848
Airport3.2	(Intercept)	0.184698	0.42976
Airport3.3	ZLog_NAT_24h_LS80_cmc	0.000000	0.00000

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.291994	0.174059	-1.678	0.09343 .
ZLDEN_cmc	1.003990	0.051424	19.524	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.017264	0.039046	-0.442	0.65839
ZFlights24h_gmc	-0.116015	0.578016	-0.201	0.84092
ZNightflightrate_gmc	-0.007437	0.210159	-0.035	0.97177
ZTrend24h_gmc	-0.182963	0.105113	-1.741	0.08175 .
ZNoiseStarts24_gmc	0.708803	0.478415	1.482	0.13846
HRC_c	-0.774412	0.512017	-1.512	0.13041
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.102146	0.019238	-5.309	1.10e-07 ***
ZLDEN_cmc:ZFlights24h_gmc	-0.094822	0.205541	-0.461	0.64456
ZLDEN_cmc:ZNightflightrate_gmc	-0.115269	0.066908	-1.723	0.08493 .
ZLDEN_cmc:ZTrend24h_gmc	-0.042994	0.043074	-0.998	0.31820
ZLDEN_cmc:ZNoiseStarts24_gmc	0.519009	0.166035	3.126	0.00177 **
ZLDEN_cmc:HRC_c	-0.792997	0.194085	-4.086	4.39e-05 ***
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	0.338630	0.177893	1.904	0.05697 .
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	0.074824	0.072484	1.032	0.30194
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.085507	0.039130	2.185	0.02887 *
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	-0.382705	0.149587	-2.558	0.01051 *
ZLog_NAT_24h_LS80_cmc:HRC_c	0.124188	0.145217	0.855	0.39245

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALdN80)
```

```
[1] NA
```

Warning message:

Can't compute random effect variances. Some variance components equal zero.

Solution: Respecify random structure!

```
> performance::r2(FM_ALdN80)
```

Random effect variances not available. Returned R2 does not account for random effects.

```
# R2 for Mixed Models
```

```
Conditional R2: NA
```

```
Marginal R2: 0.220
```

Warning message:

Can't compute random effect variances. Some variance components equal zero.

Solution: Respecify random structure!

```
> screenreg(FM_ALdN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.29
                                (0.17)
ZLDEN_cmc                       1.00 ***
                                (0.05)
ZLog_NAT_24h_LS80_cmc          -0.02
                                (0.04)
ZFlights24h_gmc                -0.12
                                (0.58)
ZNightflightrate_gmc          -0.01
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.71
                                (0.48)
HRC_c                           -0.77
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.10 ***
                                (0.02)
ZLDEN_cmc:ZFlights24h_gmc      -0.09
                                (0.21)
ZLDEN_cmc:ZNightflightrate_gmc -0.12
                                (0.07)
ZLDEN_cmc:ZTrend24h_gmc        -0.04
                                (0.04)
ZLDEN_cmc:ZNoiseStarts24_gmc   0.52 **
                                (0.17)
ZLDEN_cmc:HRC_c                 -0.79 ***
                                (0.19)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc 0.34
                                (0.18)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc 0.07
                                (0.07)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc    0.09 *
                                (0.04)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc -0.38 *
                                (0.15)
ZLog_NAT_24h_LS80_cmc:HRC_c         0.12
                                (0.15)
=====
```



```

-----
AIC                                29369.23
BIC                                29556.14
Log Likelihood                     -14661.62
Num. obs.                          24993
Num. groups: Airport3              12
Var: Airport3 (Intercept)          0.01
Var: Airport3.1 ZLDEN_cmc          0.00
Var: Airport3.2 (Intercept)        0.18
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN80)
$Airport3
  (Intercept)      ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.007629031 -0.0108809233 -0.23654217      0
1.1 0.007115132 -0.0711941138 0.22060843      0
1.2 -0.012982045 0.0929543866 -0.40251518      0
1.3 0.017677745 0.0071582958 0.54810786      0
2 0.016859953 -0.0036459026 0.52275179      0
3 0.001530135 0.0002092741 0.04744266      0
4 0.003747453 0.0216888881 0.11619176      0
91 -0.023771528 0.0011852696 -0.73704882      0
92 0.018314982 0.0184128907 0.56786573      0
93 -0.017603069 -0.0401664136 -0.54579250      0
94 0.002836834 -0.0028716726 0.08795755      0
95 -0.005530312 -0.0173388724 -0.17147025      0

with conditional variances for "Airport3"

```

## 4.7 Modell ALqN50 (akustische Prädiktoren $L_{Aeq,24h}(k = 10)$ und $\log(NAT_{24h,50})$ )

### 4.7.1 MO\_ALqN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC    logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

Random effects:

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
---
```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALqN50@theta[1] ^ 2 / (MO_ALqN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALqN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALqN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALqN50)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALqN50)
$Airport3
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.7.2 CIM\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29485.2	29566.4	-14732.6	29465.2	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.8372	-0.7468	-0.4060	0.8538	7.9485

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1948	0.4413

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.272030	0.175614	-1.549	0.1214
ZLpAeq0024_cmc	0.831929	0.024220	34.349	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.010139	0.025505	0.398	0.6910
ZFlights24h_gmc	-0.081803	0.577717	-0.142	0.8874
ZNightflightrate_gmc	-0.006724	0.211115	-0.032	0.9746
ZTrend24h_gmc	-0.180503	0.106030	-1.702	0.0887 .
ZNoiseStarts24_gmc	0.772505	0.478542	1.614	0.1065
HRC_c	-0.924303	0.516757	-1.789	0.0737 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.096210	0.019591	-4.911	9.07e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.002							
ZL_NAT_24_L	-0.014	-0.724						
ZFlights24h_	0.263	-0.002	-0.002					
ZNghtflght_	0.007	0.004	-0.005	0.661				
ZTrnd24h_gm	-0.040	-0.004	0.001	0.210	0.248			
ZNsStrts24_	0.038	0.005	0.001	-0.892	-0.755	-0.181		
HRC_c	-0.539	0.001	-0.005	-0.421	0.107	-0.106	0.043	
ZLA0024_:ZL	-0.056	-0.120	0.212	-0.015	-0.016	0.002	0.013	-0.007

> performance::icc(CIM\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.251

Marginal R2: 0.207

> screenreg(CIM\_ALqN50)

=====

Model 1

```

-----
(Intercept)                -0.27
                           (0.18)
ZLpAeq0024_cmc             0.83 ***
                           (0.02)
ZLog_NAT_24h_LS50_cmc     0.01
                           (0.03)
ZFlights24h_gmc           -0.08
                           (0.58)
ZNightflightrate_gmc     -0.01
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.77
                           (0.48)
HRC_c                     -0.92
                           (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.10 ***
                           (0.02)
-----

```

```

-----
AIC                29485.17
BIC                29566.43
Log Likelihood    -14732.59
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN50)
```

```
$Airport3
```

```

(Intercept)
1 -0.26996938
1.1 0.19101274
1.2 -0.36496217
1.3 0.59390695
2 0.53257920
3 0.05031807
4 0.15871681
91 -0.76375899
92 0.59083573
93 -0.58801804
94 0.10215290
95 -0.21809567

```

with conditional variances for "Airport3"

**4.7.3 AIM1\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29389.8	29479.2	-14683.9	29367.8	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.4890	-0.7377	-0.4132	0.8339	5.3710

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18545	0.4306
Airport3.1	ZLpAeq0024_cmc	0.05477	0.2340

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.283797	0.171609	-1.654	0.0982 .
ZLpAeq0024_cmc	0.831361	0.074278	11.193	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.071534	0.028161	-2.540	0.0111 *
ZFlights24h_gmc	-0.091373	0.564646	-0.162	0.8714
ZNightflightrate_gmc	0.002483	0.206161	0.012	0.9904
ZTrend24h_gmc	-0.186094	0.103694	-1.795	0.0727 .
ZNoiseStarts24_gmc	0.700199	0.467817	1.497	0.1345
HRC_c	-0.760875	0.504766	-1.507	0.1317
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.108959	0.020157	-5.405	6.47e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.004							
ZL_NAT_24_L	-0.022	-0.215						
ZFlights24h_	0.262	0.005	-0.004					
ZNghtflght_	0.005	0.004	-0.004	0.661				
ZTrnd24h_gm	-0.040	-0.011	0.002	0.208	0.247			
ZNsStrts24_	0.039	-0.003	0.003	-0.892	-0.754	-0.179		
HRC_c	-0.539	0.001	-0.001	-0.421	0.108	-0.105	0.043	
ZLA0024_:ZL	-0.060	-0.032	0.253	-0.013	-0.015	0.004	0.012	-0.008

> performance::icc(AIM1\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.229

Marginal R2: 0.186

> screenreg(AIM1\_ALqN50)

=====

```

-----
Model 1
-----
(Intercept)                -0.28
                             (0.17)
ZLpAeq0024_cmc              0.83 ***
                             (0.07)
ZLog_NAT_24h_LS50_cmc      -0.07 *
                             (0.03)
ZFlights24h_gmc            -0.09
                             (0.56)
ZNightflightrate_gmc       0.00
                             (0.21)
ZTrend24h_gmc              -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.70
                             (0.47)
HRC_c                       -0.76
                             (0.50)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
-----
AIC                          29389.85
BIC                          29479.24
Log Likelihood               -14683.92
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.19
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN50)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.24022269  0.17349902
1.1 0.20521384  0.10497038
1.2 -0.41487687  0.31123391
1.3 0.57583946  0.17752963
2 0.52298402 -0.09766336
3 0.05368825 -0.07875889
4 0.15197015  0.04262921
91 -0.75406544 -0.01461146
92 0.55051720  0.18791905
93 -0.53907903 -0.05830866
94 0.11925263 -0.23432054
95 -0.20195546 -0.53622479

```

with conditional variances for "Airport3"

**4.7.4 AIM2\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS50\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29412.2	29501.5	-14695.1	29390.2	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2599	-0.7408	-0.3958	0.8364	5.7535

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18370	0.4286
Airport3.1	ZLog_NAT_24h_LS50_cmc	0.07088	0.2662

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.269130	0.171092	-1.573	0.1157
ZLpAeq0024_cmc	0.862027	0.024714	34.881	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.191896	0.090102	-2.130	0.0332 *
ZFlights24h_gmc	-0.055515	0.566275	-0.098	0.9219
ZNightflightrate_gmc	0.003463	0.206240	0.017	0.9866
ZTrend24h_gmc	-0.181699	0.103190	-1.761	0.0783 .
ZNoiseStarts24_gmc	0.699622	0.468971	1.492	0.1357
HRC_c	-0.846219	0.504497	-1.677	0.0935 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.110224	0.020122	-5.478	4.3e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.003							
ZL_NAT_24_L	-0.014	-0.273						
ZFlights24h_	0.263	-0.001	0.001					
ZNghtflght_	0.006	0.003	0.001	0.664				
ZTrnd24h_gm	-0.039	-0.006	-0.004	0.211	0.249			
ZNsStrts24_	0.037	0.004	-0.001	-0.893	-0.757	-0.182		
HRC_c	-0.541	0.000	0.002	-0.422	0.106	-0.106	0.046	
ZLA0024_:ZL	-0.062	-0.146	0.130	-0.013	-0.015	0.004	0.012	-0.008

> performance::icc(AIM2\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.044

> performance::r2(AIM2\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.217

Marginal R2: 0.173

> screenreg(AIM2\_ALqN50)

=====



```

-----
Model 1
-----
(Intercept)                -0.27
                             (0.17)
ZLpAeq0024_cmc              0.86 ***
                             (0.02)
ZLog_NAT_24h_LS50_cmc      -0.19 *
                             (0.09)
ZFlights24h_gmc             -0.06
                             (0.57)
ZNightflightrate_gmc        0.00
                             (0.21)
ZTrend24h_gmc               -0.18
                             (0.10)
ZNoiseStarts24_gmc          0.70
                             (0.47)
HRC_c                       -0.85
                             (0.50)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
-----
AIC                          29412.16
BIC                          29501.55
Log Likelihood               -14695.08
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.18
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.07
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN50)
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1 -0.24708499  0.267908708
1.1 0.20448431  0.220640984
1.2 -0.40629338  0.316499062
1.3 0.58080708  0.142230944
2 0.51447428 -0.169698395
3 0.05234132  0.006124667
4 0.15765168  0.072333018
91 -0.74256060 -0.144078112
92 0.55079631  0.174835336
93 -0.54130800 -0.273202481
94 0.11654821 -0.142383823
95 -0.20830738 -0.511603630

```

with conditional variances for "Airport3"

**4.7.5 Vergleichstests ALqN50****4.7.5.1 > anova(CIM\_ALqN50, AIM1\_ALqN50)**

Models:

CIM\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN50	10	29485	29566	-14733	29465			
AIM1_ALqN50	11	29390	29479	-14684	29368	97.321	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.7.5.2 > anova(CIM\_ALqN50, AIM2\_ALqN50)**

Models:

CIM\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN50	10	29485	29566	-14733	29465			
AIM2_ALqN50	11	29412	29502	-14695	29390	75.015	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.7.6 FM\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS50\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS50\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS50\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS50\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29376.3	29563.2	-14665.1	29330.3	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6081	-0.7340	-0.4093	0.8252	5.7036

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.948e-02	2.224e-01
Airport3.1	ZLpAeq0024_cmc	1.223e-02	1.106e-01
Airport3.2	(Intercept)	1.387e-01	3.724e-01
Airport3.3	ZLog_NAT_24h_LS50_cmc	8.536e-10	2.922e-05

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.282067	0.172801	-1.632	0.102611
ZLpAeq0024_cmc	1.023286	0.057615	17.761	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.158773	0.052502	-3.024	0.002493 **
ZFlights24h_gmc	-0.081777	0.567013	-0.144	0.885324
ZNightflightrate_gmc	0.002503	0.207282	0.012	0.990366
ZTrend24h_gmc	-0.185166	0.104328	-1.775	0.075923 .
ZNoiseStarts24_gmc	0.684946	0.469715	1.458	0.144781
HRC_c	-0.767868	0.507961	-1.512	0.130618
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.113506	0.020314	-5.588	2.3e-08 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	0.363498	0.199278	1.824	0.068140 .
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.015756	0.067903	-0.232	0.816509
ZLpAeq0024_cmc:ZTrend24h_gmc	0.037881	0.039307	0.964	0.335185
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.005803	0.163797	0.035	0.971740
ZLpAeq0024_cmc:HRC_c	-0.675837	0.184406	-3.665	0.000247 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.334384	0.209761	-1.594	0.110910
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	-0.002053	0.060738	-0.034	0.973030
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	-0.013584	0.037697	-0.360	0.718591
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.343585	0.158938	2.162	0.030636 *
ZLog_NAT_24h_LS50_cmc:HRC_c	0.251220	0.193536	1.298	0.194269

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.015
Conditional ICC: 0.012
> performance::r2(FM_ALqN50)
# R2 for Mixed Models
```

```
Conditional R2: 0.224
Marginal R2: 0.213
> screenreg(FM_ALqN50)
```

```
=====
Model 1
-----
(Intercept)                -0.28
                             (0.17)
ZLpAeq0024_cmc              1.02 ***
                             (0.06)
ZLog_NAT_24h_LS50_cmc      -0.16 **
                             (0.05)
ZFlights24h_gmc            -0.08
                             (0.57)
ZNightflightrate_gmc       0.00
                             (0.21)
ZTrend24h_gmc              -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.68
                             (0.47)
HRC_c                       -0.77
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc 0.36
                             (0.20)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.02
                             (0.07)
ZLpAeq0024_cmc:ZTrend24h_gmc 0.04
                             (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.01
                             (0.16)
ZLpAeq0024_cmc:HRC_c       -0.68 ***
                             (0.18)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.33
                             (0.21)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc -0.00
                             (0.06)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc -0.01
                             (0.04)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.34 *
                             (0.16)
ZLog_NAT_24h_LS50_cmc:HRC_c 0.25
                             (0.19)
-----
AIC                          29376.28
BIC                          29563.19
Log Likelihood                -14665.14
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.05
Var: Airport3.1 ZLpAeq0024_cmc 0.01
Var: Airport3.2 (Intercept) 0.14
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN50)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1 -0.06835467 -0.086384858 -0.19154093 -7.999199e-09
1.1 0.05634336 -0.104441095 0.15788329 1.195831e-09
1.2 -0.10637968 0.169448237 -0.29809323 2.144203e-08
1.3 0.15302121 0.085210259 0.42879040 -1.392340e-08
2 0.13478279 -0.029527128 0.37768338 -9.477766e-10
3 0.01426852 0.001605837 0.03998272 2.589864e-10
4 0.04211443 0.084286712 0.11801150 4.851972e-09
91 -0.19712869 0.006025383 -0.55238675 -2.022200e-09
92 0.14749676 0.084243907 0.41330998 4.960710e-09
93 -0.14856096 -0.152905219 -0.41629203 -7.352261e-09
94 0.03240233 0.002033705 0.09079660 4.818553e-09
95 -0.05406210 -0.071780626 -0.15149083 -5.900045e-09

```

with conditional variances for "Airport3"

## 4.8 Modell ALqN60 (akustische Prädiktoren $L_{Aeq,24h}(k = 10)$ und $\log(NAT_{24h,60})$ )

### 4.8.1 MO\_ALqN60

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

Random effects:

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALqN60@theta[1] ^ 2 / (MO_ALqN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALqN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALqN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALqN60)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood              -16277.53
Num. obs.                   24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALqN60)
$Airport3
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.8.2 CIM\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29426.6	29507.8	-14703.3	29406.6	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.5120	-0.7565	-0.4000	0.8520	10.5368

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1941	0.4406

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28676	0.17541	-1.635	0.102088
ZLpAeq0024_cmc	0.63082	0.03279	19.237	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.25421	0.03476	7.314	2.59e-13 ***
ZFlights24h_gmc	-0.09421	0.57857	-0.163	0.870647
ZNightflightrate_gmc	-0.01636	0.21131	-0.077	0.938273
ZTrend24h_gmc	-0.18050	0.10587	-1.705	0.088208 .
ZNoiseStarts24_gmc	0.77819	0.47962	1.623	0.104691
HRC_c	-0.93534	0.51571	-1.814	0.069722 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.06783	0.01862	-3.644	0.000269 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.009							
ZL_NAT_24_L	-0.020	-0.860						
ZFlights24h_	0.261	-0.001	0.000					
ZNghtflght_	0.006	0.001	-0.001	0.663				
ZTrnd24h_gm	-0.040	0.000	-0.002	0.211	0.249			
ZNsStrts24_	0.039	0.004	-0.001	-0.892	-0.756	-0.181		
HRC_c	-0.538	-0.001	-0.001	-0.421	0.107	-0.106	0.044	
ZLA0024_:ZL	-0.063	-0.172	0.207	-0.010	-0.008	-0.002	0.008	-0.004

> performance::icc(CIM\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.256

Marginal R2: 0.212

> screenreg(CIM\_ALqN60)

=====

Model 1



```
-----
(Intercept)                -0.29
                           (0.18)
ZLpAeq0024_cmc             0.63 ***
                           (0.03)
ZLog_NAT_24h_LS60_cmc     0.25 ***
                           (0.03)
ZFlights24h_gmc           -0.09
                           (0.58)
ZNightflightrate_gmc     -0.02
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.78
                           (0.48)
HRC_c                     -0.94
                           (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.07 ***
                           (0.02)
-----
```

```
AIC                29426.56
BIC                29507.83
Log Likelihood    -14703.28
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN60)
```

```
$Airport3
```

```
(Intercept)
1 -0.26347169
1.1 0.20201069
1.2 -0.38398680
1.3 0.59218766
2 0.54301915
3 0.04875825
4 0.14409091
91 -0.76501568
92 0.58330560
93 -0.57635620
94 0.09613805
95 -0.20611433
```

with conditional variances for "Airport3"

**4.8.3 AIM1\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29376.0	29465.4	-14677.0	29354.0	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8679	-0.7456	-0.4104	0.8371	7.0773

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18533	0.4305
Airport3.1	ZLpAeq0024_cmc	0.04466	0.2113

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.300004	0.171614	-1.748	0.080441 .
ZLpAeq0024_cmc	0.684716	0.072976	9.383	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.148858	0.042392	3.511	0.000446 ***
ZFlights24h_gmc	-0.119153	0.566850	-0.210	0.833510
ZNightflightrate_gmc	-0.008343	0.206562	-0.040	0.967782
ZTrend24h_gmc	-0.185227	0.103694	-1.786	0.074052 .
ZNoiseStarts24_gmc	0.722010	0.469207	1.539	0.123856
HRC_c	-0.766339	0.505219	-1.517	0.129306
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.082022	0.019726	-4.158	3.21e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.005							
ZL_NAT_24_L	-0.035	-0.416						
ZFlights24h_	0.262	0.006	-0.006					
ZNghtflght_	0.006	0.004	-0.001	0.662				
ZTrnd24h_gm	-0.040	-0.010	-0.002	0.209	0.249			
ZNsStrts24_	0.037	-0.004	0.005	-0.893	-0.756	-0.181		
HRC_c	-0.539	0.000	0.004	-0.423	0.105	-0.105	0.047	
ZLA0024_:ZL	-0.070	-0.118	0.310	-0.008	-0.006	0.000	0.007	-0.003

> performance::icc(AIM1\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.239

Marginal R2: 0.196

> screenreg(AIM1\_ALqN60)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.30
                                (0.17)
ZLpAeq0024_cmc                 0.68 ***
                                (0.07)
ZLog_NAT_24h_LS60_cmc         0.15 ***
                                (0.04)
ZFlights24h_gmc               -0.12
                                (0.57)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.10)
ZNoiseStarts24_gmc           0.72
                                (0.47)
HRC_c                          -0.77
                                (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.08 ***
                                (0.02)
-----
AIC                             29376.04
BIC                             29465.43
Log Likelihood                 -14677.02
Num. obs.                      24993
Num. groups: Airport3          12
Var: Airport3 (Intercept)      0.19
Var: Airport3.1 ZLpAeq0024_cmc 0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN60)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1   -0.2501635  0.172128535
1.1  0.2149705  0.058316423
1.2 -0.4107185  0.205744916
1.3  0.5773066  0.105749594
2    0.5322116 -0.038498410
3    0.0503723 -0.057477569
4    0.1428292  0.051806641
91  -0.7489243 -0.007874440
92   0.5468384  0.227041511
93  -0.5398652 -0.004341702
94   0.1113387 -0.230213502
95  -0.1978746 -0.502104583

```

with conditional variances for "Airport3"

**4.8.4 AIM2\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS60\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29384.5	29473.9	-14681.2	29362.5	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-2.9710	-0.7468	-0.4105	0.8406	5.4948

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17601	0.4195
Airport3.1	ZLog_NAT_24h_LS60_cmc	0.07519	0.2742

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.304416	0.167696	-1.815	0.069481 .
ZLpAeq0024_cmc	0.667122	0.035412	18.839	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.152943	0.095523	1.601	0.109355
ZFlights24h_gmc	-0.085473	0.554117	-0.154	0.877413
ZNightflightrate_gmc	-0.000711	0.201644	-0.004	0.997187
ZTrend24h_gmc	-0.178543	0.101241	-1.764	0.077809 .
ZNoiseStarts24_gmc	0.698584	0.458422	1.524	0.127537
HRC_c	-0.796870	0.494270	-1.612	0.106915
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.070878	0.019732	-3.592	0.000328 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.022							
ZL_NAT_24_L	-0.027	-0.417						
ZFlights24h_	0.263	-0.001	0.001					
ZNghtflght_	0.006	-0.001	0.005	0.662				
ZTrnd24h_gm	-0.039	-0.001	-0.010	0.210	0.249			
ZNsStrts24_	0.036	0.004	-0.003	-0.893	-0.756	-0.181		
HRC_c	-0.541	-0.004	0.009	-0.424	0.105	-0.106	0.048	
ZLA0024_:ZL	-0.075	-0.244	0.160	-0.009	-0.004	0.000	0.007	0.000

> performance::icc(AIM2\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.041

> performance::r2(AIM2\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.232

Marginal R2: 0.191

> screenreg(AIM2\_ALqN60)

=====

```

-----
Model 1
-----
(Intercept)                -0.30
                           (0.17)
ZLpAeq0024_cmc             0.67 ***
                           (0.04)
ZLog_NAT_24h_LS60_cmc     0.15
                           (0.10)
ZFlights24h_gmc           -0.09
                           (0.55)
ZNightflightrate_gmc     -0.00
                           (0.20)
ZTrend24h_gmc            -0.18
                           (0.10)
ZNoiseStarts24_gmc       0.70
                           (0.46)
HRC_c                     -0.80
                           (0.49)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.07 ***
                           (0.02)
-----
AIC                        29384.47
BIC                        29473.86
Log Likelihood             -14681.23
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.08
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.25457728 0.26635379
1.1 0.22238432 0.07423656
1.2 -0.41257100 0.15960343
1.3 0.57716685 0.08761737
2 0.53460599 -0.07146086
3 0.04532648 -0.01134099
4 0.13571325 0.17201240
91 -0.72078634 -0.11611705
92 0.50506978 0.39133805
93 -0.50564810 -0.14864016
94 0.10729278 -0.25862705
95 -0.19599579 -0.59055708

```

with conditional variances for "Airport3"

**4.8.5 Vergleichstests ALqN60****4.8.5.1 > anova(CIM\_ALqN60, AIM1\_ALqN60)**

Models:

CIM\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN60	10	29427	29508	-14703	29407			
AIM1_ALqN60	11	29376	29465	-14677	29354	52.527	1	4.244e-13 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.8.5.2 > anova(CIM\_ALqN60, AIM2\_ALqN60)**

Models:

CIM\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN60	10	29427	29508	-14703	29407			
AIM2_ALqN60	11	29385	29474	-14681	29363	44.098	1	3.123e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.8.6 FM\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS60\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS60\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29372.3	29559.2	-14663.2	29326.3	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3876	-0.7443	-0.4108	0.8376	5.5974

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	5.233e-02	2.288e-01
Airport3.1	ZLpAeq0024_cmc	6.800e-09	8.246e-05
Airport3.2	(Intercept)	1.378e-01	3.712e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	5.831e-03	7.636e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.305788	0.173957	-1.758	0.078776 .
ZLpAeq0024_cmc	0.795076	0.047774	16.642	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.179213	0.069744	2.570	0.010182 *
ZFlights24h_gmc	-0.096297	0.576923	-0.167	0.867437
ZNightflightrate_gmc	-0.003782	0.209753	-0.018	0.985616
ZTrend24h_gmc	-0.180523	0.104960	-1.720	0.085447 .
ZNoiseStarts24_gmc	0.694288	0.477574	1.454	0.146008
HRC_c	-0.768194	0.511888	-1.501	0.133432
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.076179	0.019886	-3.831	0.000128 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	0.339101	0.178337	1.901	0.057241 .
ZLpAeq0024_cmc:ZNightflightrate_gmc	0.010585	0.057352	0.185	0.853567
ZLpAeq0024_cmc:ZTrend24h_gmc	0.086583	0.038710	2.237	0.025305 *
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	-0.027138	0.148926	-0.182	0.855408
ZLpAeq0024_cmc:HRC_c	-0.600095	0.155624	-3.856	0.000115 ***
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.336228	0.274597	-1.224	0.220786
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.063800	0.087954	-0.725	0.468218
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	-0.066718	0.053512	-1.247	0.212473
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.361463	0.225354	1.604	0.108718
ZLog_NAT_24h_LS60_cmc:HRC_c	0.012440	0.239239	0.052	0.958530

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN60)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.016
Conditional ICC: 0.012
> performance::r2(FM_ALqN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.226
Marginal R2: 0.214
> screenreg(FM_ALqN60)
```

```
=====
Model 1
-----
(Intercept)                -0.31
                             (0.17)
ZLpAeq0024_cmc              0.80 ***
                             (0.05)
ZLog_NAT_24h_LS60_cmc      0.18 *
                             (0.07)
ZFlights24h_gmc            -0.10
                             (0.58)
ZNightflightrate_gmc       -0.00
                             (0.21)
ZTrend24h_gmc              -0.18
                             (0.10)
ZNoiseStarts24_gmc         0.69
                             (0.48)
HRC_c                       -0.77
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.08 ***
                             (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc 0.34
                             (0.18)
ZLpAeq0024_cmc:ZNightflightrate_gmc 0.01
                             (0.06)
ZLpAeq0024_cmc:ZTrend24h_gmc 0.09 *
                             (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc -0.03
                             (0.15)
ZLpAeq0024_cmc:HRC_c       -0.60 ***
                             (0.16)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc -0.34
                             (0.27)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.06
                             (0.09)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc -0.07
                             (0.05)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc 0.36
                             (0.23)
ZLog_NAT_24h_LS60_cmc:HRC_c 0.01
                             (0.24)
-----
AIC                          29372.34
BIC                          29559.24
Log Likelihood                -14663.17
```



```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.05
Var: Airport3.1 ZLpAeq0024_cmc 0.00
Var: Airport3.2 (Intercept) 0.14
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN60)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.07198590 -4.555971e-08 -0.18949334 -0.015158900
1.1 0.06215144 -1.204016e-07 0.16360544 -0.084481732
1.2 -0.11195654 1.401034e-07 -0.29471077 0.081828521
1.3 0.15920993 8.447933e-08 0.41909907 0.037330382
2 0.14556512 -1.391855e-08 0.38318091 -0.024966479
3 0.01386543 -7.003698e-10 0.03649890 0.007693156
4 0.03954494 5.169029e-08 0.10409683 0.053705016
91 -0.20741662 2.233975e-10 -0.54599680 -0.014908166
92 0.15645684 8.749957e-08 0.41185191 0.052387083
93 -0.15616576 -1.307952e-07 -0.41108568 -0.078113065
94 0.03003044 -2.271528e-08 0.07905115 0.013079399
95 -0.05386954 -4.044129e-08 -0.14180443 -0.035923294

```

with conditional variances for "Airport3"

**4.9 Modell ALqN70 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,70})$ )****4.9.1 M0\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALqN70@theta[1] ^ 2 / (M0_ALqN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALqN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALqN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALqN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALqN70)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.9.2 CIM\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29446.5	29527.8	-14713.3	29426.5	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9143	-0.7531	-0.4056	0.8479	8.0987

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1935	0.4399

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.27411	0.17560	-1.561	0.1185
ZLpAeq0024_cmc	0.68643	0.03506	19.577	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.19029	0.03611	5.270	1.36e-07 ***
ZFlights24h_gmc	-0.10015	0.57761	-0.173	0.8624
ZNightflightrate_gmc	-0.01695	0.21103	-0.080	0.9360
ZTrend24h_gmc	-0.18063	0.10573	-1.708	0.0876 .
ZNoiseStarts24_gmc	0.78157	0.47878	1.632	0.1026 .
HRC_c	-0.93509	0.51710	-1.808	0.0706 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.08142	0.01919	-4.243	2.20e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.028							
ZL_NAT_24_L	-0.036	-0.879						
ZFlights24h_	0.262	0.007	-0.010					
ZNghtflght_	0.004	0.001	0.000	0.662				
ZTrnd24h_gm	-0.039	0.005	-0.008	0.210	0.248			
ZNsStrts24_	0.038	-0.003	0.007	-0.892	-0.756	-0.181		
HRC_c	-0.541	-0.017	0.017	-0.421	0.109	-0.106	0.043	
ZLA0024_:ZL	-0.080	-0.293	0.291	-0.017	-0.005	-0.007	0.015	0.016

> performance::icc(CIM\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.253

Marginal R2: 0.209

> screenreg(CIM\_ALqN70)

=====

Model 1

```
-----
(Intercept)                -0.27
                           (0.18)
ZLpAeq0024_cmc             0.69 ***
                           (0.04)
ZLog_NAT_24h_LS70_cmc     0.19 ***
                           (0.04)
ZFlights24h_gmc           -0.10
                           (0.58)
ZNightflightrate_gmc     -0.02
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.78
                           (0.48)
HRC_c                     -0.94
                           (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.08 ***
                           (0.02)
-----
```

```
-----
AIC                        29446.54
BIC                        29527.80
Log Likelihood            -14713.27
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN70)
```

```
$Airport3
  (Intercept)
1 -0.25936150
1.1 0.19935995
1.2 -0.37602160
1.3 0.57892133
2 0.53953076
3 0.05048445
4 0.14909350
91 -0.77166856
92 0.58923095
93 -0.57537241
94 0.10161307
95 -0.21131578
```

with conditional variances for "Airport3"

**4.9.3 AIM1\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29371.3	29460.7	-14674.7	29349.3	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.6506	-0.7449	-0.4086	0.8347	5.7360

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18473	0.4298
Airport3.1	ZLpAeq0024_cmc	0.04556	0.2135

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28958	0.17196	-1.684	0.0922 .
ZLpAeq0024_cmc	0.67366	0.07451	9.042	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.15070	0.03755	4.014	5.98e-05 ***
ZFlights24h_gmc	-0.11373	0.57181	-0.199	0.8423
ZNightflightrate_gmc	-0.01227	0.20724	-0.059	0.9528
ZTrend24h_gmc	-0.18520	0.10359	-1.788	0.0738 .
ZNoiseStarts24_gmc	0.71855	0.47262	1.520	0.1284
HRC_c	-0.79618	0.50704	-1.570	0.1164
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.08336	0.01988	-4.192	2.76e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.008							
ZL_NAT_24_L	-0.034	-0.439						
ZFlights24h_	0.265	0.008	-0.009					
ZNghtflght_	0.008	0.004	-0.002	0.665				
ZTrnd24h_gm	-0.038	-0.008	-0.006	0.211	0.250			
ZNsStrts24_	0.032	-0.006	0.008	-0.894	-0.758	-0.182		
HRC_c	-0.542	-0.003	0.011	-0.426	0.101	-0.106	0.052	
ZLA0024_:ZL	-0.080	-0.155	0.308	-0.012	-0.004	-0.003	0.011	0.013

> performance::icc(AIM1\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.233

Marginal R2: 0.190

> screenreg(AIM1\_ALqN70)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.29
                                (0.17)
ZLpAeq0024_cmc                 0.67 ***
                                (0.07)
ZLog_NAT_24h_LS70_cmc         0.15 ***
                                (0.04)
ZFlights24h_gmc               -0.11
                                (0.57)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.10)
ZNoiseStarts24_gmc           0.72
                                (0.47)
HRC_c                          -0.80
                                (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.08 ***
                                (0.02)
-----
AIC                            29371.34
BIC                            29460.73
Log Likelihood                 -14674.67
Num. obs.                      24993
Num. groups: Airport3         12
Var: Airport3 (Intercept)      0.18
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN70)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.23562722  0.17931098
1.1 0.21642961  0.07898207
1.2 -0.42083796 0.25881296
1.3 0.56397223  0.16904165
2  0.53358556 -0.09635210
3  0.05156362 -0.05595831
4  0.13756461  0.03076921
91 -0.75750660 -0.01344520
92 0.55102778  0.16289864
93 -0.53029113 -0.03212828
94 0.11161102 -0.20927505
95 -0.19306644 -0.49284686

```

with conditional variances for "Airport3"

**4.9.4 AIM2\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS70\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29396.3	29485.6	-14687.1	29374.3	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3417	-0.7532	-0.4042	0.8359	7.3701

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19972	0.4469
Airport3.1	ZLog_NAT_24h_LS70_cmc	0.06137	0.2477

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.29767	0.17875	-1.665	0.0959 .
ZLpAeq0024_cmc	0.74079	0.03779	19.601	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.12439	0.08462	1.470	0.1415
ZFlights24h_gmc	-0.15473	0.59513	-0.260	0.7949
ZNightflightrate_gmc	-0.01254	0.21561	-0.058	0.9536
ZTrend24h_gmc	-0.19505	0.10777	-1.810	0.0703 .
ZNoiseStarts24_gmc	0.75760	0.49194	1.540	0.1235
HRC_c	-0.75422	0.52694	-1.431	0.1523
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.09965	0.02021	-4.930	8.23e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.028							
ZL_NAT_24_L	-0.024	-0.428						
ZFlights24h_	0.265	0.005	0.001					
ZNghtflght_	0.008	0.002	0.002	0.665				
ZTrnd24h_gm	-0.038	0.002	-0.016	0.209	0.249			
ZNsStrts24_	0.032	-0.003	0.000	-0.894	-0.758	-0.181		
HRC_c	-0.543	-0.008	0.007	-0.426	0.102	-0.105	0.052	
ZLA0024_:ZL	-0.077	-0.349	0.164	-0.012	-0.004	-0.002	0.011	0.012

> performance::icc(AIM2\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM2\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.251

Marginal R2: 0.206

> screenreg(AIM2\_ALqN70)

=====



```

-----
Model 1
-----
(Intercept)                -0.30
                           (0.18)
ZLpAeq0024_cmc             0.74 ***
                           (0.04)
ZLog_NAT_24h_LS70_cmc     0.12
                           (0.08)
ZFlights24h_gmc           -0.15
                           (0.60)
ZNightflightrate_gmc     -0.01
                           (0.22)
ZTrend24h_gmc             -0.20
                           (0.11)
ZNoiseStarts24_gmc       0.76
                           (0.49)
HRC_c                     -0.75
                           (0.53)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                           (0.02)
-----
AIC                        29396.26
BIC                        29485.65
Log Likelihood             -14687.13
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.20
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.06
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.24683860  0.14580928
1.1 0.20976439 -0.03543837
1.2 -0.40372857  0.14514895
1.3 0.57160315  0.22430705
2  0.57019221 -0.11318344
3  0.05409145 -0.04086842
4  0.14222981  0.04841718
91 -0.79572667  0.13447987
92 0.57841113  0.20254218
93 -0.55650658  0.09653726
94 0.11911372 -0.19059644
95 -0.20180180 -0.65336739

```

with conditional variances for "Airport3"

**4.9.5 Vergleichstests ALqN70****4.9.5.1 > anova(CIM\_ALqN70, AIM1\_ALqN70)**

Models:

CIM\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN70	10	29447	29528	-14713	29427			
AIM1_ALqN70	11	29371	29461	-14675	29349	77.203	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.9.5.2 > anova(CIM\_ALqN70, AIM2\_ALqN70)**

Models:

CIM\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN70	10	29447	29528	-14713	29427			
AIM2_ALqN70	11	29396	29486	-14687	29374	52.281	1	4.811e-13 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.9.6 FM\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS70\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS70\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29307.1	29494.0	-14630.5	29261.1	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3333	-0.7411	-0.4073	0.8473	8.4126

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	3.458e-02	1.860e-01
Airport3.1	ZLpAeq0024_cmc	8.789e-09	9.375e-05
Airport3.2	(Intercept)	1.759e-01	4.194e-01
Airport3.3	ZLog_NAT_24h_LS70_cmc	7.758e-03	8.808e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.33955	0.18276	-1.858	0.06317 .
ZLpAeq0024_cmc	0.71003	0.05569	12.750	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.30379	0.07076	4.293	1.76e-05 ***
ZFlights24h_gmc	-0.21406	0.60030	-0.357	0.72140
ZNightflightrate_gmc	-0.01871	0.21916	-0.085	0.93196
ZTrend24h_gmc	-0.20031	0.11033	-1.815	0.06945 .
ZNoiseStarts24_gmc	0.78730	0.49707	1.584	0.11322
HRC_c	-0.67523	0.53460	-1.263	0.20657
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.06551	0.02051	-3.193	0.00141 **
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.11796	0.23458	-0.503	0.61505
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.09321	0.07793	-1.196	0.23166
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.04565	0.05124	-0.891	0.37301
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.53394	0.19468	2.743	0.00609 **
ZLpAeq0024_cmc:HRC_c	-0.18392	0.20271	-0.907	0.36424
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.50425	0.26903	1.874	0.06088 .
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.15590	0.09554	1.632	0.10275
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.09318	0.06206	1.502	0.13320
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.54512	0.23269	-2.343	0.01915 *
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.44892	0.27075	-1.658	0.09730 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use `print(x, correlation=TRUE)` or  
`vcov(x)` if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN70)
```

```
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.010
```

```
Conditional ICC: 0.008
```

```
> performance::r2(FM_ALqN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.237
```

```
Marginal R2: 0.229
```

```
> screenreg(FM_ALqN70)
```

```
=====
```

	Model 1
(Intercept)	-0.34 (0.18)
ZLpAeq0024_cmc	0.71 *** (0.06)
ZLog_NAT_24h_LS70_cmc	0.30 *** (0.07)
ZFlights24h_gmc	-0.21 (0.60)
ZNightflightrate_gmc	-0.02 (0.22)
ZTrend24h_gmc	-0.20 (0.11)
ZNoiseStarts24_gmc	0.79 (0.50)
HRC_c	-0.68 (0.53)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.07 ** (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.12 (0.23)
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.09 (0.08)
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.05 (0.05)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.53 ** (0.19)
ZLpAeq0024_cmc:HRC_c	-0.18 (0.20)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.50 (0.27)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.16 (0.10)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.09 (0.06)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.55 * (0.23)
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.45 (0.27)
AIC	29307.06
BIC	29493.96
Log Likelihood	-14630.53

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.03
Var: Airport3.1 ZLpAeq0024_cmc 0.00
Var: Airport3.2 (Intercept) 0.18
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN70)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.043534020 -5.803471e-08 -0.22141654 -0.042832885
1.1 0.034439064 -1.418191e-07 0.17515906 -0.096609224
1.2 -0.065994393 2.524238e-07 -0.33565129 0.077511230
1.3 0.096602809 -7.301783e-09 0.49132746 0.090829871
2 0.094527923 1.153723e-08 0.48077446 -0.050028250
3 0.009730865 -1.814316e-10 0.04949174 0.009239042
4 0.026827569 6.009099e-08 0.13644656 0.090750924
91 -0.135567330 -1.574838e-08 -0.68950325 0.007610460
92 0.096071064 4.479125e-08 0.48862297 0.024702092
93 -0.097009917 -1.057903e-07 -0.49339803 -0.088220535
94 0.023010483 9.140013e-09 0.11703264 0.030756176
95 -0.035219779 -6.057689e-08 -0.17912982 -0.064657876

```

with conditional variances for "Airport3"

**4.10 Modell ALqN80 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,80})$ )****4.10.1 M0\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALqN80@theta[1] ^ 2 / (M0_ALqN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALqN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALqN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALqN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALqN80)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.10.2 CIM\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29473.8	29555.1	-14726.9	29453.8	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5534	-0.7463	-0.4120	0.8463	8.7362

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1871	0.4326

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.254167	0.172788	-1.471	0.1413
ZLpAeq0024_cmc	0.892720	0.025327	35.247	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.039645	0.024977	-1.587	0.1125
ZFlights24h_gmc	-0.036196	0.572818	-0.063	0.9496
ZNightflightrate_gmc	-0.009326	0.208626	-0.045	0.9643
ZTrend24h_gmc	-0.174918	0.104099	-1.680	0.0929 .
ZNoiseStarts24_gmc	0.719949	0.474696	1.517	0.1294
HRC_c	-0.969577	0.510885	-1.898	0.0577 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.105482	0.018151	-5.811	6.2e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.003							
ZL_NAT_24_L	0.003	-0.743						
ZFlights24h_	0.263	0.004	-0.005					
ZNghtflght_	0.005	0.003	-0.002	0.665				
ZTrnd24h_gm	-0.039	0.001	-0.004	0.212	0.250			
ZNsStrts24_	0.037	-0.004	0.007	-0.893	-0.758	-0.183		
HRC_c	-0.543	-0.003	0.000	-0.422	0.106	-0.107	0.044	
ZLA0024_:ZL	-0.065	-0.063	-0.087	-0.024	-0.010	-0.006	0.027	0.010

> performance::icc(CIM\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.054

Conditional ICC: 0.043

> performance::r2(CIM\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.249

Marginal R2: 0.206

> screenreg(CIM\_ALqN80)

=====

Model 1



```
-----
(Intercept)                -0.25
                           (0.17)
ZLpAeq0024_cmc             0.89 ***
                           (0.03)
ZLog_NAT_24h_LS80_cmc     -0.04
                           (0.02)
ZFlights24h_gmc           -0.04
                           (0.57)
ZNightflightrate_gmc      -0.01
                           (0.21)
ZTrend24h_gmc             -0.17
                           (0.10)
ZNoiseStarts24_gmc        0.72
                           (0.47)
HRC_c                     -0.97
                           (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.11 ***
                           (0.02)
-----
```

```
AIC                29473.84
BIC                29555.10
Log Likelihood     -14726.92
Num. obs.          24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN80)
```

```
$Airport3
```

```
(Intercept)
1 -0.24328982
1.1 0.21557939
1.2 -0.39812762
1.3 0.55756940
2 0.53739383
3 0.04932552
4 0.13247560
91 -0.76490831
92 0.57730583
93 -0.54946503
94 0.09720886
95 -0.19676717
```

with conditional variances for "Airport3"

**4.10.3 AIM1\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29398.0	29487.4	-14688.0	29376.0	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8258	-0.7373	-0.4132	0.8375	5.9429

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18362	0.4285
Airport3.1	ZLpAeq0024_cmc	0.04809	0.2193

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.290289	0.171172	-1.696	0.0899 .
ZLpAeq0024_cmc	0.830570	0.071915	11.549	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.011211	0.025828	-0.434	0.6642
ZFlights24h_gmc	-0.081092	0.566778	-0.143	0.8862
ZNightflightrate_gmc	-0.005039	0.206018	-0.024	0.9805
ZTrend24h_gmc	-0.181875	0.103238	-1.762	0.0781 .
ZNoiseStarts24_gmc	0.678894	0.468798	1.448	0.1476
HRC_c	-0.793510	0.505220	-1.571	0.1163
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.088426	0.018700	-4.729	2.26e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.005							
ZL_NAT_24_L	0.002	-0.299						
ZFlights24h_	0.265	0.005	-0.002					
ZNghtflght_	0.007	0.004	-0.001	0.663				
ZTrnd24h_gm	-0.039	-0.010	-0.003	0.209	0.249			
ZNsStrts24_	0.034	-0.004	0.002	-0.893	-0.757	-0.181		
HRC_c	-0.542	0.001	0.000	-0.425	0.104	-0.105	0.049	
ZLA0024_:ZL	-0.062	-0.055	-0.032	-0.017	-0.009	-0.004	0.021	0.005

> performance::icc(AIM1\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.233

Marginal R2: 0.190

> screenreg(AIM1\_ALqN80)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.29
                                (0.17)
ZLpAeq0024_cmc                  0.83 ***
                                (0.07)
ZLog_NAT_24h_LS80_cmc          -0.01
                                (0.03)
ZFlights24h_gmc                -0.08
                                (0.57)
ZNightflightrate_gmc          -0.01
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.68
                                (0.47)
HRC_c                           -0.79
                                (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.09 ***
                                (0.02)
-----
AIC                             29398.02
BIC                             29487.41
Log Likelihood                  -14688.01
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.18
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN80)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.22400678  0.1671108653
1.1 0.22661125  0.0660084546
1.2 -0.43772393 0.2502688224
1.3 0.55184233  0.1360905003
2 0.53503691 -0.0613257637
3 0.05173578 -0.0963028165
4 0.12726108  0.0662098071
91 -0.76002588 -0.0003754544
92 0.55113567  0.1990237500
93 -0.51884952 -0.0016103142
94 0.10895118 -0.2274921590
95 -0.18350474 -0.5182775073

```

with conditional variances for "Airport3"

**4.10.4 AIM2\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS80\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29437.9	29527.3	-14708.0	29415.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.4790	-0.7503	-0.4023	0.8430	8.3099

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19671	0.4435
Airport3.1	ZLog_NAT_24h_LS80_cmc	0.02664	0.1632

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.273008	0.176939	-1.543	0.1228
ZLpAeq0024_cmc	0.925807	0.026686	34.693	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.043768	0.057587	-0.760	0.4472
ZFlights24h_gmc	-0.075797	0.586800	-0.129	0.8972
ZNightflightrate_gmc	-0.005737	0.213495	-0.027	0.9786
ZTrend24h_gmc	-0.189508	0.106823	-1.774	0.0761 .
ZNoiseStarts24_gmc	0.707011	0.485835	1.455	0.1456
HRC_c	-0.840524	0.521947	-1.610	0.1073
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.121088	0.018776	-6.449	1.13e-10 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.003							
ZL_NAT_24_L	-0.005	-0.358						
ZFlights24h_	0.264	0.002	0.006					
ZNightflight_	0.007	0.003	0.003	0.664				
ZTrnd24h_gm	-0.039	0.000	-0.016	0.210	0.249			
ZNsStrts24_	0.035	-0.002	-0.004	-0.893	-0.757	-0.181		
HRC_c	-0.541	-0.001	0.003	-0.423	0.105	-0.105	0.047	
ZLA0024_:ZL	-0.058	-0.114	-0.032	-0.018	-0.010	-0.002	0.024	0.001

convergence code: 0

Model failed to converge with max|grad| = 0.00236652 (tol = 0.002, component 1)

> performance::icc(AIM2\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(AIM2\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.258

Marginal R2: 0.214

```
> screenreg(AIM2_ALqN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.27
                                (0.18)
ZLpAeq0024_cmc                 0.93 ***
                                (0.03)
ZLog_NAT_24h_LS80_cmc         -0.04
                                (0.06)
ZFlights24h_gmc               -0.08
                                (0.59)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.11)
ZNoiseStarts24_gmc           0.71
                                (0.49)
HRC_c                          -0.84
                                (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.12 ***
                                (0.02)
-----
AIC                             29437.95
BIC                             29527.34
Log Likelihood                  -14707.97
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.20
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1   -0.23130288      0.08062498
1.1  0.22087096     -0.05733325
1.2 -0.41918916      0.12015851
1.3  0.55479057      0.12527605
2    0.56717173     -0.09640519
3    0.05231122     -0.19825006
4    0.12263472      0.03753375
91   -0.79651728     0.15559970
92    0.58758160      0.13638047
93   -0.54823354      0.07647946
94    0.10470026     -0.07201202
95   -0.18609610     -0.32724790
```

with conditional variances for "Airport3"

**4.10.5 Vergleichstests ALqN80****4.10.5.1 > anova(CIM\_ALqN80, AIM1\_ALqN80)**

Models:

CIM\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN80	10	29474	29555	-14727	29454			
AIM1_ALqN80	11	29398	29487	-14688	29376	77.818	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.10.5.2 > anova(CIM\_ALqN80, AIM2\_ALqN80)**

Models:

CIM\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN80	10	29474	29555	-14727	29454			
AIM2_ALqN80	11	29438	29527	-14708	29416	37.894	1	7.471e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### 4.10.6 FM\_ALqN80

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS80\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS80\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29365.8	29552.7	-14659.9	29319.8	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9865	-0.7322	-0.4098	0.8436	7.5380

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	9.074e-02	0.3012331
Airport3.1	ZLpAeq0024_cmc	7.691e-03	0.0876979
Airport3.2	(Intercept)	9.939e-02	0.3152627
Airport3.3	ZLog_NAT_24h_LS80_cmc	1.353e-08	0.0001163

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.306280	0.173350	-1.767	0.077257 .
ZLpAeq0024_cmc	0.982366	0.057588	17.058	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.032840	0.040555	-0.810	0.418075
ZFlights24h_gmc	-0.117472	0.568473	-0.207	0.836287
ZNightflightrate_gmc	-0.009383	0.208066	-0.045	0.964031
ZTrend24h_gmc	-0.186156	0.104876	-1.775	0.075894 .
ZNoiseStarts24_gmc	0.708776	0.471479	1.503	0.132761
HRC_c	-0.783668	0.507894	-1.543	0.122837
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.077038	0.019151	-4.023	5.75e-05 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.225250	0.222947	-1.010	0.312337
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.112723	0.075283	-1.497	0.134310
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.030645	0.044982	-0.681	0.495694
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.658766	0.180220	3.655	0.000257 ***
ZLpAeq0024_cmc:HRC_c	-0.649699	0.202880	-3.202	0.001363 **
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	0.431361	0.184487	2.338	0.019378 *
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	0.076732	0.076620	1.001	0.316604
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.073702	0.039053	1.887	0.059126 .
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	-0.514668	0.155391	-3.312	0.000926 ***
ZLog_NAT_24h_LS80_cmc:HRC_c	0.052889	0.147366	0.359	0.719671

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

Model failed to converge with max|grad| = 0.00743024 (tol = 0.002, component 1)

```
> performance::icc(FM_ALqN80)
# IntraClass Correlation Coefficient
```

Adjusted ICC: 0.027

Conditional ICC: 0.021

```
> performance::r2(FM_ALqN80)
```

```
# R2 for Mixed Models
```

Conditional R2: 0.235

Marginal R2: 0.214

```
> screenreg(FM_ALqN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.31
                                (0.17)
ZLpAeq0024_cmc                  0.98 ***
                                (0.06)
ZLog_NAT_24h_LS80_cmc          -0.03
                                (0.04)
ZFlights24h_gmc                -0.12
                                (0.57)
ZNightflightrate_gmc           -0.01
                                (0.21)
ZTrend24h_gmc                  -0.19
                                (0.10)
ZNoiseStarts24_gmc             0.71
                                (0.47)
HRC_c                           -0.78
                                (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.08 ***
                                (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc -0.23
                                (0.22)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.11
                                (0.08)
ZLpAeq0024_cmc:ZTrend24h_gmc   -0.03
                                (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.66 ***
                                (0.18)
ZLpAeq0024_cmc:HRC_c           -0.65 **
                                (0.20)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc 0.43 *
                                (0.18)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc 0.08
                                (0.08)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc 0.07
                                (0.04)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc -0.51 ***
                                (0.16)
ZLog_NAT_24h_LS80_cmc:HRC_c    0.05
                                (0.15)
-----
AIC                             29365.80
BIC                             29552.71
Log Likelihood                   -14659.90
```



```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.09
Var: Airport3.1 ZLpAeq0024_cmc 0.01
Var: Airport3.2 (Intercept) 0.10
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN80)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.11957193 -0.070720625 -0.13096912 -3.921127e-08
1.1 0.11076224 -0.081943197 0.12131972 -2.046162e-07
1.2 -0.19957062 0.135169147 -0.21859302 1.718722e-07
1.3 0.27294203 0.070554950 0.29895795 1.466482e-07
2 0.25684453 0.001635640 0.28132609 -1.611514e-07
3 0.02286906 -0.002804398 0.02504886 4.970290e-09
4 0.05979379 0.053296468 0.06549313 1.118443e-07
91 -0.36041476 0.003531474 -0.39476828 1.161864e-07
92 0.27505823 0.043018936 0.30127586 9.544199e-08
93 -0.26702368 -0.103002422 -0.29247548 -1.734976e-07
94 0.04498386 -0.004985992 0.04927157 -2.890393e-08
95 -0.08702771 -0.052396014 -0.09532290 -5.200275e-08

```

with conditional variances for "Airport3"

**4.11 Modell AMN50 (akustische Prädiktoren  $L_{AS,max,log,24h,50}$  und  $\log(NAT_{24h,50})$ )****4.11.1 MO\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN50@theta[1] ^ 2 / (MO_AMN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN50)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN50)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.11.2 CIM\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS50\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS50\_cmc:ZLog\_NAT\_24h\_LS50\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29472.8	29554.1	-14726.4	29452.8	24983

scaled residuals:

Min	1Q	Median	3Q	Max
-2.7312	-0.7515	-0.4015	0.8529	7.4262

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1973	0.4442

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32329	0.17694	-1.827	0.0677 .
ZLAmx_24h_LS50_cmc	0.57550	0.01662	34.630	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.53448	0.01750	30.550	<2e-16 ***
ZFlights24h_gmc	-0.14042	0.58851	-0.239	0.8114
ZNightflightrate_gmc	-0.02509	0.21388	-0.117	0.9066
ZTrend24h_gmc	-0.17891	0.10678	-1.675	0.0938 .
ZNoiseStarts24_gmc	0.81578	0.48695	1.675	0.0939 .
HRC_c	-0.94253	0.52333	-1.801	0.0717 .
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.02659	0.02178	-1.221	0.2222

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS50_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS50_	-0.008							
ZL_NAT_24_L	-0.008	-0.182						
ZFlights24h_	0.264	-0.005	-0.001					
ZNightflight_	0.007	0.001	0.000	0.665				
ZTrnd24h_gm	-0.039	-0.003	-0.002	0.214	0.250			
ZNsStrts24_	0.035	0.008	0.003	-0.893	-0.758	-0.184		
HRC_c	-0.542	0.000	-0.005	-0.425	0.103	-0.108	0.049	
ZLA_24_LS50_:	-0.020	-0.040	-0.008	-0.006	-0.005	0.000	0.008	-0.001

> performance::icc(CIM\_AMN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.252

Marginal R2: 0.207

> screenreg(CIM\_AMN50)

=====

Model 1

```
-----
(Intercept)                -0.32
                           (0.18)
ZLAmox_24h_LS50_cmc        0.58 ***
                           (0.02)
ZLog_NAT_24h_LS50_cmc     0.53 ***
                           (0.02)
ZFlights24h_gmc           -0.14
                           (0.59)
ZNightflightrate_gmc      -0.03
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc        0.82
                           (0.49)
HRC_c                     -0.94
                           (0.52)
ZLAmox_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.03
                           (0.02)
-----
```

```
-----
AIC                        29472.84
BIC                        29554.11
Log Likelihood             -14726.42
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.20
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN50)
```

```
$Airport3
  (Intercept)
1 -0.26208238
1.1 0.19734985
1.2 -0.38678624
1.3 0.60302129
2 0.53845509
3 0.04881345
4 0.14502295
91 -0.76447336
92 0.59954018
93 -0.58723248
94 0.08929431
95 -0.20589600
```

with conditional variances for "Airport3"

**4.11.3 AIM1\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS50\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS50\_cmc || Airport3) + ZLAmx\_24h\_LS50\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29436.4	29525.8	-14707.2	29414.4	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-2.6910	-0.7428	-0.4131	0.8424	6.1001

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19854	0.4456
Airport3.1	ZLAmx_24h_LS50_cmc	0.03147	0.1774

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34171	0.17713	-1.929	0.0537 .
ZLAmx_24h_LS50_cmc	0.59487	0.05671	10.489	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.53170	0.01755	30.295	<2e-16 ***
ZFlights24h_gmc	-0.15070	0.58657	-0.257	0.7972
ZNightflightrate_gmc	-0.02010	0.21386	-0.094	0.9251
ZTrend24h_gmc	-0.18669	0.10713	-1.743	0.0814 .
ZNoiseStarts24_gmc	0.77443	0.48568	1.595	0.1108
HRC_c	-0.82709	0.52186	-1.585	0.1130
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.01869	0.02212	-0.845	0.3982

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS50_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS50_	-0.005							
ZL_NAT_24_L	-0.009	-0.056						
ZFlights24h_	0.263	0.004	-0.001					
ZNightflight_	0.007	0.003	0.000	0.663				
ZTrnd24h_gm	-0.040	-0.010	-0.002	0.210	0.249			
ZNSstrts24_	0.036	-0.003	0.003	-0.893	-0.756	-0.181		
HRC_c	-0.540	0.001	-0.004	-0.423	0.105	-0.106	0.047	
ZLA_24_LS50_:	-0.019	-0.020	-0.010	-0.004	-0.004	0.001	0.005	-0.001

> performance::icc(AIM1\_AMN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM1\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.252

Marginal R2: 0.207

> screenreg(AIM1\_AMN50)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.34
                                (0.18)
ZLAmx_24h_LS50_cmc              0.59 ***
                                (0.06)
ZLog_NAT_24h_LS50_cmc          0.53 ***
                                (0.02)
ZFlights24h_gmc                 -0.15
                                (0.59)
ZNightflightrate_gmc           -0.02
                                (0.21)
ZTrend24h_gmc                  -0.19
                                (0.11)
ZNoiseStarts24_gmc             0.77
                                (0.49)
HRC_c                           -0.83
                                (0.52)
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.02
                                (0.02)
-----
AIC                             29436.36
BIC                             29525.75
Log Likelihood                  -14707.18
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLAmx_24h_LS50_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN50)
$Airport3
  (Intercept) ZLAmx_24h_LS50_cmc
1 -0.24512829  0.13500222
1.1 0.20270702 -0.03517211
1.2 -0.41087147  0.12283372
1.3 0.59476977  0.23773892
2  0.55013616 -0.05548173
3  0.05076574 -0.04905236
4  0.13514777  0.08256416
91 -0.77641491  0.07468905
92 0.59497614  0.07519657
93 -0.57252660 -0.02017281
94 0.09406605 -0.18256765
95 -0.19315365 -0.40062978

with conditional variances for "Airport3"
>

```

**4.11.4 AIM2\_AMN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS50_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS50_cmc || Airport3) + ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
29412.8 29502.2 -14695.4 29390.8   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.6079 -0.7409 -0.3998  0.8448  5.1823
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.18683  0.4322
Airport3.1  ZLog_NAT_24h_LS50_cmc     0.06685  0.2585
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32899	0.17197	-1.913	0.0557 .
ZLAmx_24h_LS50_cmc	0.58965	0.01686	34.982	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.38480	0.08426	4.567	4.96e-06 ***
ZFlights24h_gmc	-0.10985	0.56718	-0.194	0.8464
ZNightflightrate_gmc	-0.01567	0.20699	-0.076	0.9397
ZTrend24h_gmc	-0.17847	0.10396	-1.717	0.0860 .
ZNoiseStarts24_gmc	0.74021	0.46952	1.577	0.1149
HRC_c	-0.86840	0.50760	-1.711	0.0871 .
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.02498	0.02228	-1.121	0.2622

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLAm_24_LS50_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS50_	-0.006							
ZL_NAT_24_L	-0.008	-0.093						
ZFlights24h_	0.263	-0.004	0.002					
ZNightflight_	0.006	0.001	0.003	0.661				
ZTrnd24h_gm	-0.040	-0.004	-0.005	0.210	0.248			
ZNsStrts24_	0.038	0.007	-0.001	-0.892	-0.755	-0.180		
HRC_c	-0.541	-0.001	0.003	-0.423	0.107	-0.106	0.045	
ZLA_24_LS50_:	-0.024	-0.050	0.034	-0.005	-0.002	0.004	0.006	0.002

```
> performance::icc(AIM2_AMN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM2_AMN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.221
```

```
Marginal R2: 0.176
```

```
> screenreg(AIM2_AMN50)
```



```

=====
                                Model 1
-----
(Intercept)                    -0.33
                                (0.17)
ZLAmox_24h_LS50_cmc            0.59 ***
                                (0.02)
ZLog_NAT_24h_LS50_cmc         0.38 ***
                                (0.08)
ZFlights24h_gmc                -0.11
                                (0.57)
ZNightflightrate_gmc          -0.02
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.74
                                (0.47)
HRC_c                          -0.87
                                (0.51)
ZLAmox_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.02
                                (0.02)
-----
AIC                             29412.82
BIC                             29502.21
Log Likelihood                  -14695.41
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.07
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN50)
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1    -0.2452059      0.29800254
1.1    0.2124697      0.20156852
1.2   -0.4178543      0.23525790
1.3    0.5871654      0.13347677
2     0.5261039     -0.09585144
3     0.0497848      0.02814072
4     0.1405594      0.13418541
91   -0.7444966     -0.13349422
92    0.5628791      0.13385961
93   -0.5446224     -0.28788368
94    0.1005489     -0.17692799
95   -0.1962905     -0.50916531

```

with conditional variances for "Airport3"

**4.11.5 Vergleichstests AMN50****4.11.5.1 > anova(CIM\_AMN50, AIM1\_AMN50)**

Models:

CIM\_AMN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN50	10	29473	29554	-14726	29453			
AIM1_AMN50	11	29436	29526	-14707	29414	38.479	1	5.535e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.11.5.2 > anova(CIM\_AMN50, AIM2\_AMN50)**

Models:

CIM\_AMN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN50	10	29473	29554	-14726	29453			
AIM2_AMN50	11	29413	29502	-14695	29391	62.025	1	3.391e-15 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.11.6 FM\_AMN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS50_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS50_cmc || Airport3) + (1 + ZLog_NAT_24h_LS50_cmc ||
  Airport3) + ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc + ZLAmx_24h_LS50_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS50_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS50_cmc:HRC_c +
  ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS50_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
29388.5  29575.4 -14671.3  29342.5   24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.6047 -0.7339 -0.4124  0.8371  4.9108
```

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.135226	0.36773
Airport3.1	ZLAmx_24h_LS50_cmc	0.006209	0.07880
Airport3.2	(Intercept)	0.060282	0.24552
Airport3.3	ZLog_NAT_24h_LS50_cmc	0.001710	0.04135

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.344872	0.175766	-1.962	0.049750 *
ZLAmx_24h_LS50_cmc	0.703768	0.042467	16.572	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.502307	0.044443	11.302	< 2e-16 ***
ZFlights24h_gmc	-0.136353	0.581806	-0.234	0.814704
ZNightflightrate_gmc	-0.015810	0.212316	-0.074	0.940642
ZTrend24h_gmc	-0.183174	0.106304	-1.723	0.084869 .
ZNoiseStarts24_gmc	0.724440	0.482397	1.502	0.133161
HRC_c	-0.782823	0.517488	-1.513	0.130347
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.025790	0.022483	-1.147	0.251332
ZLAmx_24h_LS50_cmc:ZFlights24h_gmc	0.117430	0.142190	0.826	0.408879
ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc	-0.027574	0.049058	-0.562	0.574068
ZLAmx_24h_LS50_cmc:ZTrend24h_gmc	0.022400	0.027790	0.806	0.420203
ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc	0.098719	0.119140	0.829	0.407335
ZLAmx_24h_LS50_cmc:HRC_c	-0.428034	0.128194	-3.339	0.000841 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.082126	0.202381	-0.406	0.684890
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	-0.006835	0.054612	-0.125	0.900400
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	0.008650	0.030164	0.287	0.774292
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.315077	0.157158	2.005	0.044979 *
ZLog_NAT_24h_LS50_cmc:HRC_c	-0.188354	0.160452	-1.174	0.240438

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

convergence code: 0  
Model failed to converge with max|grad| = 0.00226599 (tol = 0.002, component 1)

> performance::icc(FM\_AMN50)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.039

Conditional ICC: 0.031

> performance::r2(FM\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.243

Marginal R2: 0.212

> screenreg(FM\_AMN50)

```
=====
                                Model 1
-----
(Intercept)                    -0.34 *
                                (0.18)
ZLAmx_24h_LS50_cmc              0.70 ***
                                (0.04)
ZLog_NAT_24h_LS50_cmc          0.50 ***
                                (0.04)
ZFlights24h_gmc                -0.14
                                (0.58)
ZNightflightrate_gmc           -0.02
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.72
                                (0.48)
HRC_c                           -0.78
                                (0.52)
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.03
                                (0.02)
ZLAmx_24h_LS50_cmc:ZFlights24h_gmc 0.12
                                (0.14)
ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc -0.03
                                (0.05)
ZLAmx_24h_LS50_cmc:ZTrend24h_gmc 0.02
                                (0.03)
ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc 0.10
                                (0.12)
ZLAmx_24h_LS50_cmc:HRC_c       -0.43 ***
                                (0.13)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.08
                                (0.20)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc -0.01
                                (0.05)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc 0.01
                                (0.03)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.32 *
                                (0.16)
ZLog_NAT_24h_LS50_cmc:HRC_c    -0.19
                                (0.16)
-----
AIC                               29388.53
BIC                               29575.44
```

```

Log Likelihood                -14671.27
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.14
Var: Airport3.1 ZLamax_24h_LS50_cmc 0.01
Var: Airport3.2 (Intercept)   0.06
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc 0.00

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN50)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS50_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1    -0.17688760    -0.018314825    -0.07885448    -0.014124477
1.1  0.15237306    -0.111589069     0.06792618    -0.029667736
1.2 -0.28935543     0.050770425    -0.12899135     0.045834970
1.3  0.40757122     0.115623591     0.18169061     0.007342331
2     0.36365220    -0.037047236     0.16211201    -0.001311175
3     0.03695842     0.003607352     0.01647564     0.001172849
4     0.10348704     0.057846559     0.04613334     0.018934249
91    -0.52866249     0.020892441    -0.23567171    -0.004056303
92    0.40431737     0.024493270     0.18024008     0.009896808
93    -0.39856561    -0.073872077    -0.17767601    -0.025265435
94    0.07730164    -0.005128857     0.03446019     0.005855030
95    -0.13710544    -0.034537349    -0.06112004    -0.016590175

```

```

with conditional variances for "Airport3"

```

**4.12 Modell AMN60 (akustische Prädiktoren  $L_{AS,max,log,24h,60}$  und  $\log(NAT_{24h,60})$ )****4.12.1 MO\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN60@theta[1] ^ 2 / (MO_AMN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN60)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN60)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.12.2 CIM\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS60\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS60\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29459.6	29540.9	-14719.8	29439.6	24983

scaled residuals:

Min	1Q	Median	3Q	Max
-2.4626	-0.7593	-0.4029	0.8534	9.5126

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2063	0.4542

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.35662	0.18045	-1.976	0.0481 *
ZLAmx_24h_LS60_cmc	0.29019	0.01614	17.985	<2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.73551	0.01904	38.622	<2e-16 ***
ZFlights24h_gmc	-0.15448	0.59498	-0.260	0.7951
ZNightflightrate_gmc	-0.02121	0.21731	-0.098	0.9222
ZTrend24h_gmc	-0.18212	0.10895	-1.672	0.0946 .
ZNoiseStarts24_gmc	0.81381	0.49249	1.652	0.0984 .
HRC_c	-0.89703	0.53151	-1.688	0.0915 .
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.04112	0.02102	1.956	0.0504 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS60_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS60_	-0.001							
ZL_NAT_24_L	-0.019	-0.332						
ZFlights24h_	0.264	-0.006	-0.001					
ZNightflight_	0.007	-0.001	0.002	0.661				
ZTrnd24h_gm	-0.041	-0.001	-0.005	0.211	0.249			
ZNsStrts24_	0.037	0.007	0.003	-0.892	-0.755	-0.181		
HRC_c	-0.539	0.002	-0.002	-0.423	0.106	-0.106	0.046	
ZLA_24_LS60_:	-0.035	-0.143	0.188	-0.004	0.002	-0.002	0.005	0.005

> performance::icc(CIM\_AMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.059

Conditional ICC: 0.046

> performance::r2(CIM\_AMN60)

# R2 for Mixed Models

Conditional R2: 0.259

Marginal R2: 0.212

> screenreg(CIM\_AMN60)

=====

Model 1



```
-----
(Intercept)                -0.36 *
                           (0.18)
ZLAmox_24h_LS60_cmc        0.29 ***
                           (0.02)
ZLog_NAT_24h_LS60_cmc     0.74 ***
                           (0.02)
ZFlights24h_gmc           -0.15
                           (0.59)
ZNightflightrate_gmc      -0.02
                           (0.22)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc        0.81
                           (0.49)
HRC_c                     -0.90
                           (0.53)
ZLAmox_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.04
                           (0.02)
-----
```

```
-----
AIC                        29459.65
BIC                        29540.91
Log Likelihood            -14719.82
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.21
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN60)
```

```
$Airport3
```

```
(Intercept)
1 -0.24906288
1.1 0.19566272
1.2 -0.41858388
1.3 0.61763181
2 0.55803431
3 0.05204299
4 0.14065216
91 -0.79243517
92 0.60496498
93 -0.58920904
94 0.09364629
95 -0.19862670
```

with conditional variances for "Airport3"

**4.12.3 AIM1\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS60\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS60\_cmc || Airport3) + ZLAmx\_24h\_LS60\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29435.9	29525.3	-14707.0	29413.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8269	-0.7556	-0.4066	0.8612	9.3805

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.21121	0.4596
Airport3.1	ZLAmx_24h_LS60_cmc	0.01609	0.1268

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.37626	0.18250	-2.062	0.0392 *
ZLAmx_24h_LS60_cmc	0.31735	0.04335	7.321	2.47e-13 ***
ZLog_NAT_24h_LS60_cmc	0.74375	0.01934	38.466	< 2e-16 ***
ZFlights24h_gmc	-0.18765	0.60087	-0.312	0.7548
ZNightflightrate_gmc	-0.01909	0.21956	-0.087	0.9307
ZTrend24h_gmc	-0.18942	0.11025	-1.718	0.0858 .
ZNoiseStarts24_gmc	0.81253	0.49785	1.632	0.1027
HRC_c	-0.80802	0.53615	-1.507	0.1318
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.05043	0.02229	2.262	0.0237 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS60_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS60_	-0.002							
ZL_NAT_24_L	-0.020	-0.135						
ZFlights24h_	0.262	0.002	-0.002					
ZNightflight_	0.006	0.002	0.002	0.661				
ZTrnd24h_gm	-0.041	-0.008	-0.005	0.210	0.248			
ZNSstrts24_	0.038	-0.001	0.004	-0.892	-0.754	-0.181		
HRC_c	-0.539	0.002	-0.001	-0.422	0.107	-0.104	0.045	
ZLA_24_LS60_:	-0.033	-0.090	0.208	0.000	0.004	-0.001	0.001	0.004

> performance::icc(AIM1\_AMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.060

Conditional ICC: 0.047

> performance::r2(AIM1\_AMN60)

# R2 for Mixed Models

Conditional R2: 0.265

Marginal R2: 0.218

> screenreg(AIM1\_AMN60)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.38 *
                                (0.18)
ZLAmx_24h_LS60_cmc             0.32 ***
                                (0.04)
ZLog_NAT_24h_LS60_cmc         0.74 ***
                                (0.02)
ZFlights24h_gmc                -0.19
                                (0.60)
ZNightflightrate_gmc          -0.02
                                (0.22)
ZTrend24h_gmc                 -0.19
                                (0.11)
ZNoiseStarts24_gmc            0.81
                                (0.50)
HRC_c                          -0.81
                                (0.54)
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.05 *
                                (0.02)
-----
AIC                             29435.92
BIC                             29525.31
Log Likelihood                  -14706.96
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.21
Var: Airport3.1 ZLAmx_24h_LS60_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN60)
$Airport3
  (Intercept) ZLAmx_24h_LS60_cmc
1 -0.25087381  0.111654202
1.1 0.19469730 -0.106562754
1.2 -0.41634147 -0.110658339
1.3 0.62087255  0.147585987
2 0.56830625 -0.004288533
3 0.05227870  0.045177133
4 0.13907669  0.036163579
91 -0.80206914 0.073409136
92 0.61553543  0.092742220
93 -0.59882924 0.040004214
94 0.09352819 -0.094097492
95 -0.19593385 -0.239180652

with conditional variances for "Airport3"
>

```

**4.12.4 AIM2\_AMN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS60_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS60_cmc || Airport3) + ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cm
c
```

```
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29420.3 29509.7 -14699.2 29398.3   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5181 -0.7508 -0.4118  0.8458  5.7323
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.18453  0.4296
Airport3.1  ZLog_NAT_24h_LS60_cmc    0.08475  0.2911
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-0.3802246	0.1711808	-2.221	0.0263	*
ZLAmx_24h_LS60_cmc	0.2919717	0.0167559	17.425	< 2e-16	***
ZLog_NAT_24h_LS60_cmc	0.7090989	0.0920834	7.701	1.35e-14	***
ZFlights24h_gmc	-0.1274405	0.5657414	-0.225	0.8218	
ZNightflightrate_gmc	-0.0006631	0.2059396	-0.003	0.9974	
ZTrend24h_gmc	-0.1788009	0.1035222	-1.727	0.0841	.
ZNoiseStarts24_gmc	0.7220717	0.4678008	1.544	0.1227	
HRC_c	-0.7659884	0.5046121	-1.518	0.1290	
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.0522715	0.0217710	2.401	0.0164	*

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLAm_24_LS60_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS60_	0.007							
ZL_NAT_24_L	-0.016	-0.130						
ZFlights24h_	0.264	-0.003	0.002					
ZNghtflght_	0.006	-0.004	0.006	0.662				
ZTrnd24h_gm	-0.039	-0.001	-0.011	0.209	0.249			
ZNsStrts24_	0.036	0.006	-0.002	-0.892	-0.755	-0.180		
HRC_c	-0.541	-0.005	0.009	-0.425	0.104	-0.105	0.049	
ZLA_24_LS60_:	-0.042	-0.169	0.062	-0.006	0.005	0.001	0.005	0.012

```
> performance::icc(AIM2_AMN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.053
```

```
Conditional ICC: 0.042
```

```
> performance::r2(AIM2_AMN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.243
```

```
Marginal R2: 0.200
```

```
> screenreg(AIM2_AMN60)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.38 *
                                (0.17)
ZLAmox_24h_LS60_cmc            0.29 ***
                                (0.02)
ZLog_NAT_24h_LS60_cmc         0.71 ***
                                (0.09)
ZFlights24h_gmc                -0.13
                                (0.57)
ZNightflightrate_gmc          -0.00
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.72
                                (0.47)
HRC_c                          -0.77
                                (0.50)
ZLAmox_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.05 *
                                (0.02)
-----
AIC                             29420.32
BIC                             29509.71
Log Likelihood                  -14699.16
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.08
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1   -0.25573609      0.36539847
1.1  0.21710306      0.04358737
1.2 -0.42320596      0.03620657
1.3  0.60141923      0.11090362
2    0.55396886     -0.01395007
3    0.04479878      0.02545529
4    0.13033887      0.20918972
91  -0.73532428     -0.16991386
92   0.51722759      0.41224255
93  -0.51937764     -0.19404390
94   0.09982716     -0.28589437
95  -0.19199861     -0.58716737

```

with conditional variances for "Airport3"

**4.12.5 Vergleichstests AMN60****4.12.5.1 > anova(CIM\_AMN60, AIM1\_AMN60)**

Models:

CIM\_AMN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN60	10	29460	29541	-14720	29440			
AIM1_AMN60	11	29436	29525	-14707	29414	25.726	1	3.934e-07 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.12.5.2 > anova(CIM\_AMN60, AIM2\_AMN60)**

Models:

CIM\_AMN60: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN60	10	29460	29541	-14720	29440			
AIM2_AMN60	11	29420	29510	-14699	29398	41.329	1	1.286e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.12.6 FM\_AMN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS60_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS60_cmc || Airport3) + (1 + ZLog_NAT_24h_LS60_cmc ||
  Airport3) + ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc + ZLAmx_24h_LS60_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS60_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS60_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS60_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS60_cmc:HRC_c +
  ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS60_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
29399.6  29586.5 -14676.8  29353.6   24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.8337 -0.7441 -0.4185  0.8527  5.8441
```

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	5.580e-02	2.362e-01
Airport3.1	ZLAmx_24h_LS60_cmc	4.891e-09	6.993e-05
Airport3.2	(Intercept)	1.489e-01	3.859e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	6.615e-03	8.133e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.386735	0.179976	-2.149	0.03165 *
ZLAmx_24h_LS60_cmc	0.309104	0.022460	13.762	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.818469	0.053185	15.389	< 2e-16 ***
ZFlights24h_gmc	-0.135881	0.595355	-0.228	0.81946
ZNightflightrate_gmc	-0.003341	0.217166	-0.015	0.98772
ZTrend24h_gmc	-0.183725	0.108734	-1.690	0.09109 .
ZNoiseStarts24_gmc	0.718359	0.493344	1.456	0.14536
HRC_c	-0.735908	0.529665	-1.389	0.16472
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.059140	0.023281	2.540	0.01108 *
ZLAmx_24h_LS60_cmc:ZFlights24h_gmc	0.135328	0.089742	1.508	0.13156
ZLAmx_24h_LS60_cmc:ZNightflightrate_gmc	0.038790	0.030249	1.282	0.19972
ZLAmx_24h_LS60_cmc:ZTrend24h_gmc	0.037646	0.018715	2.012	0.04426 *
ZLAmx_24h_LS60_cmc:ZNoiseStarts24_gmc	-0.083541	0.074542	-1.121	0.26240
ZLAmx_24h_LS60_cmc:HRC_c	-0.231373	0.073212	-3.160	0.00158 **
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.252906	0.198689	-1.273	0.20306
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.093058	0.063349	-1.469	0.14184
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	0.002844	0.036058	0.079	0.93712
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.513736	0.160577	3.199	0.00138 **
ZLog_NAT_24h_LS60_cmc:HRC_c	-0.412724	0.178858	-2.308	0.02102 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

```
convergence code: 0
boundary (singular) fit: see ?issingular
```

```
> performance::icc(FM_AMN60)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.017
Conditional ICC: 0.013
> performance::r2(FM_AMN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.235
Marginal R2: 0.222
> screenreg(FM_AMN60)
```

```
=====
Model 1
-----
(Intercept)                -0.39 *
                           (0.18)
ZLAmox_24h_LS60_cmc         0.31 ***
                           (0.02)
ZLog_NAT_24h_LS60_cmc      0.82 ***
                           (0.05)
ZFlights24h_gmc            -0.14
                           (0.60)
ZNightflightrate_gmc       -0.00
                           (0.22)
ZTrend24h_gmc              -0.18
                           (0.11)
ZNoiseStarts24_gmc         0.72
                           (0.49)
HRC_c                       -0.74
                           (0.53)
ZLAmox_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.06 *
                           (0.02)
ZLAmox_24h_LS60_cmc:ZFlights24h_gmc       0.14
                           (0.09)
ZLAmox_24h_LS60_cmc:ZNightflightrate_gmc  0.04
                           (0.03)
ZLAmox_24h_LS60_cmc:ZTrend24h_gmc         0.04 *
                           (0.02)
ZLAmox_24h_LS60_cmc:ZNoiseStarts24_gmc    -0.08
                           (0.07)
ZLAmox_24h_LS60_cmc:HRC_c                 -0.23 **
                           (0.07)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc     -0.25
                           (0.20)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.09
                           (0.06)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc       0.00
                           (0.04)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc  0.51 **
                           (0.16)
ZLog_NAT_24h_LS60_cmc:HRC_c              -0.41 *
                           (0.18)
-----
AIC                                     29399.60
BIC                                     29586.51
```



```

Log Likelihood                -14676.80
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.06
Var: Airport3.1 ZLamax_24h_LS60_cmc 0.00
Var: Airport3.2 (Intercept)  0.15
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN60)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS60_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1    -0.06889515    7.157401e-08 -0.18383450    0.024588922
1.1  0.05859685   -1.470390e-07  0.15635530   -0.101466324
1.2 -0.11614272   -8.074517e-08 -0.30990625   -0.002863131
1.3  0.16391466    1.685739e-07  0.43737718    0.083627495
2     0.15188594   -7.652288e-08  0.40528068   -0.049187153
3     0.01455318    1.218225e-08  0.03883258    0.016649203
4     0.03899140    4.369360e-08  0.10404164    0.066609860
91   -0.21632210    2.325665e-08 -0.57721715   -0.026909605
92    0.16156083    3.894881e-08  0.43109642    0.058883799
93   -0.15873108   -4.629462e-08 -0.42354574   -0.070998501
94    0.02967233   -2.271450e-08  0.07917535    0.022153212
95   -0.05359192    7.280084e-09 -0.14300054   -0.029789595

```

```

with conditional variances for "Airport3"

```

**4.13 Modell AMN70 (akustische Prädiktoren  $L_{AS,max,log,24h,70}$  und  $\log(NAT_{24h,70})$ )****4.13.1 MO\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN70@theta[1] ^ 2 / (MO_AMN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN70)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN70)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.13.2 CIM\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS70\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS70\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29825.3	29906.5	-14902.6	29805.3	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.9891	-0.7804	-0.4108	0.8620	7.6449

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2234	0.4727

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.40636	0.18784	-2.163	0.0305 *
ZLAmx_24h_LS70_cmc	-0.04699	0.02130	-2.206	0.0274 *
ZLog_NAT_24h_LS70_cmc	0.84560	0.02045	41.357	< 2e-16 ***
ZFlights24h_gmc	-0.25137	0.61746	-0.407	0.6839
ZNightflightrate_gmc	-0.02540	0.22614	-0.112	0.9106
ZTrend24h_gmc	-0.19692	0.11324	-1.739	0.0821 .
ZNoiseStarts24_gmc	0.86767	0.51221	1.694	0.0903 .
HRC_c	-0.72637	0.55140	-1.317	0.1877
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc	0.09174	0.02195	4.179	2.93e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS70_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS70_	0.039							
ZL_NAT_24_L	-0.036	-0.525						
ZFlights24h_	0.262	0.014	-0.011					
ZNightflight_	0.006	0.003	0.001	0.662				
ZTrnd24h_gm	-0.041	0.005	-0.010	0.211	0.249			
ZNsStrts24_	0.038	-0.012	0.011	-0.892	-0.755	-0.182		
HRC_c	-0.539	-0.016	0.015	-0.419	0.109	-0.104	0.041	
ZLA_24_LS70_:	-0.057	-0.624	0.281	-0.028	-0.009	-0.007	0.028	0.021

> performance::icc(CIM\_AMN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.064

Conditional ICC: 0.051

> performance::r2(CIM\_AMN70)

# R2 for Mixed Models

Conditional R2: 0.248

Marginal R2: 0.197

> screenreg(CIM\_AMN70)

=====

Model 1

```

-----
(Intercept)                -0.41 *
                           (0.19)
ZLAmox_24h_LS70_cmc        -0.05 *
                           (0.02)
ZLog_NAT_24h_LS70_cmc      0.85 ***
                           (0.02)
ZFlights24h_gmc            -0.25
                           (0.62)
ZNightflightrate_gmc       -0.03
                           (0.23)
ZTrend24h_gmc              -0.20
                           (0.11)
ZNoiseStarts24_gmc         0.87
                           (0.51)
HRC_c                       -0.73
                           (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                           (0.02)
-----

```

```

-----
AIC                29825.26
BIC                29906.52
Log Likelihood     -14902.63
Num. obs.          24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.22
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN70)
```

```

$Airport3
  (Intercept)
1 -0.25271955
1.1 0.15629183
1.2 -0.38391856
1.3 0.61962842
2 0.57516548
3 0.06486016
4 0.18700642
91 -0.85813036
92 0.62694166
93 -0.62357790
94 0.13936784
95 -0.23631611

```

with conditional variances for "Airport3"

**4.13.3 AIM1\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS70\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS70\_cmc || Airport3) + ZLAmx\_24h\_LS70\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29801.7	29891.1	-14889.8	29779.7	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3889	-0.7833	-0.4049	0.8628	8.1190

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.22924	0.4788
Airport3.1	ZLAmx_24h_LS70_cmc	0.01323	0.1150

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.42246	0.19022	-2.221	0.0264 *
ZLAmx_24h_LS70_cmc	-0.06510	0.04366	-1.491	0.1360
ZLog_NAT_24h_LS70_cmc	0.87032	0.02155	40.391	< 2e-16 ***
ZFlights24h_gmc	-0.28020	0.62663	-0.447	0.6548
ZNightflightrate_gmc	-0.02570	0.22902	-0.112	0.9107
ZTrend24h_gmc	-0.20018	0.11469	-1.745	0.0809 .
ZNoiseStarts24_gmc	0.88266	0.51930	1.700	0.0892 .
HRC_c	-0.69031	0.55711	-1.239	0.2153
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc	0.10379	0.02485	4.177	2.95e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS70_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS70_	0.023							
ZL_NAT_24_L	-0.040	-0.296						
ZFlights24h_	0.263	0.009	-0.013					
ZNightflight_	0.008	0.001	0.001	0.663				
ZTrnd24h_gm	-0.041	-0.002	-0.010	0.212	0.249			
ZNsStrts24_	0.036	-0.008	0.013	-0.893	-0.755	-0.183		
HRC_c	-0.538	-0.008	0.015	-0.421	0.105	-0.105	0.046	
ZLA_24_LS70_:	-0.059	-0.343	0.292	-0.025	-0.007	-0.006	0.025	0.017

> performance::icc(AIM1\_AMN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.065

Conditional ICC: 0.052

> performance::r2(AIM1\_AMN70)

# R2 for Mixed Models

Conditional R2: 0.254

Marginal R2: 0.202

> screenreg(AIM1\_AMN70)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.42 *
                                (0.19)
ZLAmx_24h_LS70_cmc             -0.07
                                (0.04)
ZLog_NAT_24h_LS70_cmc         0.87 ***
                                (0.02)
ZFlights24h_gmc                -0.28
                                (0.63)
ZNightflightrate_gmc          -0.03
                                (0.23)
ZTrend24h_gmc                 -0.20
                                (0.11)
ZNoiseStarts24_gmc            0.88
                                (0.52)
HRC_c                          -0.69
                                (0.56)
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.10 ***
                                (0.02)
-----
AIC                             29801.69
BIC                             29891.08
Log Likelihood                  -14889.84
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.23
Var: Airport3.1 ZLAmx_24h_LS70_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN70)
$Airport3
  (Intercept) ZLAmx_24h_LS70_cmc
1 -0.25775101  0.175190156
1.1 0.15637933 -0.065120928
1.2 -0.38545855 -0.208843201
1.3 0.62944049 -0.020921289
2 0.58371285 -0.077001587
3 0.06552157 0.125980684
4 0.18867902 0.009586129
91 -0.86785203 0.032403319
92 0.63385979 0.055665215
93 -0.63460232 0.036471903
94 0.14157543 -0.008184130
95 -0.23590951 -0.059256554

with conditional variances for "Airport3"
>

```

**4.13.4 AIM2\_AMN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS70_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS70_cmc || Airport3) + ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
29782.5 29871.9 -14880.3 29760.5    24982
```

```
Scaled residuals:
```

```
      Min      1Q  Median      3Q      Max
-2.1769 -0.7720 -0.4264  0.8555  7.6076
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.21732  0.4662
Airport3.1  ZLog_NAT_24h_LS70_cmc      0.04843  0.2201
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.42546    0.18557  -2.293   0.0219 *
ZLAmx_24h_LS70_cmc -0.04557    0.02274  -2.004   0.0451 *
ZLog_NAT_24h_LS70_cmc  0.86904    0.07048  12.331 < 2e-16 ***
ZFlights24h_gmc   -0.28337    0.61423  -0.461   0.6446
ZNightflightrate_gmc -0.02722    0.22345  -0.122   0.9031
ZTrend24h_gmc    -0.20780    0.11222  -1.852   0.0641 .
ZNoiseStarts24_gmc  0.85488    0.50808   1.683   0.0925 .
HRC_c           -0.63365    0.54526  -1.162   0.2452
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc  0.09270    0.02290   4.049 5.15e-05 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
              (Intr) ZLAm_24_LS70_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS70_  0.046
ZL_NAT_24_L    -0.020 -0.190
ZFlghts24h_   0.264  0.024      0.001
ZNghtflght_   0.008  0.007      0.003  0.662
ZTrnd24h_gm  -0.039  0.006     -0.022  0.206  0.247
ZNSStrts24_   0.033 -0.024      0.002 -0.893 -0.755 -0.179
HRC_c         -0.540 -0.018      0.007 -0.424  0.104 -0.104  0.050
ZLA_24_LS70_: -0.059 -0.647      0.099 -0.033 -0.011 -0.007  0.034  0.020
```

```
> performance::icc(AIM2_AMN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.062
```

```
Conditional ICC: 0.049
```

```
> performance::r2(AIM2_AMN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.251
```

```
Marginal R2: 0.202
```

```
> screenreg(AIM2_AMN70)
```



```

=====
                                Model 1
-----
(Intercept)                    -0.43 *
                                (0.19)
ZLAmox_24h_LS70_cmc            -0.05 *
                                (0.02)
ZLog_NAT_24h_LS70_cmc         0.87 ***
                                (0.07)
ZFlights24h_gmc                -0.28
                                (0.61)
ZNightflightrate_gmc          -0.03
                                (0.22)
ZTrend24h_gmc                 -0.21
                                (0.11)
ZNoiseStarts24_gmc            0.85
                                (0.51)
HRC_c                          -0.63
                                (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                                (0.02)
-----
AIC                             29782.55
BIC                             29871.94
Log Likelihood                  -14880.27
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.22
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.26864109 0.34149470
1.1 0.16441877 -0.05013580
1.2 -0.36712612 -0.08058397
1.3 0.61768128 0.23972202
2 0.59746980 -0.14612449
3 0.05865704 0.17467642
4 0.17394480 -0.01984087
91 -0.83472475 -0.03456748
92 0.59096939 0.12839984
93 -0.59940656 -0.02690696
94 0.13554496 -0.08027279
95 -0.23003537 -0.47918455

```

with conditional variances for "Airport3"

**4.13.5 Vergleichstests AMN70****4.13.5.1 > anova(CIM\_AMN70, AIM1\_AMN70)**

Models:

CIM\_AMN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN70	10	29825	29907	-14903	29805			
AIM1_AMN70	11	29802	29891	-14890	29780	25.569	1	4.268e-07 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.13.5.2 > anova(CIM\_AMN70, AIM2\_AMN70)**

Models:

CIM\_AMN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN70	10	29825	29907	-14903	29805			
AIM2_AMN70	11	29783	29872	-14880	29761	44.711	1	2.284e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.13.6 FM\_AMN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLamax_24h_LS70_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLamax_24h_LS70_cmc || Airport3) + (1 + ZLog_NAT_24h_LS70_cmc ||
  Airport3) + ZLamax_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc + ZLamax_24h_LS70_cmc:ZFlights24h_gm
c +
  ZLamax_24h_LS70_cmc:ZNightflightrate_gmc + ZLamax_24h_LS70_cmc:ZTrend24h_gmc +
  ZLamax_24h_LS70_cmc:ZNoiseStarts24_gmc + ZLamax_24h_LS70_cmc:HRC_c +
  ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS70_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
29771.3  29958.2 -14862.6  29725.3   24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.4256 -0.7736 -0.4283  0.8558  7.5026
```

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	2.241e-01	4.734e-01
Airport3.1	ZLamax_24h_LS70_cmc	1.382e-09	3.717e-05
Airport3.2	(Intercept)	6.857e-05	8.281e-03
Airport3.3	ZLog_NAT_24h_LS70_cmc	1.495e-02	1.223e-01

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-0.423280	0.188417	-2.247	0.024671	*
ZLamax_24h_LS70_cmc	-0.092358	0.029912	-3.088	0.002017	**
ZLog_NAT_24h_LS70_cmc	1.017375	0.060545	16.804	< 2e-16	***
ZFlights24h_gmc	-0.272303	0.621840	-0.438	0.661459	
ZNightflightrate_gmc	-0.027578	0.226698	-0.122	0.903176	
ZTrend24h_gmc	-0.209383	0.113865	-1.839	0.065933	.
ZNoiseStarts24_gmc	0.842304	0.515262	1.635	0.102110	
HRC_c	-0.638586	0.551634	-1.158	0.247016	
ZLamax_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc	0.088544	0.026405	3.353	0.000798	***
ZLamax_24h_LS70_cmc:ZFlights24h_gmc	-0.039974	0.103374	-0.387	0.698985	
ZLamax_24h_LS70_cmc:ZNightflightrate_gmc	0.015494	0.034111	0.454	0.649659	
ZLamax_24h_LS70_cmc:ZTrend24h_gmc	-0.006604	0.018096	-0.365	0.715165	
ZLamax_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.057451	0.086926	-0.661	0.508670	
ZLamax_24h_LS70_cmc:HRC_c	0.032041	0.064690	0.495	0.620389	
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.217667	0.203850	1.068	0.285620	
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.057835	0.069586	0.831	0.405902	
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.073809	0.040672	1.815	0.069566	.
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	0.146593	0.169984	0.862	0.388471	
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.550532	0.197103	-2.793	0.005220	**

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

```
convergence code: 0
boundary (singular) fit: see ?issingular
```

```
> performance::icc(FM_AMN70)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.064
Conditional ICC: 0.050
> performance::r2(FM_AMN70)
# R2 for Mixed Models
```

```
Conditional R2: 0.266
Marginal R2: 0.216
> screenreg(FM_AMN70)
```

```
=====
Model 1
-----
(Intercept)                -0.42 *
                             (0.19)
ZLAmox_24h_LS70_cmc         -0.09 **
                             (0.03)
ZLog_NAT_24h_LS70_cmc       1.02 ***
                             (0.06)
ZFlights24h_gmc             -0.27
                             (0.62)
ZNightflightrate_gmc        -0.03
                             (0.23)
ZTrend24h_gmc               -0.21
                             (0.11)
ZNoiseStarts24_gmc          0.84
                             (0.52)
HRC_c                       -0.64
                             (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                             (0.03)
ZLAmox_24h_LS70_cmc:ZFlights24h_gmc        -0.04
                             (0.10)
ZLAmox_24h_LS70_cmc:ZNightflightrate_gmc    0.02
                             (0.03)
ZLAmox_24h_LS70_cmc:ZTrend24h_gmc           -0.01
                             (0.02)
ZLAmox_24h_LS70_cmc:ZNoiseStarts24_gmc     -0.06
                             (0.09)
ZLAmox_24h_LS70_cmc:HRC_c                   0.03
                             (0.06)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc       0.22
                             (0.20)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc  0.06
                             (0.07)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc         0.07
                             (0.04)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc    0.15
                             (0.17)
ZLog_NAT_24h_LS70_cmc:HRC_c                 -0.55 **
                             (0.20)
-----
AIC                                29771.29
BIC                                29958.20
```

```

Log Likelihood                -14862.65
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.22
Var: Airport3.1 ZLamax_24h_LS70_cmc 0.00
Var: Airport3.2 (Intercept) 0.00
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN70)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS70_cmc      (Intercept) ZLog_NAT_24h_LS70_cmc
1      -0.26482805      2.156243e-08 -8.103101e-05      0.09463495
1.1    0.16579174      2.559115e-08  5.072828e-05     -0.14206340
1.2   -0.37673322     -5.079642e-08 -1.152713e-04     -0.14421096
1.3    0.61470467     -1.560692e-08  1.880848e-04      0.16168350
2      0.59753689     -2.378627e-08  1.828319e-04     -0.13501459
3      0.06414298      3.896391e-09  1.962621e-05      0.03528893
4      0.18272915     -1.734617e-09  5.591072e-05      0.11335605
91     -0.86114700      3.312826e-09 -2.634903e-04     -0.02229470
92     0.60421915     -1.126083e-09  1.848765e-04      0.05773625
93    -0.61730913      1.931111e-08 -1.888817e-04     -0.05911664
94     0.15033981      9.170575e-09  4.600036e-05      0.05230031
95    -0.23079719      9.923060e-09 -7.061839e-05     -0.03037671

```

```

with conditional variances for "Airport3"

```

**4.14 Modell AMN80 (akustische Prädiktoren  $L_{AS,max,log,24h,80}$  und  $\log(NAT_{24h,80})$ )****4.14.1 MO\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN80@theta[1] ^ 2 / (MO_AMN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN80)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.14.2 CIM\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS80\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS80\_cmc:ZLog\_NAT\_24h\_LS80\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
30778.5	30859.8	-15379.3	30758.5	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.8033	-0.7887	-0.4860	0.9150	6.7990

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2175	0.4663

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.35481	0.18537	-1.914	0.0556 .
ZLAmx_24h_LS80_cmc	-0.14016	0.02153	-6.509	7.55e-11 ***
ZLog_NAT_24h_LS80_cmc	0.70367	0.01877	37.488	< 2e-16 ***
ZFlights24h_gmc	-0.30335	0.61330	-0.495	0.6209
ZNightflightrate_gmc	-0.06017	0.22367	-0.269	0.7879
ZTrend24h_gmc	-0.18741	0.11172	-1.677	0.0935 .
ZNoiseStarts24_gmc	0.95600	0.50791	1.882	0.0598 .
HRC_c	-0.85793	0.54632	-1.570	0.1163
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.08270	0.01601	5.167	2.38e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS80_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS80_	0.024							
ZL_NAT_24_L	-0.020	-0.494						
ZFlights24h_	0.265	0.019	-0.016					
ZNightflight_	0.008	0.011	-0.006	0.663				
ZTrnd24h_gm	-0.040	0.003	-0.008	0.213	0.249			
ZNsStrts24_	0.034	-0.020	0.020	-0.893	-0.756	-0.183		
HRC_c	-0.540	-0.007	0.003	-0.423	0.105	-0.107	0.047	
ZLA_24_LS80_:	-0.043	-0.564	0.215	-0.036	-0.020	-0.005	0.042	0.009

> performance::icc(CIM\_AMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.062

Conditional ICC: 0.053

> performance::r2(CIM\_AMN80)

# R2 for Mixed Models

Conditional R2: 0.202

Marginal R2: 0.150

> screenreg(CIM\_AMN80)

=====

Model 1



```
-----
(Intercept)                -0.35
                           (0.19)
ZLAmox_24h_LS80_cmc        -0.14 ***
                           (0.02)
ZLog_NAT_24h_LS80_cmc      0.70 ***
                           (0.02)
ZFlights24h_gmc            -0.30
                           (0.61)
ZNightflightrate_gmc       -0.06
                           (0.22)
ZTrend24h_gmc              -0.19
                           (0.11)
ZNoiseStarts24_gmc         0.96
                           (0.51)
HRC_c                       -0.86
                           (0.55)
ZLAmox_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.08 ***
                           (0.02)
-----
```

```
-----
AIC                          30778.53
BIC                          30859.79
Log Likelihood               -15379.26
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.22
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN80)
```

```
$Airport3
  (Intercept)
1 -0.28491459
1.1 0.15653551
1.2 -0.32791574
1.3 0.62503884
2 0.54210011
3 0.05588391
4 0.18546803
91 -0.80313415
92 0.65739397
93 -0.65908467
94 0.10612812
95 -0.23786535
```

with conditional variances for "Airport3"

**4.14.3 AIM1\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS80\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS80\_cmc || Airport3) + ZLAmx\_24h\_LS80\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
30712.7	30802.1	-15345.3	30690.7	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.9562	-0.7682	-0.4962	0.9016	13.2869

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.24372	0.4937
Airport3.1	ZLAmx_24h_LS80_cmc	0.05125	0.2264

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.39431	0.19662	-2.005	0.044915 *
ZLAmx_24h_LS80_cmc	-0.26481	0.07409	-3.574	0.000351 ***
ZLog_NAT_24h_LS80_cmc	0.77141	0.02083	37.027	< 2e-16 ***
ZFlights24h_gmc	-0.37513	0.65507	-0.573	0.566877
ZNightflightrate_gmc	-0.07717	0.23828	-0.324	0.746026
ZTrend24h_gmc	-0.19974	0.11829	-1.688	0.091320 .
ZNoiseStarts24_gmc	1.01984	0.54273	1.879	0.060231 .
HRC_c	-0.81080	0.58030	-1.397	0.162350
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.15526	0.02273	6.832	8.37e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS80_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS80_	0.011							
ZL_NAT_24_L	-0.028	-0.231						
ZFlights24h_	0.265	0.016	-0.019					
ZNightflight_	0.009	0.008	-0.010	0.667				
ZTrnd24h_gm	-0.039	-0.007	-0.011	0.215	0.251			
ZNSstrts24_	0.033	-0.016	0.025	-0.894	-0.760	-0.186		
HRC_c	-0.542	-0.004	0.005	-0.423	0.103	-0.107	0.048	
ZLA_24_LS80_:	-0.052	-0.223	0.333	-0.038	-0.025	-0.010	0.045	0.010

> performance::icc(AIM1\_AMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.069

Conditional ICC: 0.058

> performance::r2(AIM1\_AMN80)

# R2 for Mixed Models

Conditional R2: 0.214

Marginal R2: 0.156

> screenreg(AIM1\_AMN80)

=====

```

Model 1
-----
(Intercept)                -0.39 *
                           (0.20)
ZLAmx_24h_LS80_cmc        -0.26 ***
                           (0.07)
ZLog_NAT_24h_LS80_cmc     0.77 ***
                           (0.02)
ZFlights24h_gmc           -0.38
                           (0.66)
ZNightflightrate_gmc     -0.08
                           (0.24)
ZTrend24h_gmc            -0.20
                           (0.12)
ZNoiseStarts24_gmc        1.02
                           (0.54)
HRC_c                     -0.81
                           (0.58)
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.16 ***
                           (0.02)
-----
AIC                        30712.68
BIC                        30802.07
Log Likelihood            -15345.34
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.24
Var: Airport3.1 ZLAmx_24h_LS80_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN80)
$Airport3
  (Intercept) ZLAmx_24h_LS80_cmc
1 -0.29675556 0.21141729
1.1 0.14670595 -0.08506906
1.2 -0.31933983 -0.12838530
1.3 0.64751371 -0.10014425
2 0.58280574 -0.45526248
3 0.06067045 0.21539138
4 0.19958167 0.31755458
91 -0.86050253 0.24982150
92 0.70031607 0.00298865
93 -0.70057114 -0.04637649
94 0.11704084 -0.04486228
95 -0.25472706 -0.14071079

```

with conditional variances for "Airport3"

**4.14.4 AIM2\_AMN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS80_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS80_cmc || Airport3) + ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
30668.7 30758.1 -15323.3 30646.7   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.3462 -0.7614 -0.4988  0.8995  5.3359
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.2422  0.4922
Airport3.1  ZLog_NAT_24h_LS80_cmc    0.0902  0.3003
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.38437    0.19528  -1.968  0.0490 *
ZLAmx_24h_LS80_cmc -0.19055    0.02402  -7.933 2.14e-15 ***
ZLog_NAT_24h_LS80_cmc  0.83701    0.09242   9.057 < 2e-16 ***
ZFlights24h_gmc   -0.29377    0.64913  -0.453  0.6509
ZNightflightrate_gmc -0.06565    0.23606  -0.278  0.7809
ZTrend24h_gmc    -0.21411    0.11824  -1.811  0.0702 .
ZNoiseStarts24_gmc  0.92834    0.53733   1.728  0.0840 .
HRC_c           -0.77711    0.57363  -1.355  0.1755
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.12487    0.01715   7.279 3.36e-13 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
      (Intr) ZLAm_24_LS80_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS80_  0.026
ZL_NAT_24_L   -0.009 -0.140
ZFlghts24h_  0.263  0.021      0.008
ZNghtflght_  0.010  0.013      0.002  0.665
ZTrnd24h_gm  -0.040  0.006     -0.022  0.208  0.248
ZNsStrts24_  0.034 -0.025     -0.004 -0.894 -0.757 -0.180
HRC_c        -0.539 -0.004     -0.001 -0.423  0.102 -0.104  0.050
ZLA_24_LS80_: -0.040 -0.576      0.073 -0.030 -0.019 -0.006  0.038  0.004
```

```
> performance::icc(AIM2_AMN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.069
```

```
Conditional ICC: 0.056
```

```
> performance::r2(AIM2_AMN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.233
```

```
Marginal R2: 0.177
```

```
> screenreg(AIM2_AMN80)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.38 *
                                (0.20)
ZLAmox_24h_LS80_cmc            -0.19 ***
                                (0.02)
ZLog_NAT_24h_LS80_cmc         0.84 ***
                                (0.09)
ZFlights24h_gmc                -0.29
                                (0.65)
ZNightflightrate_gmc          -0.07
                                (0.24)
ZTrend24h_gmc                  -0.21
                                (0.12)
ZNoiseStarts24_gmc            0.93
                                (0.54)
HRC_c                           -0.78
                                (0.57)
ZLAmox_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.12 ***
                                (0.02)
-----
AIC                             30668.70
BIC                             30758.09
Log Likelihood                  -15323.35
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.24
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.09
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.27536833 0.43896770
1.1 0.14675643 -0.13274800
1.2 -0.33230691 -0.22525727
1.3 0.61681899 -0.07969079
2 0.62260078 -0.23013887
3 0.06453456 0.31510921
4 0.18891335 0.45503786
91 -0.89392691 0.24554992
92 0.66533306 0.03305311
93 -0.66100336 -0.19487721
94 0.14199778 -0.19705398
95 -0.24734466 -0.45928384

```

with conditional variances for "Airport3"

**4.14.5 Vergleichstests AMN80****4.14.5.1 > anova(CIM\_AMN80, AIM1\_AMN80)**

Models:

CIM\_AMN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN80	10	30779	30860	-15379	30759			
AIM1_AMN80	11	30713	30802	-15345	30691	67.849	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.14.5.2 > anova(CIM\_AMN80, AIM2\_AMN80)**

Models:

CIM\_AMN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN80	10	30779	30860	-15379	30759			
AIM2_AMN80	11	30669	30758	-15323	30647	111.83	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.14.6 FM\_AMN80**

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS80_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS80_cmc || Airport3) + (1 + ZLog_NAT_24h_LS80_cmc ||
  Airport3) + ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc + ZLAmx_24h_LS80_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS80_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS80_cmc:HRC_c +
  ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS80_cmc:HRC_c
Data: dat

```

```

      AIC      BIC   logLik deviance df.resid
30651.6 30838.5 -15302.8 30605.6   24970

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-2.3932 -0.7570 -0.4996  0.8893  7.5228

```

Random effects:

```

Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.009548 0.09771
Airport3.1  ZLAmx_24h_LS80_cmc          0.014083 0.11867
Airport3.2  (Intercept)                0.246181 0.49617
Airport3.3  ZLog_NAT_24h_LS80_cmc      0.039840 0.19960
Number of obs: 24993, groups: Airport3, 12

```

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-0.405892	0.200844	-2.021	0.0433	*
ZLAmx_24h_LS80_cmc	-0.307144	0.062537	-4.911	9.04e-07	***
ZLog_NAT_24h_LS80_cmc	0.972874	0.086982	11.185	< 2e-16	***
ZFlights24h_gmc	-0.323666	0.666707	-0.485	0.6273	
ZNightflightrate_gmc	-0.069958	0.242072	-0.289	0.7726	
ZTrend24h_gmc	-0.215324	0.121289	-1.775	0.0758	.
ZNoiseStarts24_gmc	0.961046	0.551910	1.741	0.0816	.
HRC_c	-0.765842	0.589841	-1.298	0.1942	
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.162664	0.026068	6.240	4.37e-10	***
ZLAmx_24h_LS80_cmc:ZFlights24h_gmc	-0.057407	0.225951	-0.254	0.7994	
ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc	-0.011639	0.067812	-0.172	0.8637	
ZLAmx_24h_LS80_cmc:ZTrend24h_gmc	-0.072327	0.037802	-1.913	0.0557	.
ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc	0.002337	0.191820	0.012	0.9903	
ZLAmx_24h_LS80_cmc:HRC_c	0.019299	0.160882	0.120	0.9045	
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	-0.485303	0.296913	-1.634	0.1022	
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	-0.094629	0.106504	-0.889	0.3743	
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.015074	0.055812	0.270	0.7871	
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	0.596419	0.248240	2.403	0.0163	*
ZLog_NAT_24h_LS80_cmc:HRC_c	-0.380883	0.256637	-1.484	0.1378	

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0  
Model failed to converge with max|grad| = 0.00328461 (tol = 0.002, component 1)

> performance::icc(FM\_AMN80)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
Conditional ICC: 0.002  
> performance::r2(FM\_AMN80)  
# R2 for Mixed Models

Conditional R2: 0.191  
Marginal R2: 0.189  
> screenreg(FM\_AMN80)

```
=====
                                Model 1
-----
(Intercept)                    -0.41 *
                                (0.20)
ZLAmx_24h_LS80_cmc              -0.31 ***
                                (0.06)
ZLog_NAT_24h_LS80_cmc          0.97 ***
                                (0.09)
ZFlights24h_gmc                 -0.32
                                (0.67)
ZNightflightrate_gmc           -0.07
                                (0.24)
ZTrend24h_gmc                   -0.22
                                (0.12)
ZNoiseStarts24_gmc             0.96
                                (0.55)
HRC_c                           -0.77
                                (0.59)
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.16 ***
                                (0.03)
ZLAmx_24h_LS80_cmc:ZFlights24h_gmc    -0.06
                                (0.23)
ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc -0.01
                                (0.07)
ZLAmx_24h_LS80_cmc:ZTrend24h_gmc      -0.07
                                (0.04)
ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc 0.00
                                (0.19)
ZLAmx_24h_LS80_cmc:HRC_c             0.02
                                (0.16)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc -0.49
                                (0.30)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc -0.09
                                (0.11)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc   0.02
                                (0.06)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc 0.60 *
                                (0.25)
ZLog_NAT_24h_LS80_cmc:HRC_c          -0.38
                                (0.26)
-----
AIC                                30651.61
BIC                                30838.51
```



```

Log Likelihood                -15302.80
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.01
Var: Airport3.1 ZLamax_24h_LS80_cmc 0.01
Var: Airport3.2 (Intercept) 0.25
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.04

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN80)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS80_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1   -0.010777932   -0.023210249 -0.27789798      0.19419918
1.1  0.005406782   -0.008210485  0.13940837     -0.20525094
1.2 -0.012071883    0.019975162 -0.31126119     -0.15423245
1.3  0.023556961   -0.031507810  0.60739224     0.05405708
2    0.023842057   -0.202739100  0.61474314     -0.42745151
3    0.002479890    0.032016542  0.06394144     0.07010611
4    0.007335552    0.165778759  0.18913974     0.22724394
91   -0.034393052    0.054457816 -0.88678977     0.09299232
92   0.025702606   -0.016956600  0.66271548     0.07393941
93   -0.025830920   -0.035550162 -0.66602394     -0.04882515
94   0.005478073    0.140117841  0.14124653     0.14086898
95   -0.009426841   -0.090835436 -0.24306148     -0.04417381

```

```

with conditional variances for "Airport3"

```

**4.15 Modell ALD: LDEN (akustischer Prädiktor  $L_{den}$ )****4.15.1 M0\_ALd**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial (logit)
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name             Variance Std.Dev.
Airport3 (Intercept) 0.4188  0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -0.6544      0.1864  -3.511 0.000446 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALd@theta[1] ^ 2 / (M0_ALd@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALd)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALd)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALd)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(M0_ALd)
```

```
$Airport3
```

```
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.15.2 CIM\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29488.1	29553.1	-14736.0	29472.1	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.2373	-0.7385	-0.4208	0.8607	7.3603

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1971	0.4439

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32065	0.17672	-1.814	0.0696 .
ZLDEN_cmc	0.85151	0.01657	51.385	<2e-16 ***
ZFlights24h_gmc	-0.12316	0.58490	-0.211	0.8332
ZNightflightrate_gmc	-0.02191	0.21320	-0.103	0.9181
ZTrend24h_gmc	-0.18040	0.10670	-1.691	0.0909 .
ZNoiseStarts24_gmc	0.79896	0.48396	1.651	0.0988 .
HRC_c	-0.92226	0.52318	-1.763	0.0779 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLDEN_cmc		-0.012				
ZFlights24h_	0.264		-0.004			
ZNightflight_	0.006	0.001		0.662		
ZTrnd24h_gm	-0.039	-0.005	0.212		0.249	
ZNsStrts24_	0.037	0.007	-0.892	-0.756		-0.182
HRC_c	-0.542	-0.002	-0.424	0.106	-0.106	0.046

> performance::icc(CIM\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_ALd)

# R2 for Mixed Models

Conditional R2: 0.247

Marginal R2: 0.201

> screenreg(CIM\_ALd)

```
=====
                        Model 1
-----
(Intercept)                -0.32
                           (0.18)
ZLDEN_cmc                   0.85 ***
                           (0.02)
```

ZFlights24h_gmc	-0.12 (0.58)
ZNightflightrate_gmc	-0.02 (0.21)
ZTrend24h_gmc	-0.18 (0.11)
ZNoiseStarts24_gmc	0.80 (0.48)
HRC_c	-0.92 (0.52)

```
-----
AIC                29488.06
BIC                29553.07
Log Likelihood    -14736.03
Num. obs.         24993
Num. groups: Airport3    12
Var: Airport3 (Intercept)  0.20
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_ALd)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.25820363
1.1 0.19235508
1.2 -0.37716158
1.3 0.58962897
2 0.54473625
3 0.05061758
4 0.14856821
91 -0.77723703
92 0.59747789
93 -0.58348411
94 0.09778671
95 -0.21015933
```

```
with conditional variances for "Airport3"
```

**4.15.3 AIM1\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29418.3	29491.4	-14700.1	29400.3	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.7387	-0.7317	-0.4238	0.8468	4.7265

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19194	0.4381
Airport3.1	ZLDEN_cmc	0.04703	0.2169

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34401	0.17473	-1.969	0.0490 *
ZLDEN_cmc	0.80894	0.06771	11.948	<2e-16 ***
ZFlights24h_gmc	-0.14490	0.57685	-0.251	0.8017
ZNightflightrate_gmc	-0.01364	0.21021	-0.065	0.9483
ZTrend24h_gmc	-0.18247	0.10542	-1.731	0.0835 .
ZNoiseStarts24_gmc	0.74116	0.47727	1.553	0.1204
HRC_c	-0.76240	0.51712	-1.474	0.1404

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLDEN_cmc	-0.008					
ZFlights24h_	0.265	0.004				
ZNightflght_	0.005	0.003	0.661			
ZTrnd24h_gm	-0.039	-0.011	0.209	0.248		
ZNsStrts24_	0.037	-0.002	-0.892	-0.756	-0.180	
HRC_c	-0.544	0.002	-0.424	0.108	-0.105	0.045

> performance::icc(AIM1\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.055

Conditional ICC: 0.045

> performance::r2(AIM1\_ALd)

# R2 for Mixed Models

Conditional R2: 0.229

Marginal R2: 0.185

> screenreg(AIM1\_ALd)

```
=====
                        Model 1
-----
(Intercept)                -0.34 *
                           (0.17)
ZLDEN_cmc                   0.81 ***
```

	(0.07)
ZFlights24h_gmc	-0.14
	(0.58)
ZNightflightrate_gmc	-0.01
	(0.21)
ZTrend24h_gmc	-0.18
	(0.11)
ZNoiseStarts24_gmc	0.74
	(0.48)
HRC_c	-0.76
	(0.52)

```
-----
AIC                29418.29
BIC                29491.43
Log Likelihood    -14700.14
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.19
Var: Airport3.1 ZLDEN_cmc  0.05
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(AIM1_ALd)
```

```
$Airport3
```

	(Intercept)	ZLDEN_cmc
1	-0.24491710	0.24478675
1.1	0.20932131	0.09415148
1.2	-0.40972879	0.20927969
1.3	0.57817431	0.06057048
2	0.54050175	-0.08026785
3	0.05195586	-0.07261168
4	0.14260191	0.10611651
91	-0.76766950	-0.01913233
92	0.57269977	0.16409313
93	-0.55502453	0.02342523
94	0.10847265	-0.25367226
95	-0.19768447	-0.49855488

```
with conditional variances for "Airport3"
```

#### 4.15.4 Vergleichstest ALd

##### 4.15.4.1 > *anova(CIM\_ALd, AIM1\_ALd)*

Data: dat

Models:

CIM\_ALd: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +

CIM\_ALd: ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALd: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +

AIM1\_ALd: ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALd	8	29488	29553	-14736	29472			
AIM1_ALd	9	29418	29491	-14700	29400	71.771	1	< 2.2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.15.5 FM\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3) +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29404.5	29518.2	-14688.2	29376.5	24979

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.7177	-0.7305	-0.4288	0.8466	5.1469

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.196462	0.44324
Airport3.1	ZLDEN_cmc	0.002649	0.05147

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34705	0.17613	-1.970	0.0488 *
ZLDEN_cmc	0.98083	0.03357	29.217	< 2e-16 ***
ZFlights24h_gmc	-0.16238	0.58185	-0.279	0.7802
ZNightflightrate_gmc	-0.01588	0.21231	-0.075	0.9404
ZTrend24h_gmc	-0.18129	0.10652	-1.702	0.0888 .
ZNoiseStarts24_gmc	0.74968	0.48169	1.556	0.1196
HRC_c	-0.74640	0.51879	-1.439	0.1502
ZLDEN_cmc:ZFlights24h_gmc	0.13166	0.12402	1.062	0.2884
ZLDEN_cmc:ZNightflightrate_gmc	-0.06187	0.03954	-1.565	0.1176
ZLDEN_cmc:ZTrend24h_gmc	0.02305	0.02445	0.943	0.3458
ZLDEN_cmc:ZNoiseStarts24_gmc	0.24952	0.10216	2.442	0.0146 *
ZLDEN_cmc:HRC_c	-0.68260	0.11640	-5.864	4.52e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLDEN_:ZF	ZLDEN_:ZN_	ZLDEN_:ZT	Z
ZLDEN_:ZNS											
ZLDEN_cmc	-0.025										
ZFlights24h_	0.263	-0.012									
ZNghtflght_	0.007	0.003	0.662								
ZTrnd24h_gm	-0.041	-0.006	0.210	0.249							
ZNSstrts24_	0.036	0.005	-0.892	-0.755	-0.182						
HRC_c	-0.540	0.025	-0.423	0.105	-0.104	0.047					
ZLDEN_:ZF24	-0.013	0.212	-0.038	-0.015	-0.003	0.033	0.024				
ZLDEN_c:ZN_	0.004	-0.125	-0.018	-0.014	-0.009	0.019	0.000	0.695			
ZLDEN_:ZT24	-0.004	0.104	-0.003	-0.008	-0.035	0.004	0.000	0.233	0.328		
ZLDEN_:ZNS2	0.006	0.086	0.034	0.016	0.004	-0.034	-0.013	-0.896	-0.771	-0.165	
ZLDEN_:HRC_	0.024	-0.644	0.022	0.000	0.002	-0.011	-0.037	-0.432	0.088	-0.187	

0.049

> performance::icc(FM\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

```
Conditional ICC: 0.045
> performance::r2(FM_ALd)
# R2 for Mixed Models
```

```
Conditional R2: 0.245
Marginal R2: 0.200
> screenreg(FM_ALd)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.35 *
                                (0.18)
ZLDEN_cmc                       0.98 ***
                                (0.03)
ZFlights24h_gmc                 -0.16
                                (0.58)
ZNightflightrate_gmc           -0.02
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.75
                                (0.48)
HRC_c                          -0.75
                                (0.52)
ZLDEN_cmc:ZFlights24h_gmc       0.13
                                (0.12)
ZLDEN_cmc:ZNightflightrate_gmc -0.06
                                (0.04)
ZLDEN_cmc:ZTrend24h_gmc         0.02
                                (0.02)
ZLDEN_cmc:ZNoiseStarts24_gmc   0.25 *
                                (0.10)
ZLDEN_cmc:HRC_c                 -0.68 ***
                                (0.12)
-----
AIC                             29404.47
BIC                             29518.23
Log Likelihood                  -14688.23
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLDEN_cmc        0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALd)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.25638727 -0.0034343830
1.1 0.21120655 -0.0563050473
1.2 -0.39982527 0.0700734255
1.3 0.58095846 -0.0010048125
2 0.53190170 -0.0182547049
3 0.05412985 0.0032581128
4 0.15001678 0.0256552073
91 -0.77373611 -0.0005577526
92 0.59226929 0.0264004710
93 -0.58620430 -0.0384775813
94 0.11238124 0.0047108103
```

95 -0.19866574 -0.0159387949

with conditional variances for "Airport3"

#### 4.16 Modell ALq10 (akustischer Prädiktor $L_{Aeq,24h}(k = 10)$ )

##### 4.16.1 M0\_ALq10

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

Scaled residuals:

```
      Min      1Q  Median      3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

Random effects:

```
Groups   Name          Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
---
```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALq10@theta[1] ^ 2 / (M0_ALq10@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq10)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq10)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq10)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(M0_ALq10)
$Airport3
  (Intercept)
1      0.4686904885
1.1    0.7435390058
1.2    0.0001140482
1.3    0.6990449052
2      0.2338175059
3      0.5264938387
4      0.4750795415
91    -1.1814080555
92     0.2169198868
93    -0.4855654165
94    -0.8947654414
95    -0.7829518165
```

with conditional variances for "Airport3"

```
>
```

**4.16.2 CIM\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29508.3	29573.3	-14746.2	29492.3	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6083	-0.7396	-0.4200	0.8517	6.5857

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1982	0.4452

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32113	0.17724	-1.812	0.0700 .
ZLpAeq0024_cmc	0.84621	0.01653	51.179	<2e-16 ***
ZFlights24h_gmc	-0.12549	0.58740	-0.214	0.8308
ZNightflightrate_gmc	-0.02247	0.21410	-0.105	0.9164
ZTrend24h_gmc	-0.17999	0.10695	-1.683	0.0924 .
ZNoiseStarts24_gmc	0.80563	0.48658	1.656	0.0978 .
HRC_c	-0.94040	0.52532	-1.790	0.0734 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA002	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq0024_c	-0.012					
ZFlights24h_	0.263	-0.004				
ZNghtflight_	0.005	0.001	0.663			
ZTrnd24h_gm	-0.039	-0.005	0.212	0.249		
ZNsStrts24_	0.038	0.008	-0.892	-0.757	-0.182	
HRC_c	-0.543	-0.004	-0.422	0.107	-0.107	0.044

> performance::icc(CIM\_ALq10)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_ALq10)

# R2 for Mixed Models

Conditional R2: 0.247

Marginal R2: 0.201

> screenreg(CIM\_ALq10)

```
=====
                        Model 1
-----
(Intercept)                -0.32
                           (0.18)
ZLpAeq0024_cmc              0.85 ***
                           (0.02)
```

ZFlights24h_gmc	-0.13 (0.59)
ZNightflightrate_gmc	-0.02 (0.21)
ZTrend24h_gmc	-0.18 (0.11)
ZNoiseStarts24_gmc	0.81 (0.49)
HRC_c	-0.94 (0.53)

```
-----
AIC                29508.31
BIC                29573.32
Log Likelihood    -14746.15
Num. obs.         24993
Num. groups: Airport3    12
Var: Airport3 (Intercept)  0.20
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_ALq10)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.26640206
1.1 0.19352413
1.2 -0.37084306
1.3 0.59555047
2 0.54227890
3 0.04963420
4 0.15074346
91 -0.77220656
92 0.60220849
93 -0.59164740
94 0.09494711
95 -0.21293850
```

```
with conditional variances for "Airport3"
```

**4.16.3 AIM1\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29417.0	29490.2	-14699.5	29399.0	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9100	-0.7301	-0.4198	0.8397	4.3930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18853	0.4342
Airport3.1	ZLpAeq0024_cmc	0.05308	0.2304

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34126	0.17314	-1.971	0.0487 *
ZLpAeq0024_cmc	0.80154	0.07142	11.223	<2e-16 ***
ZFlights24h_gmc	-0.13119	0.57624	-0.228	0.8199
ZNightflightrate_gmc	-0.01431	0.20922	-0.068	0.9455
ZTrend24h_gmc	-0.18414	0.10460	-1.760	0.0783 .
ZNoiseStarts24_gmc	0.73002	0.47637	1.532	0.1254
HRC_c	-0.78214	0.51294	-1.525	0.1273

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLA002	ZFl24_	ZNght_	ZTr24_	ZNS24_	
ZLpAeq0024_c	-0.007					
ZFlights24h_	0.265	0.004				
ZNghtflght_	0.007	0.003	0.664			
ZTrnd24h_gm	-0.038	-0.011	0.211	0.250		
ZNSstrts24_	0.035	-0.003	-0.893	-0.758	-0.182	
HRC_c	-0.543	0.001	-0.426	0.103	-0.106	0.050

> performance::icc(AIM1\_ALq10)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.054

Conditional ICC: 0.044

> performance::r2(AIM1\_ALq10)

# R2 for Mixed Models

Conditional R2: 0.228

Marginal R2: 0.184

> screenreg(AIM1\_ALq10)

```
=====
                                Model 1
-----
(Intercept)                    -0.34 *
                                (0.17)
ZLpAeq0024_cmc                  0.80 ***
```

	(0.07)
ZFlights24h_gmc	-0.13
	(0.58)
ZNightflightrate_gmc	-0.01
	(0.21)
ZTrend24h_gmc	-0.18
	(0.10)
ZNoiseStarts24_gmc	0.73
	(0.48)
HRC_c	-0.78
	(0.51)

```
-----
AIC                29417.03
BIC                29490.17
Log Likelihood    -14699.51
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.19
Var: Airport3.1 ZLpAeq0024_cmc  0.05
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(AIM1\_ALq10)

\$Airport3

```
  (Intercept) ZLpAeq0024_cmc
1  -0.24084685  0.20329686
1.1 0.21058517  0.09271405
1.2 -0.41688565  0.25035035
1.3 0.57737516  0.15678943
2   0.53757723 -0.07070689
3   0.05124066 -0.09047446
4   0.13959651  0.09192527
91 -0.76019171 -0.01360524
92  0.56059279  0.19929063
93 -0.54275440 -0.05706820
94  0.10779476 -0.25108821
95 -0.19524728 -0.53368472
```

with conditional variances for "Airport3"



**4.16.4 Vergleichstest ALq10****4.16.4.1 > anova(CIM\_ALq10, AIM1\_ALq10)**

Data: dat

Models:

CIM\_ALq10: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq10: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq10: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq10: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc ||

AIM1\_ALq10: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq10	8	29508	29573	-14746	29492			
AIM1_ALq10	9	29417	29490	-14700	29399	93.279	1	< 2.2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.16.5 FM\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
 ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc ||  
 Airport3) + ZLpAeq0024\_cmc:ZFlights24h\_gmc + ZLpAeq0024\_cmc:ZNightflightrate\_gmc +  
 ZLpAeq0024\_cmc:ZTrend24h\_gmc + ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c

\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29408.9	29522.7	-14690.5	29380.9	24979

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8933	-0.7301	-0.4219	0.8383	4.8328

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.192812	0.43910
Airport3.1	ZLpAeq0024_cmc	0.006843	0.08272

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34461	0.17487	-1.971	0.0488 *
ZLpAeq0024_cmc	0.97299	0.04245	22.923	< 2e-16 ***
ZFlights24h_gmc	-0.14042	0.58138	-0.242	0.8091
ZNightflightrate_gmc	-0.01529	0.21152	-0.072	0.9424
ZTrend24h_gmc	-0.18324	0.10564	-1.734	0.0828 .
ZNoiseStarts24_gmc	0.73227	0.48112	1.522	0.1280
HRC_c	-0.77276	0.51605	-1.497	0.1343
ZLpAeq0024_cmc:ZFlights24h_gmc	0.12026	0.14987	0.802	0.4223
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.06034	0.05016	-1.203	0.2289
ZLpAeq0024_cmc:ZTrend24h_gmc	0.03084	0.02916	1.058	0.2902
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.25883	0.12311	2.102	0.0355 *
ZLpAeq0024_cmc:HRC_c	-0.64953	0.13708	-4.738	2.15e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLpA0024_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA0024_:ZF	ZLA0024_:ZN_	ZLA0
024_:ZT	ZLA0024_:ZNS								
ZLpAq0024_c	-0.019								
ZFlights24h_	0.264	-0.006							
ZNghtflght_	0.007	0.004	0.665						
ZTrnd24h_gm	-0.040	-0.005	0.211	0.250					
ZNsStrts24_	0.035	0.001	-0.893	-0.758	-0.182				
HRC_c	-0.542	0.017	-0.424	0.103	-0.105	0.049			
ZLA0024_:ZF	-0.008	0.219	-0.027	-0.011	0.000	0.024	0.016		
ZLA0024_:ZN_	0.004	-0.082	-0.012	-0.010	-0.006	0.013	-0.001	0.681	
ZLA0024_:ZT	-0.003	0.058	0.001	-0.005	-0.032	0.002	-0.002	0.203	0.285
ZLA0024_:ZNS	0.002	0.074	0.025	0.012	0.001	-0.026	-0.007	-0.896	-0.766
62									
ZLA0024_:HR	0.017	-0.600	0.014	-0.001	0.000	-0.006	-0.027	-0.422	0.102
57	0.050								-0.1

&gt; performance::icc(FM\_ALq10)

# Intraclass Correlation Coefficient

```

Adjusted ICC: 0.055
Conditional ICC: 0.044
> performance::r2(FM_ALq10)
# R2 for Mixed Models

Conditional R2: 0.245
Marginal R2: 0.201
> screenreg(FM_ALq10)

=====
Model 1
-----
(Intercept)                -0.34 *
                             (0.17)
ZLpAeq0024_cmc              0.97 ***
                             (0.04)
ZFlights24h_gmc             -0.14
                             (0.58)
ZNightflightrate_gmc       -0.02
                             (0.21)
ZTrend24h_gmc               -0.18
                             (0.11)
ZNoiseStarts24_gmc         0.73
                             (0.48)
HRC_c                       -0.77
                             (0.52)
ZLpAeq0024_cmc:ZFlights24h_gmc 0.12
                             (0.15)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.06
                             (0.05)
ZLpAeq0024_cmc:ZTrend24h_gmc 0.03
                             (0.03)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.26 *
                             (0.12)
ZLpAeq0024_cmc:HRC_c       -0.65 ***
                             (0.14)
-----
AIC                          29408.91
BIC                          29522.68
Log Likelihood                -14690.45
Num. obs.                     24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.19
Var: Airport3.1 ZLpAeq0024_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALq10)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.25334613 -0.0471558946
1.1 0.21491658 -0.0803715106
1.2 -0.40824651 0.1157329535
1.3 0.58135891 0.0538531886
2 0.53201636 -0.0194725962
3 0.05246919 0.0015147288
4 0.14498613 0.0519308251
91 -0.76454650 -0.0003872135
92 0.57773436 0.0686540544
93 -0.57081440 -0.1064919061

```

94	0.10973133	-0.0043863862
95	-0.19549766	-0.0418357342

**4.17 Modell ALq20 (akustischer Prädiktor  $L_{Aeq,24h}(k = 20)$ )****4.17.1 M0\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALq20@theta[1] ^ 2 / (M0_ALq20@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq20)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq20)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq20)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALq20)
$Airport3
  (Intercept)
1 0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.17.2 CIM\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30021.3	30086.3	-15002.7	30005.3	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6882	-0.7571	-0.4386	0.8933	4.3525

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1752	0.4185

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.29961	0.16668	-1.798	0.0722 .
ZLpAeq24h_k20_cmc	0.79460	0.01696	46.859	<2e-16 ***
ZFlights24h_gmc	-0.06808	0.55296	-0.123	0.9020
ZNightflightrate_gmc	-0.02426	0.20140	-0.120	0.9041
ZTrend24h_gmc	-0.16867	0.10075	-1.674	0.0941 .
ZNoiseStarts24_gmc	0.71608	0.45778	1.564	0.1178
HRC_c	-0.91562	0.49320	-1.856	0.0634 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq24_20_	-0.009					
ZFlights24h_	0.263	-0.001				
ZNghtflight_	0.006	0.001	0.664			
ZTrnd24h_gm	-0.039	-0.001	0.210	0.249		
ZNsStrts24_	0.037	0.002	-0.893	-0.757	-0.181	
HRC_c	-0.542	-0.002	-0.422	0.106	-0.106	0.045

> performance::icc(CIM\_ALq20)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.042

> performance::r2(CIM\_ALq20)

# R2 for Mixed Models

Conditional R2: 0.214

Marginal R2: 0.172

> screenreg(CIM\_ALq20)

```
=====
                        Model 1
-----
(Intercept)                -0.30
                           (0.17)
ZLpAeq24h_k20_cmc          0.79 ***
                           (0.02)
```

ZFlights24h_gmc	-0.07 (0.55)
ZNightflightrate_gmc	-0.02 (0.20)
ZTrend24h_gmc	-0.17 (0.10)
ZNoiseStarts24_gmc	0.72 (0.46)
HRC_c	-0.92 (0.49)

```
-----
AIC                30021.32
BIC                30086.33
Log Likelihood    -15002.66
Num. obs.         24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.18
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_ALq20)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.21596904
1.1 0.19613884
1.2 -0.41168400
1.3 0.54853257
2 0.51126708
3 0.05219998
4 0.13344879
91 -0.74438530
92 0.54996891
93 -0.52331170
94 0.10373884
95 -0.18499936
```

```
with conditional variances for "Airport3"
```



**4.17.3 AIM1\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29974.4	30047.5	-14978.2	29956.4	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9057	-0.7542	-0.4455	0.8749	5.2182

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17417	0.4173
Airport3.1	ZLpAeq24h_k20_cmc	0.08941	0.2990

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32613	0.16609	-1.964	0.0496 *
ZLpAeq24h_k20_cmc	0.85019	0.09366	9.078	<2e-16 ***
ZFlights24h_gmc	-0.08178	0.54770	-0.149	0.8813
ZNightflightrate_gmc	-0.01225	0.19996	-0.061	0.9512
ZTrend24h_gmc	-0.17553	0.10054	-1.746	0.0808 .
ZNoiseStarts24_gmc	0.68726	0.45365	1.515	0.1298
HRC_c	-0.81652	0.49025	-1.666	0.0958 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq24_20_	-0.008					
ZFlights24h_	0.261	0.002				
ZNightflght_	0.004	0.003	0.661			
ZTrnd24h_gm	-0.040	-0.009	0.208	0.248		
ZNsStrts24_	0.040	-0.002	-0.892	-0.755	-0.180	
HRC_c	-0.541	0.003	-0.422	0.109	-0.105	0.043

> performance::icc(AIM1\_ALq20)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.050

Conditional ICC: 0.041

> performance::r2(AIM1\_ALq20)

# R2 for Mixed Models

Conditional R2: 0.226

Marginal R2: 0.185

> screenreg(AIM1\_ALq20)

```
=====
                                Model 1
-----
(Intercept)                    -0.33 *
                                (0.17)
ZLpAeq24h_k20_cmc              0.85 ***
```

	(0.09)
ZFlights24h_gmc	-0.08
	(0.55)
ZNightflightrate_gmc	-0.01
	(0.20)
ZTrend24h_gmc	-0.18
	(0.10)
ZNoiseStarts24_gmc	0.69
	(0.45)
HRC_c	-0.82
	(0.49)

```
-----
AIC                29974.38
BIC                30047.52
Log Likelihood    -14978.19
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.17
Var: Airport3.1 ZLpAeq24h_k20_cmc  0.09
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(AIM1\_ALq20)

\$Airport3

```
  (Intercept) ZLpAeq24h_k20_cmc
1 -0.23062650    0.33086453
1.1 0.21056789   -0.06296706
1.2 -0.41405461  -0.01137870
1.3 0.55746225  -0.14949144
2  0.51446029    0.24367337
3  0.04921218   -0.19492610
4  0.13342417    0.07684406
91 -0.72756998  -0.03734508
92  0.53420746    0.47467661
93 -0.51633002    0.10938877
94  0.10416713   -0.17818044
95 -0.18589077   -0.62908580
```

with conditional variances for "Airport3"

**4.17.4 Vergleichstest ALq20****4.17.4.1 > anova(CIM\_ALq20, AIM1\_ALq20)**

Data: dat

Models:

CIM\_ALq20: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq20: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq20: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq20: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc ||

AIM1\_ALq20: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq20	8	30021	30086	-15003	30005			
AIM1_ALq20	9	29974	30048	-14978	29956	48.943	1	2.635e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.17.5 FM\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial ( logit )  
 Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
 ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc |  
 Airport3) + ZLpAeq24h\_k20\_cmc:ZFlights24h\_gmc + ZLpAeq24h\_k20\_cmc:ZNightflightrate\_gmc +  
 ZLpAeq24h\_k20\_cmc:ZTrend24h\_gmc + ZLpAeq24h\_k20\_cmc:ZNoiseStarts24\_gmc + ZLpAeq24h\_k2  
 0\_cmc:HRC\_c  
 Data: dat

AIC	BIC	logLik	deviance	df.resid
29955.9	30069.7	-14963.9	29927.9	24979

scaled residuals:

Min	1Q	Median	3Q	Max
-2.8786	-0.7545	-0.4530	0.8773	6.0448

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.185562	0.43077
Airport3.1	ZLpAeq24h_k20_cmc	0.001462	0.03824

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32606	0.17109	-1.906	0.056683 .
ZLpAeq24h_k20_cmc	1.00466	0.03833	26.211	< 2e-16 ***
ZFlights24h_gmc	-0.06656	0.56202	-0.118	0.905724
ZNightflightrate_gmc	-0.01120	0.20566	-0.054	0.956557
ZTrend24h_gmc	-0.18082	0.10357	-1.746	0.080843 .
ZNoiseStarts24_gmc	0.67996	0.46558	1.460	0.144162
HRC_c	-0.81480	0.50309	-1.620	0.105321
ZLpAeq24h_k20_cmc:ZFlights24h_gmc	-0.04134	0.15085	-0.274	0.784036
ZLpAeq24h_k20_cmc:ZNightflightrate_gmc	-0.14427	0.04116	-3.505	0.000456 ***
ZLpAeq24h_k20_cmc:ZTrend24h_gmc	0.12474	0.03099	4.025	5.69e-05 ***
ZLpAeq24h_k20_cmc:ZNoiseStarts24_gmc	0.38430	0.11804	3.256	0.001131 **
ZLpAeq24h_k20_cmc:HRC_c	-0.95624	0.16079	-5.947	2.73e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA24_20_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA24_20_:ZF	ZLA24_20_:ZN_
ZLA24_20_:ZT									
ZLpAq24_20_	-0.025								
ZFlghts24h_	0.261	-0.010							
ZNghtflght_	0.005	0.005	0.660						
ZTrnd24h_gm	-0.041	-0.004	0.207	0.247					
ZNsStrts24_	0.040	0.004	-0.891	-0.753	-0.179				
HRC_c	-0.539	0.024	-0.421	0.109	-0.103	0.043			
ZLA24_20_:ZF	-0.008	0.311	-0.033	-0.015	-0.003	0.031	0.018		
ZLA24_20_:ZN_	0.008	-0.165	-0.019	-0.019	-0.012	0.022	-0.004	0.678	
ZLA24_20_:ZT	-0.004	0.239	-0.003	-0.008	-0.034	0.006	-0.005	0.233	0.353
ZLA24_20_:ZNS	0.001	0.000	0.031	0.017	0.006	-0.032	-0.009	-0.881	-0.756
-0.151									
ZLA24_20_:H	0.020	-0.763	0.017	-0.002	-0.004	-0.009	-0.028	-0.532	0.042
-0.231									
ZLA24_20_:ZNS									
ZLpAq24_20_									

```

ZFlights24h_
ZNightflight_
ZTrnd24h_gm
ZNsStrts24_
HRC_c
ZLA24_20_:ZF
ZLA24_20_:ZN_
ZLA24_20_:ZT
ZLA24_20_:ZNS
ZLA24_20_:H    0.119
convergence code: 0
Model failed to converge with max|grad| = 0.00273955 (tol = 0.002, component 1)

```

```

> performance::icc(FM_ALq20)
# Intraclass Correlation Coefficient

```

```

    Adjusted ICC: 0.053
    Conditional ICC: 0.044

```

```

> performance::r2(FM_ALq20)
# R2 for Mixed Models

```

```

    Conditional R2: 0.220
    Marginal R2: 0.176

```

```

> screenreg(FM_ALq20)

```

```

=====
                                Model 1
-----
(Intercept)                    -0.33
                                (0.17)
ZLpAeq24h_k20_cmc              1.00 ***
                                (0.04)
ZFlights24h_gmc                -0.07
                                (0.56)
ZNightflightrate_gmc          -0.01
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.68
                                (0.47)
HRC_c                          -0.81
                                (0.50)
ZLpAeq24h_k20_cmc:ZFlights24h_gmc -0.04
                                (0.15)
ZLpAeq24h_k20_cmc:ZNightflightrate_gmc -0.14 ***
                                (0.04)
ZLpAeq24h_k20_cmc:ZTrend24h_gmc 0.12 ***
                                (0.03)
ZLpAeq24h_k20_cmc:ZNoiseStarts24_gmc 0.38 **
                                (0.12)
ZLpAeq24h_k20_cmc:HRC_c       -0.96 ***
                                (0.16)
-----
AIC                             29955.89
BIC                             30069.66
Log Likelihood                  -14963.94
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19

```

---

Var: Airport3.1 ZLpAeq24h\_k20\_cmc 0.00

=====  
\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(FM\_ALq20)

\$Airport3

	(Intercept)	ZLpAeq24h_k20_cmc
1	-0.22339623	0.0116126208
1.1	0.20332764	-0.0340498744
1.2	-0.41378385	0.0427952121
1.3	0.54992811	-0.0202666390
2	0.53459469	-0.0023110969
3	0.05538077	0.0010407137
4	0.13701720	0.0008035294
91	-0.77713055	-0.0040835323
92	0.56292112	0.0135751292
93	-0.54073823	-0.0097008431
94	0.11601427	-0.0030258975
95	-0.18836257	0.0019866955

with conditional variances for "Airport3"

**4.18 Modell ALq30 (akustischer Prädiktor  $L_{Aeq,24h}(k = 30)$ )****4.18.1 M0\_ALq30**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
```

```
Family: binomial (logit)
```

```
Formula: HA ~ (1 | Airport3)
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name             Variance Std.Dev.
Airport3 (Intercept) 0.4188  0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544      0.1864  -3.511 0.000446 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALq30@theta[1] ^ 2 / (M0_ALq30@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq30)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq30)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq30)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALq30)
$Airport3
  (Intercept)
1  0.4686904885
1.1 0.7435390058
```

```

1.2 0.0001140482
1.3 0.6990449052
2 0.2338175059
3 0.5264938387
4 0.4750795415
91 -1.1814080555
92 0.2169198868
93 -0.4855654165
94 -0.8947654414
95 -0.7829518165

```

with conditional variances for "Airport3"

>

**4.18.2** > summary(CIM\_ALq30)

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30605.2	30670.3	-15294.6	30589.2	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.0385	-0.7874	-0.4686	0.9354	4.5588

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1656	0.4069

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28778	0.16201	-1.776	0.0757 .
ZLpAeq24h_k30_cmc	0.75596	0.01822	41.499	<2e-16 ***
ZFlights24h_gmc	-0.06529	0.53744	-0.121	0.9033
ZNightflightrate_gmc	-0.02665	0.19559	-0.136	0.8916
ZTrend24h_gmc	-0.16390	0.09803	-1.672	0.0945 .
ZNoiseStarts24_gmc	0.69671	0.44474	1.567	0.1172
HRC_c	-0.89605	0.47882	-1.871	0.0613 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq24_30_	-0.007					
ZFlights24h_	0.263	-0.001				
ZNightflght_	0.006	0.000	0.663			
ZTrnd24h_gm	-0.039	0.001	0.210	0.249		
ZNSstrts24_	0.037	0.001	-0.893	-0.757	-0.181	
HRC_c	-0.542	0.000	-0.423	0.105	-0.106	0.046

> performance::icc(CIM\_ALq30)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.048

Conditional ICC: 0.041

> performance::r2(CIM\_ALq30)

# R2 for Mixed Models



```

Conditional R2: 0.185
Marginal R2: 0.144
> screenreg(CIM_ALq30)

=====
                        Model 1
-----
(Intercept)                -0.29
                           (0.16)
ZLpAeq24h_k30_cmc          0.76 ***
                           (0.02)
ZFlights24h_gmc            -0.07
                           (0.54)
ZNightflightrate_gmc      -0.03
                           (0.20)
ZTrend24h_gmc              -0.16
                           (0.10)
ZNoiseStarts24_gmc        0.70
                           (0.44)
HRC_c                      -0.90
                           (0.48)
-----
AIC                        30605.24
BIC                        30670.26
Log Likelihood             -15294.62
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.17
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALq30)
$Airport3
  (Intercept)
1 -0.20118043
1.1 0.18928365
1.2 -0.41226965
1.3 0.53091864
2 0.49109690
3 0.05343206
4 0.13309191
91 -0.72695316
92 0.53211731
93 -0.50508930
94 0.10837165
95 -0.17762085

with conditional variances for "Airport3"
>

```

**4.18.3 AIM1\_ALq30**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k30\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30545.8	30619.0	-15263.9	30527.8	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.5442	-0.7880	-0.4691	0.9195	5.4819

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1694	0.4116
Airport3.1	ZLpAeq24h_k30_cmc	0.1862	0.4315

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.30784	0.16420	-1.875	0.0608 .
ZLpAeq24h_k30_cmc	0.89883	0.13597	6.611	3.83e-11 ***
ZFlights24h_gmc	-0.05692	0.54506	-0.104	0.9168
ZNightflightrate_gmc	-0.01528	0.19812	-0.077	0.9385
ZTrend24h_gmc	-0.16915	0.09918	-1.706	0.0881 .
ZNoiseStarts24_gmc	0.66905	0.45052	1.485	0.1375
HRC_c	-0.84977	0.48649	-1.747	0.0807 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_	
ZLpAq24_30_	-0.006					
ZFlights24h_	0.265	0.002				
ZNghtflght_	0.006	0.002	0.663			
ZTrnd24h_gm	-0.039	-0.006	0.210	0.249		
ZNSstrts24_	0.036	-0.001	-0.892	-0.757	-0.181	
HRC_c	-0.544	0.002	-0.425	0.104	-0.106	0.048

> performance::icc(AIM1\_ALq30)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.049

Conditional ICC: 0.040

> performance::r2(AIM1\_ALq30)

# R2 for Mixed Models

Conditional R2: 0.215

Marginal R2: 0.175

> screenreg(AIM1\_ALq30)

```
=====
                                Model 1
-----
(Intercept)                    -0.31
                                (0.16)
ZLpAeq24h_k30_cmc              0.90 ***
```

	(0.14)
ZFlights24h_gmc	-0.06
	(0.55)
ZNightflightrate_gmc	-0.02
	(0.20)
ZTrend24h_gmc	-0.17
	(0.10)
ZNoiseStarts24_gmc	0.67
	(0.45)
HRC_c	-0.85
	(0.49)

```
-----
AIC                30545.83
BIC                30618.96
Log Likelihood    -15263.91
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.17
Var: Airport3.1 ZLpAeq24h_k30_cmc  0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(AIM1\_ALq30)

\$Airport3

```
  (Intercept) ZLpAeq24h_k30_cmc
1  -0.22304373    0.522061600
1.1 0.20507972   -0.163101520
1.2 -0.40741223   -0.118386500
1.3 0.54353006   -0.254968756
2   0.49100214    0.647702528
3   0.05136319   -0.257987227
4   0.13920245   -0.009924774
91  -0.71770888    0.046952971
92   0.54047090    0.288821187
93  -0.52034079    0.294418144
94   0.10805410   -0.126600132
95  -0.18363919   -0.901574262
```

with conditional variances for "Airport3"

**4.18.4 Vergleichstest ALq30****4.18.4.1 > anova(CIM\_ALq30, AIM1\_ALq30)**

Data: dat

Models:

CIM\_ALq30: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq30: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq30: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq30: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k30\_cmc ||

AIM1\_ALq30: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq30	8	30605	30670	-15295	30589			
AIM1_ALq30	9	30546	30619	-15264	30528	61.418	1	4.615e-15 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.18.5 FM\_ALq30**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial ( logit )  
 Formula: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
 ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k30\_cmc ||  
 Airport3) + ZLpAeq24h\_k30\_cmc:ZFlights24h\_gmc + ZLpAeq24h\_k30\_cmc:ZNightflightrate\_gmc +  
 ZLpAeq24h\_k30\_cmc:ZTrend24h\_gmc + ZLpAeq24h\_k30\_cmc:ZNoiseStarts24\_gmc + ZLpAeq24h\_k3  
 0\_cmc:HRC\_c  
 Data: dat

AIC	BIC	logLik	deviance	df.resid
30523.2	30636.9	-15247.6	30495.2	24979

scaled residuals:

Min	1Q	Median	3Q	Max
-2.5352	-0.7857	-0.4637	0.9226	5.7256

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.174145	0.41731
Airport3.1	ZLpAeq24h_k30_cmc	0.003073	0.05543

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.30702	0.16601	-1.849	0.064399 .
ZLpAeq24h_k30_cmc	1.11172	0.05621	19.778	< 2e-16 ***
ZFlights24h_gmc	-0.04222	0.55119	-0.077	0.938940
ZNightflightrate_gmc	-0.01369	0.20069	-0.068	0.945621
ZTrend24h_gmc	-0.17322	0.10050	-1.724	0.084765 .
ZNoiseStarts24_gmc	0.66428	0.45629	1.456	0.145440
HRC_c	-0.85488	0.48955	-1.746	0.080768 .
ZLpAeq24h_k30_cmc:ZFlights24h_gmc	-0.16526	0.21387	-0.773	0.439673
ZLpAeq24h_k30_cmc:ZNightflightrate_gmc	-0.19233	0.05202	-3.697	0.000218 ***
ZLpAeq24h_k30_cmc:ZTrend24h_gmc	0.26935	0.04615	5.836	5.34e-09 ***
ZLpAeq24h_k30_cmc:ZNoiseStarts24_gmc	0.59987	0.16128	3.719	0.000200 ***
ZLpAeq24h_k30_cmc:HRC_c	-1.38132	0.25855	-5.342	9.17e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA24_30_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA24_30_:ZF	ZLA24_30_:ZN_
ZLA24_30_:ZT									
ZLpAq24_30_	-0.018								
ZFlghts24h_	0.262	-0.004							
ZNghtflght_	0.007	0.005	0.664						
ZTrnd24h_gm	-0.040	0.000	0.210	0.249					
ZNsstrts24_	0.037	0.002	-0.893	-0.757	-0.181				
HRC_c	-0.540	0.013	-0.423	0.104	-0.105	0.047			
ZLA24_30_:ZF	-0.004	0.379	-0.023	-0.010	0.003	0.022	0.011		
ZLA24_30_:ZN_	0.007	-0.143	-0.015	-0.015	-0.007	0.017	-0.003	0.646	
ZLA24_30_:ZT	-0.004	0.360	0.000	-0.004	-0.022	0.003	-0.006	0.165	0.258
ZLA24_30_:ZNS	-0.001	-0.015	0.023	0.013	0.004	-0.024	-0.008	-0.841	-0.739
-0.072									
ZLA24_30_:H	0.012	-0.794	0.009	-0.003	-0.008	-0.006	-0.013	-0.595	0.012
-0.266									
ZLA24_30_:ZNS									
ZLpAq24_30_									

```

ZFlights24h_
ZNightflight_
ZTrnd24h_gm
ZNsStrts24_
HRC_c
ZLA24_30_:ZF
ZLA24_30_:ZN_
ZLA24_30_:ZT
ZLA24_30_:ZNS
ZLA24_30_:H    0.113
> performance::icc(FM_ALq30)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.050
Conditional ICC: 0.043
> performance::r2(FM_ALq30)
# R2 for Mixed Models

Conditional R2: 0.194
Marginal R2: 0.151
> screenreg(FM_ALq30)

=====
Model 1
-----
(Intercept)                -0.31
                             (0.17)
ZLpAeq24h_k30_cmc          1.11 ***
                             (0.06)
ZFlights24h_gmc            -0.04
                             (0.55)
ZNightflightrate_gmc       -0.01
                             (0.20)
ZTrend24h_gmc              -0.17
                             (0.10)
ZNoiseStarts24_gmc         0.66
                             (0.46)
HRC_c                       -0.85
                             (0.49)
ZLpAeq24h_k30_cmc:ZFlights24h_gmc -0.17
                             (0.21)
ZLpAeq24h_k30_cmc:ZNightflightrate_gmc -0.19 ***
                             (0.05)
ZLpAeq24h_k30_cmc:ZTrend24h_gmc 0.27 ***
                             (0.05)
ZLpAeq24h_k30_cmc:ZNoiseStarts24_gmc 0.60 ***
                             (0.16)
ZLpAeq24h_k30_cmc:HRC_c     -1.38 ***
                             (0.26)
-----
AIC                          30523.17
BIC                          30636.93
Log Likelihood                -15247.58
Num. obs.                     24993
Num. groups: Airport3         12
Var: Airport3 (Intercept)      0.17
Var: Airport3.1 ZLpAeq24h_k30_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```
> ranef(FM_ALq30)
$Airport3
  (Intercept) ZLpAeq24h_k30_cmc
1 -0.21793642    0.018403042
1.1 0.19878313   -0.056113205
1.2 -0.40720841    0.070934977
1.3 0.53788381   -0.033470981
2  0.51060225    0.011742220
3  0.05456613   -0.001103001
4  0.14034239   -0.008039282
91 -0.74938076   -0.003333157
92 0.54059314   -0.004865364
93 -0.52154383    0.004546625
94 0.11749974   -0.007249751
95 -0.18792857    0.006187764

with conditional variances for "Airport3"
```

**4.19 Modell ALdN50 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,50})$ )****4.19.1 M0\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min      1Q  Median      3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALdN50@theta[1] ^ 2 / (M0_ALdN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALdN50)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood              -16277.53
Num. obs.                   24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALdN50)
$Airport3
  (Intercept)
```



1 0.4686904885  
1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.19.2 CIM\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
  LS50_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29408.3 29489.5 -14694.1 29388.3   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-3.0812 -0.7555 -0.4000  0.8470 11.2375
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1936   0.44
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.22952	0.17525	-1.310	0.1903
ZLDEN_cmc	0.88227	0.02504	35.231	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.04142	0.02581	-1.605	0.1086
ZFlights24h_gmc	-0.04027	0.57869	-0.070	0.9445
ZNightflightrate_gmc	0.01066	0.21115	0.050	0.9597
ZTrend24h_gmc	-0.18265	0.10577	-1.727	0.0842 .
ZNoiseStarts24_gmc	0.73886	0.47924	1.542	0.1231
HRC_c	-0.88908	0.51634	-1.722	0.0851 .
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.18297	0.02045	-8.947	<2e-16 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.003							
ZL_NAT_24_L	-0.015	-0.741						
ZFlights24h_	0.263	0.000	-0.002					
ZNightflight_	0.006	0.005	-0.005	0.663				
ZTrnd24h_gm	-0.040	-0.005	0.003	0.211	0.249			
ZNsStrts24_	0.037	0.004	0.000	-0.892	-0.756	-0.182		
HRC_c	-0.540	0.003	-0.004	-0.422	0.107	-0.106	0.045	
ZLDEN_:ZL_N	-0.056	-0.210	0.229	-0.016	-0.018	0.003	0.014	-0.007

```
> performance::icc(CIM_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.056
```

```
Conditional ICC: 0.044
```

```
> performance::r2(CIM_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.256
```

```
Marginal R2: 0.212
```

```
> screenreg(CIM_ALdN50)
```

```
=====
```

```

                                Model 1
-----
(Intercept)                    -0.23
                                (0.18)
ZLDEN_cmc                       0.88 ***
                                (0.03)
ZLog_NAT_24h_LS50_cmc          -0.04
                                (0.03)
ZFlights24h_gmc                -0.04
                                (0.58)
ZNightflightrate_gmc           0.01
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.74
                                (0.48)
HRC_c                           -0.89
                                (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.18 ***
                                (0.02)
-----
AIC                             29408.28
BIC                             29489.54
Log Likelihood                  -14694.14
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALdn50)
$Airport3
  (Intercept)
1 -0.27414283
1.1 0.19080375
1.2 -0.36151938
1.3 0.59300200
2 0.53073686
3 0.05102876
4 0.16529827
91 -0.76295531
92 0.58067268
93 -0.58461851
94 0.10995996
95 -0.22394136

```

with conditional variances for "Airport3"

**4.19.3 AIM1\_ALdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
  ZLog_NAT_24h_LS50_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29333.1 29422.5 -14655.6 29311.1   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.9295 -0.7470 -0.4083  0.8319  7.9795
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18987 0.4357
Airport3.1  ZLDEN_cmc    0.04344 0.2084
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.24207	0.17363	-1.394	0.1633
ZLDEN_cmc	0.87260	0.06763	12.903	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.11725	0.02842	-4.125	3.7e-05 ***
ZFlights24h_gmc	-0.07307	0.57179	-0.128	0.8983
ZNightflightrate_gmc	0.01548	0.20868	0.074	0.9409
ZTrend24h_gmc	-0.18810	0.10488	-1.793	0.0729 .
ZNoiseStarts24_gmc	0.69790	0.47348	1.474	0.1405
HRC_c	-0.74596	0.51059	-1.461	0.1440
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.19398	0.02118	-9.159	< 2e-16 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	-0.003							
ZL_NAT_24_L	-0.023	-0.243						
ZFlights24h_	0.262	0.005	-0.003					
ZNghtflght_	0.006	0.004	-0.003	0.661				
ZTrnd24h_gm	-0.041	-0.012	0.004	0.208	0.248			
ZNsStrts24_	0.038	-0.002	0.001	-0.892	-0.755	-0.180		
HRC_c	-0.539	0.002	0.000	-0.423	0.107	-0.104	0.045	
ZLDEN_:ZL_N	-0.061	-0.069	0.270	-0.014	-0.015	0.006	0.010	-0.003

```
> performance::icc(AIM1_ALdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.235
```

```
Marginal R2: 0.190
```

```
> screenreg(AIM1_ALdN50)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.24
                                (0.17)
ZLDEN_cmc                      0.87 ***
                                (0.07)
ZLog_NAT_24h_LS50_cmc        -0.12 ***
                                (0.03)
ZFlights24h_gmc              -0.07
                                (0.57)
ZNightflightrate_gmc         0.02
                                (0.21)
ZTrend24h_gmc                -0.19
                                (0.10)
ZNoiseStarts24_gmc           0.70
                                (0.47)
HRC_c                         -0.75
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                                (0.02)
-----
AIC                            29333.12
BIC                            29422.51
Log Likelihood                 -14655.56
Num. obs.                      24993
Num. groups: Airport3         12
Var: Airport3 (Intercept)      0.19
Var: Airport3.1 ZLDEN_cmc     0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN50)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.25609175  0.18485137
1.1 0.20376101  0.11837399
1.2 -0.40143978  0.30344819
1.3 0.58848280  0.07740807
2 0.52224465 -0.13798683
3 0.05339558 -0.05660192
4 0.16091969  0.01067765
91 -0.75426043 -0.02411694
92 0.56205801  0.12604476
93 -0.56001334  0.02548160
94 0.11915208 -0.17996543
95 -0.21012935 -0.46795414

```

with conditional variances for "Airport3"

**4.19.4 AIM2\_ALdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS50\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS50\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29351.4	29440.8	-14664.7	29329.4	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3418	-0.7525	-0.3927	0.8399	9.7677

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18735	0.4328
Airport3.1	ZLog_NAT_24h_LS50_cmc	0.05063	0.2250

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.22838	0.17278	-1.322	0.18623
ZLDEN_cmc	0.90501	0.02543	35.584	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.20868	0.07962	-2.621	0.00877 **
ZFlights24h_gmc	-0.03199	0.57128	-0.056	0.95535
ZNightflightrate_gmc	0.01414	0.20803	0.068	0.94582
ZTrend24h_gmc	-0.18755	0.10418	-1.800	0.07184 .
ZNoiseStarts24_gmc	0.69983	0.47265	1.481	0.13870
HRC_c	-0.85522	0.50992	-1.677	0.09351 .
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.19049	0.02094	-9.099	< 2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.007							
ZL_NAT_24_L	-0.015	-0.301						
ZFlights24h_	0.264	-0.001	0.002					
ZNghtflght_	0.007	0.004	0.002	0.663				
ZTrnd24h_gm	-0.039	-0.007	-0.003	0.211	0.249			
ZNsStrts24_	0.036	0.005	-0.003	-0.892	-0.756	-0.182		
HRC_c	-0.541	0.000	0.003	-0.424	0.105	-0.107	0.047	
ZLDEN_:ZL_N	-0.061	-0.226	0.132	-0.013	-0.015	0.007	0.010	-0.005

convergence code: 0

Model failed to converge with max|grad| = 0.00402352 (tol = 0.002, component 1)

> performance::icc(AIM2\_ALdN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.054

Conditional ICC: 0.044

> performance::r2(AIM2\_ALdN50)

# R2 for Mixed Models

Conditional R2: 0.228

Marginal R2: 0.184  
> screenreg(AIM2\_ALdN50)

```
=====
                                Model 1
-----
(Intercept)                    -0.23
                                (0.17)
ZLDEN_cmc                       0.91 ***
                                (0.03)
ZLog_NAT_24h_LS50_cmc          -0.21 **
                                (0.08)
ZFlights24h_gmc                 -0.03
                                (0.57)
ZNightflightrate_gmc           0.01
                                (0.21)
ZTrend24h_gmc                  -0.19
                                (0.10)
ZNoiseStarts24_gmc             0.70
                                (0.47)
HRC_c                           -0.86
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                                (0.02)
-----
AIC                               29351.45
BIC                               29440.84
Log Likelihood                   -14664.72
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)         0.19
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.05
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(AIM2\_ALdN50)

```
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1   -0.26439285    0.274199372
1.1  0.20606788    0.173345805
1.2 -0.39795005    0.302844996
1.3  0.59722893    0.081970135
2    0.51681012   -0.219859339
3    0.05080681   -0.043272867
4    0.16377979   -0.037013686
91   -0.74068586   -0.133848905
92    0.55347351    0.131545642
93   -0.55447946   -0.196613465
94    0.11491685   -0.004288171
95   -0.21657766   -0.360245027
```

with conditional variances for "Airport3"

**4.19.5 Vergleichstests ALdN50****4.19.5.1 > anova(CIM\_ALdN50, AIM1\_ALdN50)**

Models:

CIM\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN50	10	29408	29490	-14694	29388			
AIM1_ALdN50	11	29333	29423	-14656	29311	77.155	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.19.5.2 > anova(CIM\_ALdN50, AIM2\_ALdN50)**

Models:

CIM\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN50: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN50	10	29408	29490	-14694	29388			
AIM2_ALdN50	11	29351	29441	-14665	29329	58.831	1	1.718e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.19.6 FM\_ALdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 +  
ZLDEN\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS50\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT  
\_24h\_LS50\_cmc + ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc + ZLDEN\_c  
mc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS50  
\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS50  
\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS50\_cmc  
:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29317.7	29504.6	-14635.8	29271.7	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.2647	-0.7453	-0.4069	0.8321	7.5061

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.095239	0.30861
Airport3.1	ZLDEN_cmc	0.001275	0.03571
Airport3.2	(Intercept)	0.099519	0.31547
Airport3.3	ZLog_NAT_24h_LS50_cmc	0.003934	0.06273

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.246234	0.176107	-1.398	0.162051
ZLDEN_cmc	1.052600	0.040435	26.032	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.210070	0.057558	-3.650	0.000263 ***
ZFlights24h_gmc	-0.096823	0.582934	-0.166	0.868081
ZNightflightrate_gmc	0.010690	0.212080	0.050	0.959798
ZTrend24h_gmc	-0.187128	0.106115	-1.763	0.077825 .
ZNoiseStarts24_gmc	0.705931	0.482220	1.464	0.143216
HRC_c	-0.739157	0.518522	-1.426	0.154010
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc	-0.192062	0.021333	-9.003	< 2e-16 ***
ZLDEN_cmc:ZFlights24h_gmc	0.384475	0.141898	2.710	0.006738 **
ZLDEN_cmc:ZNightflightrate_gmc	0.005104	0.046411	0.110	0.912433
ZLDEN_cmc:ZTrend24h_gmc	0.007486	0.028594	0.262	0.793482
ZLDEN_cmc:ZNoiseStarts24_gmc	-0.006679	0.119652	-0.056	0.955483
ZLDEN_cmc:HRC_c	-0.696429	0.136070	-5.118	3.09e-07 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.214872	0.231822	-0.927	0.353988
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	0.016039	0.070382	0.228	0.819735
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	0.033709	0.038849	0.868	0.385564
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.200086	0.182913	1.094	0.274003
ZLog_NAT_24h_LS50_cmc:HRC_c	0.330910	0.193481	1.710	0.087211 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

```
unable to evaluate scaled gradient
Model failed to converge: degenerate Hessian with 1 negative eigenvalues
```

```
> performance::icc(FM_ALdN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.028
Conditional ICC: 0.022
> performance::r2(FM_ALdN50)
# R2 for Mixed Models
```

```
Conditional R2: 0.235
Marginal R2: 0.213
> screenreg(FM_ALdN50)
```

```
=====
Model 1
-----
(Intercept)                -0.25
                             (0.18)
ZLDEN_cmc                   1.05 ***
                             (0.04)
ZLog_NAT_24h_LS50_cmc     -0.21 ***
                             (0.06)
ZFlights24h_gmc           -0.10
                             (0.58)
ZNightflightrate_gmc      0.01
                             (0.21)
ZTrend24h_gmc             -0.19
                             (0.11)
ZNoiseStarts24_gmc        0.71
                             (0.48)
HRC_c                      -0.74
                             (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS50_cmc -0.19 ***
                             (0.02)
ZLDEN_cmc:ZFlights24h_gmc 0.38 **
                             (0.14)
ZLDEN_cmc:ZNightflightrate_gmc 0.01
                             (0.05)
ZLDEN_cmc:ZTrend24h_gmc   0.01
                             (0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc -0.01
                             (0.12)
ZLDEN_cmc:HRC_c           -0.70 ***
                             (0.14)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.21
                             (0.23)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc 0.02
                             (0.07)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc 0.03
                             (0.04)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.20
                             (0.18)
ZLog_NAT_24h_LS50_cmc:HRC_c 0.33
                             (0.19)
-----
AIC                        29317.66
BIC                        29504.57
```

```

Log Likelihood                -14635.83
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.10
Var: Airport3.1 ZLDEN_cmc    0.00
Var: Airport3.2 (Intercept)  0.10
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc 0.00

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_ALdN50)

```

```

$Airport3
  (Intercept)    ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1 -0.13764767 -0.006684116 -0.14383383 -0.012630031
1.1 0.10456337 -0.025069148 0.10926266 -0.040722499
1.2 -0.19019084 0.034539950 -0.19873839 0.093449536
1.3 0.29341213 0.003150246 0.30659864 -0.035820261
2 0.24507221 -0.008694335 0.25608624 -0.009314680
3 0.02664926 0.001303461 0.02784693 0.003413723
4 0.08663970 0.014920950 0.09053345 0.025433096
91 -0.36495940 0.001118897 -0.38136139 -0.010113474
92 0.28472816 0.009804713 0.29752440 0.024283812
93 -0.29361345 -0.019504703 -0.30680901 -0.035142304
94 0.06110904 0.003934514 0.06385540 0.014912737
95 -0.10626083 -0.010760373 -0.11103640 -0.021400993

```

```

with conditional variances for "Airport3"

```

**4.20 Modell ALdN60 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,60})$ )****4.20.1 MO\_A LdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALdN60@theta[1] ^ 2 / (MO_ALdN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALdN60)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALdN60)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.20.2 CIM\_ALdN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS60_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29381.5 29462.8 -14680.8 29361.5   24983
```

```
scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.3764 -0.7578 -0.3986  0.8550 14.7488
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1903   0.4363
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.254138	0.173784	-1.462	0.1436
ZLDEN_cmc	0.676780	0.033361	20.287	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.212910	0.034960	6.090	1.13e-09 ***
ZFlights24h_gmc	-0.074102	0.572003	-0.130	0.8969
ZNightflightrate_gmc	-0.008741	0.208957	-0.042	0.9666
ZTrend24h_gmc	-0.180332	0.104876	-1.719	0.0855 .
ZNoiseStarts24_gmc	0.760189	0.473786	1.604	0.1086
HRC_c	-0.915052	0.512274	-1.786	0.0741 .
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.122558	0.019239	-6.370	1.89e-10 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.015							
ZL_NAT_24_L	-0.023	-0.863						
ZFlights24h_	0.262	0.000	-0.001					
ZNightflight_	0.005	0.002	-0.001	0.661				
ZTrnd24h_gm	-0.040	-0.001	-0.002	0.210	0.248			
ZNsStrts24_	0.039	0.004	-0.001	-0.891	-0.755	-0.181		
HRC_c	-0.539	0.000	-0.001	-0.422	0.108	-0.106	0.043	
ZLDEN_:ZL_N	-0.064	-0.253	0.243	-0.010	-0.010	-0.001	0.008	-0.003

```
> performance::icc(CIM_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.043
```

```
> performance::r2(CIM_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.259
```

```
Marginal R2: 0.216
```

```
> screenreg(CIM_ALdN60)
```

```
=====
```

```
Model 1
```

```

-----
(Intercept)                -0.25
                           (0.17)
ZLDEN_cmc                   0.68 ***
                           (0.03)
ZLog_NAT_24h_LS60_cmc      0.21 ***
                           (0.03)
ZFlights24h_gmc            -0.07
                           (0.57)
ZNightflightrate_gmc      -0.01
                           (0.21)
ZTrend24h_gmc              -0.18
                           (0.10)
ZNoiseStarts24_gmc        0.76
                           (0.47)
HRC_c                       -0.92
                           (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.12 ***
                           (0.02)
-----

```

```

-----
AIC                29381.53
BIC                29462.80
Log Likelihood    -14680.77
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALdn60)
```

```
$Airport3
```

```

(Intercept)
1  -0.26832463
1.1 0.20379301
1.2 -0.37661518
1.3 0.58749087
2   0.53880863
3   0.04797849
4   0.14647510
91  -0.75622950
92  0.57089209
93  -0.56989241
94  0.09929634
95  -0.20906865

```

with conditional variances for "Airport3"

**4.20.3 AIM1\_ALdN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
ZLog_NAT_24h_LS60_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29341.8 29431.2 -14659.9 29319.8   24982
```

```
scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5757 -0.7500 -0.4088  0.8385 10.3515
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18712 0.4326
Airport3.1  ZLDEN_cmc    0.03715 0.1927
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.269499	0.172633	-1.561	0.11850
ZLDEN_cmc	0.717748	0.068287	10.511	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.122841	0.041834	2.936	0.00332 **
ZFlights24h_gmc	-0.118525	0.570811	-0.208	0.83551
ZNightflightrate_gmc	-0.002867	0.207955	-0.014	0.98900
ZTrend24h_gmc	-0.184411	0.104165	-1.770	0.07666 .
ZNoiseStarts24_gmc	0.728444	0.472691	1.541	0.12330
HRC_c	-0.753903	0.506986	-1.487	0.13701
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.137358	0.020537	-6.688	2.26e-11 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.008							
ZL_NAT_24_L	-0.038	-0.438						
ZFlights24h_	0.263	0.006	-0.006					
ZNightflight_	0.007	0.004	-0.001	0.664				
ZTrnd24h_gm	-0.040	-0.009	-0.002	0.209	0.249			
ZNsStrts24_	0.036	-0.004	0.004	-0.893	-0.757	-0.181		
HRC_c	-0.539	0.001	0.004	-0.422	0.105	-0.104	0.047	
ZLDEN_:ZL_N	-0.072	-0.161	0.340	-0.009	-0.008	0.001	0.006	0.000

```
> performance::icc(AIM1_ALdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.043
```

```
> performance::r2(AIM1_ALdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.244
```

```
Marginal R2: 0.201
```

```
> screenreg(AIM1_ALdN60)
```

```
=====
```



```

-----
                                Model 1
-----
(Intercept)                    -0.27
                                (0.17)
ZLDEN_cmc                       0.72 ***
                                (0.07)
ZLog_NAT_24h_LS60_cmc          0.12 **
                                (0.04)
ZFlights24h_gmc                 -0.12
                                (0.57)
ZNightflightrate_gmc           -0.00
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.10)
ZNoiseStarts24_gmc             0.73
                                (0.47)
HRC_c                           -0.75
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.14 ***
                                (0.02)
-----
AIC                             29341.79
BIC                             29431.18
Log Likelihood                  -14659.90
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
Var: Airport3.1 ZLDEN_cmc       0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN60)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.26372549  0.175381313
1.1 0.21580896  0.061465633
1.2 -0.39727816  0.199323200
1.3 0.58388380  0.015109861
2 0.53063769 -0.063089168
3 0.04930167 -0.046561495
4 0.14807738  0.041246471
91 -0.74502451 -0.006028837
92 0.55258925  0.183473137
93 -0.55357680  0.073265564
94 0.11019889 -0.202391222
95 -0.20342627 -0.449494752

```

with conditional variances for "Airport3"

**4.20.4 AIM2\_ALdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS60\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29344.9	29434.3	-14661.5	29322.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9241	-0.7505	-0.4043	0.8409	9.7117

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17713	0.4209
Airport3.1	ZLog_NAT_24h_LS60_cmc	0.05196	0.2279

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.262798	0.168495	-1.560	0.1188
ZLDEN_cmc	0.721292	0.036221	19.914	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.094694	0.084150	1.125	0.2605
ZFlights24h_gmc	-0.068042	0.557729	-0.122	0.9029
ZNightflightrate_gmc	0.001528	0.202640	0.008	0.9940
ZTrend24h_gmc	-0.181092	0.101546	-1.783	0.0745 .
ZNoiseStarts24_gmc	0.701200	0.461260	1.520	0.1285
HRC_c	-0.825549	0.497059	-1.661	0.0967 .
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.130542	0.020492	-6.370	1.88e-10 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.028						
ZL_NAT_24_L	-0.031	-0.472					
ZFlights24h_	0.264	-0.001	0.001				
ZNghtflght_	0.006	-0.001	0.006	0.663			
ZTrnd24h_gm	-0.038	-0.003	-0.009	0.210	0.249		
ZNsStrts24_	0.035	0.006	-0.004	-0.893	-0.757	-0.182	
HRC_c	-0.542	-0.007	0.011	-0.425	0.104	-0.106	0.048
ZLDEN_:ZL_N	-0.077	-0.324	0.197	-0.008	-0.005	0.003	0.004

> performance::icc(AIM2\_ALdN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.041

> performance::r2(AIM2\_ALdN60)

# R2 for Mixed Models

Conditional R2: 0.236

Marginal R2: 0.195

> screenreg(AIM2\_ALdN60)

```

=====
                                Model 1
-----
(Intercept)                    -0.26
                                (0.17)
ZLDEN_cmc                       0.72 ***
                                (0.04)
ZLog_NAT_24h_LS60_cmc          0.09
                                (0.08)
ZFlights24h_gmc                -0.07
                                (0.56)
ZNightflightrate_gmc           0.00
                                (0.20)
ZTrend24h_gmc                  -0.18
                                (0.10)
ZNoiseStarts24_gmc             0.70
                                (0.46)
HRC_c                           -0.83
                                (0.50)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.13 ***
                                (0.02)
-----
AIC                             29344.94
BIC                             29434.33
Log Likelihood                  -14661.47
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.26498037  0.27828826
1.1 0.22498991  0.08458122
1.2 -0.40524822 0.19076788
1.3 0.58393521  0.05849529
2  0.53147778 -0.12679447
3  0.04401007 -0.06562849
4  0.13827019  0.09332774
91 -0.71640948 -0.09668881
92 0.51003687  0.27792403
93 -0.51538664 -0.12393806
94 0.10366595 -0.14586975
95 -0.20029525 -0.46103210

```

with conditional variances for "Airport3"

**4.20.5 Vergleichstests ALdN60****4.20.5.1 > anova(CIM\_ALdN60, AIM1\_ALdN60)**

Models:

CIM\_ALdN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN60: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN60	10	29382	29463	-14681	29362			
AIM1_ALdN60	11	29342	29431	-14660	29320	41.74	1	1.043e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.20.5.2 > anova(CIM\_ALdN60, AIM2\_ALdN60)**

Models:

CIM\_ALdN60:

AIM2\_ALdN60:

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN60	10	29382	29463	-14681	29362			
AIM2_ALdN60	11	29345	29434	-14662	29323	38.595	1	5.216e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.20.6 FM\_ALdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS60\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS60\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS60\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29326.8	29513.7	-14640.4	29280.8	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.0587	-0.7446	-0.4103	0.8360	8.9874

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.033e-03	6.350e-02
Airport3.1	ZLDEN_cmc	4.533e-09	6.733e-05
Airport3.2	(Intercept)	1.849e-01	4.299e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	3.953e-03	6.287e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.270287	0.173061	-1.562	0.1183
ZLDEN_cmc	0.850774	0.048748	17.452	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.093064	0.067410	1.381	0.1674
ZFlights24h_gmc	-0.101040	0.568379	-0.178	0.8589
ZNightflightrate_gmc	-0.004096	0.207638	-0.020	0.9843
ZTrend24h_gmc	-0.182385	0.104541	-1.745	0.0811 .
ZNoiseStarts24_gmc	0.705306	0.470791	1.498	0.1341
HRC_c	-0.772817	0.506738	-1.525	0.1272
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc	-0.128692	0.020628	-6.239	4.41e-10 ***
ZLDEN_cmc:ZFlights24h_gmc	0.282616	0.178405	1.584	0.1132
ZLDEN_cmc:ZNightflightrate_gmc	-0.016850	0.058524	-0.288	0.7734
ZLDEN_cmc:ZTrend24h_gmc	0.029720	0.036117	0.823	0.4106
ZLDEN_cmc:ZNoiseStarts24_gmc	0.016696	0.147698	0.113	0.9100
ZLDEN_cmc:HRC_c	-0.748125	0.149804	-4.994	5.91e-07 ***
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.222745	0.266386	-0.836	0.4031
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.025653	0.086981	-0.295	0.7681
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	0.001644	0.047785	0.034	0.9726
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.259617	0.216837	1.197	0.2312
ZLog_NAT_24h_LS60_cmc:HRC_c	0.236303	0.219093	1.079	0.2808

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALdN60)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.001
Conditional ICC: 0.001
> performance::r2(FM_ALdN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.221
Marginal R2: 0.221
> screenreg(FM_ALdN60)
```

```
=====
Model 1
-----
(Intercept)                -0.27
                             (0.17)
ZLDEN_cmc                   0.85 ***
                             (0.05)
ZLog_NAT_24h_LS60_cmc      0.09
                             (0.07)
ZFlights24h_gmc           -0.10
                             (0.57)
ZNightflightrate_gmc      -0.00
                             (0.21)
ZTrend24h_gmc             -0.18
                             (0.10)
ZNoiseStarts24_gmc        0.71
                             (0.47)
HRC_c                      -0.77
                             (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS60_cmc -0.13 ***
                             (0.02)
ZLDEN_cmc:ZFlights24h_gmc 0.28
                             (0.18)
ZLDEN_cmc:ZNightflightrate_gmc -0.02
                             (0.06)
ZLDEN_cmc:ZTrend24h_gmc   0.03
                             (0.04)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.02
                             (0.15)
ZLDEN_cmc:HRC_c           -0.75 ***
                             (0.15)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc -0.22
                             (0.27)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.03
                             (0.09)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc 0.00
                             (0.05)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc 0.26
                             (0.22)
ZLog_NAT_24h_LS60_cmc:HRC_c 0.24
                             (0.22)
-----
AIC                        29326.83
BIC                        29513.74
Log Likelihood             -14640.42
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.18
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN60)
$Airport3
  (Intercept)    ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.005806999 -9.587849e-09 -0.26617842    4.610806e-03
1.1 0.004828784 -4.267031e-08  0.22133950   -7.459863e-02
1.2 -0.008529003  7.741877e-08 -0.39094835    7.459479e-02
1.3 0.012456120 -2.011200e-08  0.57095764    8.958691e-05
2  0.011011010 -3.985996e-08  0.50471741   -2.522267e-02
3  0.001082306  5.277394e-09  0.04961021    7.112279e-03
4  0.003293861  3.647692e-08  0.15098243    3.739068e-02
91 -0.015845785  2.817353e-09 -0.72633148   -8.486689e-03
92  0.012053211  4.305350e-08  0.55248928    2.966270e-02
93 -0.012265307 -5.165211e-08 -0.56221127   -4.304001e-02
94  0.002437607  1.419951e-08  0.11173385    1.432870e-02
95 -0.004322133 -2.215170e-08 -0.19811587   -2.138757e-02

```

with conditional variances for "Airport3"

**4.21 Modell ALdN70 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,70})$ )****4.21.1 M0\_ALdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALdN70@theta[1] ^ 2 / (M0_ALdN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALdN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALdN70)
$Airport3
  (Intercept)
1    0.4686904885
```



1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.21.2 CIM\_ALdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS70_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29402.0 29483.3 -14691.0 29382.0   24983
```

```
scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.4807 -0.7556 -0.4028  0.8484  9.0231
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1926   0.4388
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.26462	0.17508	-1.511	0.1307
ZLDEN_cmc	0.69105	0.03333	20.735	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.20071	0.03412	5.882	4.04e-09 ***
ZFlights24h_gmc	-0.09231	0.57825	-0.160	0.8732
ZNightflightrate_gmc	-0.01437	0.21080	-0.068	0.9456
ZTrend24h_gmc	-0.18070	0.10551	-1.713	0.0868 .
ZNoiseStarts24_gmc	0.77173	0.47881	1.612	0.1070
HRC_c	-0.92461	0.51576	-1.793	0.0730 .
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.09933	0.01929	-5.149	2.62e-07 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNgght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.029							
ZL_NAT_24_L	-0.038	-0.862						
ZFlights24h_	0.263	0.008	-0.011					
ZNgghtflight_	0.006	0.001	0.000	0.663				
ZTrnd24h_gm	-0.039	0.005	-0.008	0.211	0.249			
ZNsStrts24_	0.036	-0.004	0.008	-0.893	-0.757	-0.182		
HRC_c	-0.541	-0.016	0.017	-0.422	0.106	-0.107	0.046	
ZLDEN_:ZL_N	-0.078	-0.324	0.304	-0.017	-0.006	-0.008	0.015	0.018

```
> performance::icc(CIM_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.055
```

```
Conditional ICC: 0.044
```

```
> performance::r2(CIM_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.256
```

```
Marginal R2: 0.212
```

```
> screenreg(CIM_ALdN70)
```

```
=====
```

```
Model 1
```

```
-----
(Intercept)                -0.26
                           (0.18)
ZLDEN_cmc                   0.69 ***
                           (0.03)
ZLog_NAT_24h_LS70_cmc     0.20 ***
                           (0.03)
ZFlights24h_gmc           -0.09
                           (0.58)
ZNightflightrate_gmc     -0.01
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.77
                           (0.48)
HRC_c                      -0.92
                           (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                           (0.02)
-----
```

```
-----
AIC                        29401.99
BIC                        29483.26
Log Likelihood            -14691.00
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALdn70)
```

```
$Airport3
  (Intercept)
1 -0.25453318
1.1 0.19937246
1.2 -0.38026985
1.3 0.57536440
2 0.54132844
3 0.05101694
4 0.14680843
91 -0.77359510
92 0.58536544
93 -0.56946762
94 0.10229091
95 -0.20908427
```

with conditional variances for "Airport3"

**4.21.3 AIM1\_ALdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
ZLog_NAT_24h_LS70_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29347.2 29436.6 -14662.6 29325.2   24982
```

```
scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.2258 -0.7477 -0.4113  0.8384  6.4457
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18872 0.4344
Airport3.1  ZLDEN_cmc   0.03782 0.1945
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28301	0.17384	-1.628	0.1035
ZLDEN_cmc	0.66732	0.06891	9.684	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.17399	0.03519	4.944	7.64e-07 ***
ZFlights24h_gmc	-0.12412	0.57746	-0.215	0.8298
ZNightflightrate_gmc	-0.01064	0.20944	-0.051	0.9595
ZTrend24h_gmc	-0.18360	0.10467	-1.754	0.0794 .
ZNoiseStarts24_gmc	0.72949	0.47729	1.528	0.1264
HRC_c	-0.78571	0.51279	-1.532	0.1255
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.10109	0.01994	-5.069	3.99e-07 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNgght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.008							
ZL_NAT_24_L	-0.035	-0.441						
ZFlights24h_	0.266	0.007	-0.009					
ZNgghtflght_	0.008	0.004	-0.002	0.665				
ZTrnd24h_gm	-0.038	-0.007	-0.006	0.211	0.250			
ZNSstrts24_	0.032	-0.005	0.009	-0.894	-0.758	-0.182		
HRC_c	-0.543	-0.003	0.011	-0.426	0.101	-0.106	0.052	
ZLDEN_:ZL_N	-0.078	-0.171	0.315	-0.012	-0.004	-0.004	0.010	0.015

```
> performance::icc(AIM1_ALdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.238
```

```
Marginal R2: 0.194
```

```
> screenreg(AIM1_ALdN70)
```

```
=====
```

```

-----
                                Model 1
-----
(Intercept)                    -0.28
                                (0.17)
ZLDEN_cmc                      0.67 ***
                                (0.07)
ZLog_NAT_24h_LS70_cmc         0.17 ***
                                (0.04)
ZFlights24h_gmc               -0.12
                                (0.58)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc           0.73
                                (0.48)
HRC_c                          -0.79
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                                (0.02)
-----
AIC                             29347.24
BIC                             29436.63
Log Likelihood                  -14662.62
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.19
Var: Airport3.1 ZLDEN_cmc       0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN70)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.24183629  0.19753665
1.1  0.21491104  0.08273027
1.2 -0.41324877  0.22401801
1.3  0.56829032  0.08055619
2   0.53658071 -0.10806605
3   0.05199178 -0.03760891
4   0.14087827  0.03329473
91 -0.76420317 -0.01602152
92  0.56460518  0.12750613
93 -0.54505253  0.04163937
94  0.11076111 -0.19943020
95 -0.19618186 -0.44498055

```

with conditional variances for "Airport3"

**4.21.4 AIM2\_ALdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS70\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29361.4	29450.8	-14669.7	29339.4	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-2.4285	-0.7552	-0.4043	0.8416	7.8339

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.20029	0.4475
Airport3.1	ZLog_NAT_24h_LS70_cmc	0.04894	0.2212

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28627	0.17885	-1.601	0.1095
ZLDEN_cmc	0.73067	0.03549	20.588	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.14822	0.07691	1.927	0.0540 .
ZFlights24h_gmc	-0.14108	0.59059	-0.239	0.8112
ZNightflightrate_gmc	-0.01122	0.21496	-0.052	0.9584
ZTrend24h_gmc	-0.19382	0.10784	-1.797	0.0723 .
ZNoiseStarts24_gmc	0.75353	0.48889	1.541	0.1232
HRC_c	-0.77694	0.52653	-1.476	0.1401
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.11366	0.02018	-5.632	1.79e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.030							
ZL_NAT_24_L	-0.026	-0.434						
ZFlights24h_	0.263	0.006	0.000					
ZNghtflght_	0.005	0.002	0.003	0.662				
ZTrnd24h_gm	-0.039	0.003	-0.017	0.207	0.248			
ZNSstrts24_	0.036	-0.004	0.000	-0.893	-0.756	-0.179		
HRC_c	-0.542	-0.011	0.010	-0.423	0.107	-0.105	0.047	
ZLDEN_:ZL_N	-0.077	-0.368	0.169	-0.013	-0.004	-0.003	0.011	0.015

> performance::icc(AIM2\_ALdN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM2\_ALdN70)

# R2 for Mixed Models

Conditional R2: 0.253

Marginal R2: 0.208

> screenreg(AIM2\_ALdN70)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.29
                                (0.18)
ZLDEN_cmc                      0.73 ***
                                (0.04)
ZLog_NAT_24h_LS70_cmc         0.15
                                (0.08)
ZFlights24h_gmc               -0.14
                                (0.59)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.11)
ZNoiseStarts24_gmc           0.75
                                (0.49)
HRC_c                          -0.78
                                (0.53)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.11 ***
                                (0.02)
-----
AIC                             29361.43
BIC                             29450.82
Log Likelihood                  -14669.72
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.24939277  0.19480093
1.1 0.21103417 -0.01492785
1.2 -0.40319300  0.14012661
1.3 0.57459238  0.18520643
2  0.57144042 -0.13719402
3  0.05325687 -0.07235942
4  0.14026160  0.02240773
91 -0.79503527  0.10912087
92 0.58050828  0.15456681
93 -0.55861500  0.08720504
94 0.11501786 -0.13761161
95 -0.20128649 -0.56438060

```

with conditional variances for "Airport3"

**4.21.5 Vergleichstests ALdN70****4.21.5.1 > anova(CIM\_ALdN70, AIM1\_ALdN70)**

Models:

CIM\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN70	10	29402	29483	-14691	29382			
AIM1_ALdN70	11	29347	29437	-14663	29325	56.749	1	4.95e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.21.5.2 > anova(CIM\_ALdN70, AIM2\_ALdN70)**

Models:

CIM\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN70: [hier gekürzt, Spezifikation siehe oben]

	npars	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN70	10	29402	29483	-14691	29382			
AIM2_ALdN70	11	29361	29451	-14670	29339	42.562	1	6.848e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.21.6 FM\_ALdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS70\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS70\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS70\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29319.6	29506.5	-14636.8	29273.6	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3450	-0.7475	-0.4124	0.8481	8.4673

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	1.038e-01	0.3221917
Airport3.1	ZLDEN_cmc	2.413e-08	0.0001553
Airport3.2	(Intercept)	1.019e-01	0.3192099
Airport3.3	ZLog_NAT_24h_LS70_cmc	4.910e-03	0.0700691

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.31421	0.18083	-1.738	0.0823 .
ZLDEN_cmc	0.73251	0.05493	13.336	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.29776	0.06500	4.581	4.63e-06 ***
ZFlights24h_gmc	-0.19627	0.59676	-0.329	0.7422
ZNightflightrate_gmc	-0.01702	0.21752	-0.078	0.9376
ZTrend24h_gmc	-0.19663	0.10908	-1.803	0.0715 .
ZNoiseStarts24_gmc	0.77897	0.49469	1.575	0.1153
HRC_c	-0.70524	0.52992	-1.331	0.1832
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc	-0.09075	0.02049	-4.429	9.45e-06 ***
ZLDEN_cmc:ZFlights24h_gmc	-0.14934	0.22896	-0.652	0.5142
ZLDEN_cmc:ZNightflightrate_gmc	-0.10792	0.07777	-1.388	0.1653
ZLDEN_cmc:ZTrend24h_gmc	-0.08046	0.04685	-1.717	0.0859 .
ZLDEN_cmc:ZNoiseStarts24_gmc	0.45898	0.18665	2.459	0.0139 *
ZLDEN_cmc:HRC_c	-0.31601	0.19514	-1.619	0.1054
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.48359	0.25237	1.916	0.0553 .
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.13024	0.09409	1.384	0.1663
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.13548	0.05442	2.489	0.0128 *
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.40474	0.21479	-1.884	0.0595 .
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.34596	0.23778	-1.455	0.1457

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

Model failed to converge with max|grad| = 0.00419699 (tol = 0.002, component 1)

```
> performance::icc(FM_ALdN70)
# IntraClass Correlation Coefficient
```

Adjusted ICC: 0.031

Conditional ICC: 0.024

```
> performance::r2(FM_ALdN70)
```

```
# R2 for Mixed Models
```

Conditional R2: 0.249

Marginal R2: 0.225

```
> screenreg(FM_ALdN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.31
                                (0.18)
ZLDEN_cmc                       0.73 ***
                                (0.05)
ZLog_NAT_24h_LS70_cmc          0.30 ***
                                (0.07)
ZFlights24h_gmc                -0.20
                                (0.60)
ZNightflightrate_gmc           -0.02
                                (0.22)
ZTrend24h_gmc                  -0.20
                                (0.11)
ZNoiseStarts24_gmc             0.78
                                (0.49)
HRC_c                           -0.71
                                (0.53)
ZLDEN_cmc:ZLog_NAT_24h_LS70_cmc -0.09 ***
                                (0.02)
ZLDEN_cmc:ZFlights24h_gmc      -0.15
                                (0.23)
ZLDEN_cmc:ZNightflightrate_gmc -0.11
                                (0.08)
ZLDEN_cmc:ZTrend24h_gmc        -0.08
                                (0.05)
ZLDEN_cmc:ZNoiseStarts24_gmc   0.46 *
                                (0.19)
ZLDEN_cmc:HRC_c                 -0.32
                                (0.20)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc 0.48
                                (0.25)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc 0.13
                                (0.09)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc   0.14 *
                                (0.05)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc -0.40
                                (0.21)
ZLog_NAT_24h_LS70_cmc:HRC_c        -0.35
                                (0.24)
-----
AIC                               29319.60
BIC                               29506.50
Log Likelihood                    -14636.80
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.10
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.10
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN70)
$Airport3
  (Intercept)      ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.13267675 -8.683131e-08 -0.13023233 -0.004046739
1.1 0.10636320 -4.175531e-07 0.10440358 -0.089560904
1.2 -0.20173579 7.834775e-07 -0.19801903 0.048801965
1.3 0.29448984 -2.379993e-07 0.28906418 0.054556565
2 0.28435040 -8.322271e-08 0.27911155 -0.053396513
3 0.02907578 2.324416e-08 0.02854009 0.010197758
4 0.08023826 2.180504e-07 0.07875996 0.066626263
91 -0.40860749 -3.966893e-08 -0.40107934 0.008339502
92 0.29526277 1.078049e-07 0.28982287 0.017322145
93 -0.29701378 -2.431305e-07 -0.29154162 -0.052949206
94 0.06657902 1.196304e-07 0.06535238 0.025190643
95 -0.10586331 -1.790813e-07 -0.10391289 -0.038275231

```

with conditional variances for "Airport3"

**4.22 Modell ALdN80 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{24h,80})$ )****4.22.1 M0\_ALdN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALdN80@theta[1] ^ 2 / (M0_ALdN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALdN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALdN80)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.22.2 CIM\_ALdN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_24h_
LS80_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29445.0 29526.2 -14712.5 29425.0   24983
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5781 -0.7487 -0.4142  0.8545 10.3320
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.1866   0.432
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.244955	0.172373	-1.421	0.1553
ZLDEN_cmc	0.874894	0.024491	35.724	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.002420	0.024035	-0.101	0.9198
ZFlights24h_gmc	-0.028130	0.569652	-0.049	0.9606
ZNightflightrate_gmc	-0.007698	0.207814	-0.037	0.9705
ZTrend24h_gmc	-0.174225	0.103935	-1.676	0.0937 .
ZNoiseStarts24_gmc	0.708593	0.471984	1.501	0.1333
HRC_c	-0.955871	0.508573	-1.880	0.0602 .
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.124185	0.018273	-6.796	1.07e-11 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.000							
ZL_NAT_24_L	0.000	-0.716						
ZFlights24h_	0.264	0.005	-0.006					
ZNghtflght_	0.006	0.004	-0.002	0.663				
ZTrnd24h_gm	-0.039	0.002	-0.005	0.211	0.249			
ZNsStrts24_	0.036	-0.005	0.008	-0.892	-0.757	-0.181		
HRC_c	-0.541	-0.002	-0.001	-0.421	0.107	-0.106	0.044	
ZLDEN_:ZL_N	-0.063	-0.111	-0.058	-0.023	-0.010	-0.008	0.027	0.010

```
> performance::icc(CIM_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.043
```

```
> performance::r2(CIM_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.250
```

```
Marginal R2: 0.208
```

```
> screenreg(CIM_ALdN80)
```

```
=====
```

```

                                Model 1
-----
(Intercept)                    -0.24
                                (0.17)
ZLDEN_cmc                       0.87 ***
                                (0.02)
ZLog_NAT_24h_LS80_cmc          -0.00
                                (0.02)
ZFlights24h_gmc                -0.03
                                (0.57)
ZNightflightrate_gmc           -0.01
                                (0.21)
ZTrend24h_gmc                  -0.17
                                (0.10)
ZNoiseStarts24_gmc             0.71
                                (0.47)
HRC_c                           -0.96
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.12 ***
                                (0.02)
-----
AIC                               29444.99
BIC                               29526.25
Log Likelihood                   -14712.49
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.19
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALdn80)
$Airport3
  (Intercept)
1 -0.23444611
1.1 0.21331270
1.2 -0.40380871
1.3 0.55180663
2 0.54017881
3 0.05044384
4 0.13034258
91 -0.77118878
92 0.57487458
93 -0.54264566
94 0.09958943
95 -0.19387942

```

with conditional variances for "Airport3"

**4.22.3 AIM1\_ALdN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLDEN_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:
ZLog_NAT_24h_LS80_cmc
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
29387.3 29476.6 -14682.6 29365.3   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.2438 -0.7413 -0.4133  0.8433  7.0226
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept) 0.18747 0.4330
Airport3.1  ZLDEN_cmc   0.04215 0.2053
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.282451	0.172795	-1.635	0.1021
ZLDEN_cmc	0.819472	0.068103	12.033	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	0.020062	0.024891	0.806	0.4202
ZFlights24h_gmc	-0.086450	0.571246	-0.151	0.8797
ZNightflightrate_gmc	-0.003066	0.208075	-0.015	0.9882
ZTrend24h_gmc	-0.179136	0.104271	-1.718	0.0858 .
ZNoiseStarts24_gmc	0.682713	0.472944	1.444	0.1489
HRC_c	-0.779915	0.509577	-1.531	0.1259
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.109889	0.018913	-5.810	6.23e-09 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	-0.005							
ZL_NAT_24_L	0.000	-0.303						
ZFlights24h_	0.264	0.005	-0.002					
ZNightflight_	0.006	0.005	-0.002	0.663				
ZTrnd24h_gm	-0.039	-0.009	-0.003	0.209	0.248			
ZNsStrts24_	0.035	-0.004	0.003	-0.892	-0.756	-0.181		
HRC_c	-0.542	0.002	-0.001	-0.423	0.106	-0.105	0.046	
ZLDEN_:ZL_N	-0.060	-0.077	-0.006	-0.016	-0.009	-0.005	0.020	0.006

```
> performance::icc(AIM1_ALdN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM1_ALdN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.236
```

```
Marginal R2: 0.192
```

```
> screenreg(AIM1_ALdN80)
```

```
=====
```



```

-----
                                Model 1
-----
(Intercept)                    -0.28
                                (0.17)
ZLDEN_cmc                       0.82 ***
                                (0.07)
ZLog_NAT_24h_LS80_cmc          0.02
                                (0.02)
ZFlights24h_gmc                 -0.09
                                (0.57)
ZNightflightrate_gmc           -0.00
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.10)
ZNoiseStarts24_gmc             0.68
                                (0.47)
HRC_c                           -0.78
                                (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.11 ***
                                (0.02)
-----
AIC                             29387.26
BIC                             29476.65
Log Likelihood                  -14682.63
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLDEN_cmc        0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALdN80)
$Airport3
  (Intercept)  ZLDEN_cmc
1 -0.22661306  0.201928601
1.1  0.22529695  0.063007788
1.2 -0.43226723  0.218324572
1.3  0.55269718  0.046610827
2   0.53868115 -0.076528217
3   0.05257142 -0.074494134
4   0.12923353  0.077437281
91 -0.76929903 -0.005809774
92  0.56548601  0.155520226
93 -0.53158135  0.077166560
94  0.10900872 -0.223448794
95 -0.18513153 -0.479508653

```

with conditional variances for "Airport3"

**4.22.4 AIM2\_ALdN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLog\_NAT\_24h\_LS80\_cmc ||  
Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS80\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29418.4	29507.8	-14698.2	29396.4	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.4141	-0.7519	-0.4129	0.8488	9.4591

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19656	0.4434
Airport3.1	ZLog_NAT_24h_LS80_cmc	0.02208	0.1486

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.264685	0.176601	-1.499	0.1339
ZLDEN_cmc	0.898223	0.025566	35.134	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.008778	0.053519	-0.164	0.8697
ZFlights24h_gmc	-0.069293	0.582193	-0.119	0.9053
ZNightflightrate_gmc	-0.004526	0.212314	-0.021	0.9830
ZTrend24h_gmc	-0.185803	0.106711	-1.741	0.0817 .
ZNoiseStarts24_gmc	0.698123	0.481874	1.449	0.1474
HRC_c	-0.831481	0.519748	-1.600	0.1096
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.134630	0.018921	-7.115	1.12e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLDEN_c	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLDEN_cmc	0.000						
ZL_NAT_24_L	-0.006	-0.362					
ZFlights24h_	0.264	0.002	0.005				
ZNghtflght_	0.007	0.003	0.003	0.661			
ZTrnd24h_gm	-0.039	0.001	-0.016	0.209	0.248		
ZNSstrts24_	0.036	-0.003	-0.003	-0.892	-0.755	-0.180	
HRC_c	-0.540	0.000	0.003	-0.423	0.106	-0.105	0.046
ZLDEN_:ZL_N	-0.057	-0.147	-0.025	-0.018	-0.010	-0.005	0.023

> performance::icc(AIM2\_ALdN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(AIM2\_ALdN80)

# R2 for Mixed Models

Conditional R2: 0.256

Marginal R2: 0.212

> screenreg(AIM2\_ALdN80)

=====

```

-----
Model 1
-----
(Intercept)                -0.26
                             (0.18)
ZLDEN_cmc                   0.90 ***
                             (0.03)
ZLog_NAT_24h_LS80_cmc     -0.01
                             (0.05)
ZFlights24h_gmc           -0.07
                             (0.58)
ZNightflightrate_gmc     -0.00
                             (0.21)
ZTrend24h_gmc             -0.19
                             (0.11)
ZNoiseStarts24_gmc       0.70
                             (0.48)
HRC_c                      -0.83
                             (0.52)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.13 ***
                             (0.02)
-----
AIC                        29418.39
BIC                        29507.78
Log Likelihood             -14698.20
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.20
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALdN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.22671126  0.11975747
1.1 0.21767837 -0.02022653
1.2 -0.41947500  0.10312588
1.3 0.55075062  0.08400298
2 0.56565005 -0.11051792
3 0.05346905 -0.16561890
4 0.12427507  0.03497302
91 -0.80093506  0.12786803
92 0.58908873  0.09930657
93 -0.54793403  0.08422839
94 0.10775644 -0.07687853
95 -0.18576438 -0.29737607

```

with conditional variances for "Airport3"

**4.22.5 Vergleichstests ALdN80****4.22.5.1 > anova(CIM\_ALdN80, AIM1\_ALdN80)**

Models:

CIM\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN80	10	29445	29526	-14712	29425			
AIM1_ALdN80	11	29387	29477	-14683	29365	59.728	1	1.089e-14 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.22.5.2 > anova(CIM\_ALdN80, AIM2\_ALdN80)**

Models:

CIM\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALdN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALdN80	10	29445	29526	-14712	29425			
AIM2_ALdN80	11	29418	29508	-14698	29396	28.592	1	8.936e-08 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.22.6 FM\_ALdN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLDEN\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc ||  
Airport3) + (1 + ZLog\_NAT\_24h\_LS80\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_24h\_LS80\_cmc +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc +  
ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_24h\_LS80\_cmc:ZFlights24h\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZTrend24h\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29369.2	29556.1	-14661.6	29323.2	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.2857	-0.7392	-0.4191	0.8433	8.4505

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.005957	0.07718
Airport3.1	ZLDEN_cmc	0.003419	0.05848
Airport3.2	(Intercept)	0.184698	0.42976
Airport3.3	ZLog_NAT_24h_LS80_cmc	0.000000	0.00000

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.291994	0.174059	-1.678	0.09343 .
ZLDEN_cmc	1.003990	0.051424	19.524	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.017264	0.039046	-0.442	0.65839
ZFlights24h_gmc	-0.116015	0.578016	-0.201	0.84092
ZNightflightrate_gmc	-0.007437	0.210159	-0.035	0.97177
ZTrend24h_gmc	-0.182963	0.105113	-1.741	0.08175 .
ZNoiseStarts24_gmc	0.708803	0.478415	1.482	0.13846
HRC_c	-0.774412	0.512017	-1.512	0.13041
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc	-0.102146	0.019238	-5.309	1.10e-07 ***
ZLDEN_cmc:ZFlights24h_gmc	-0.094822	0.205541	-0.461	0.64456
ZLDEN_cmc:ZNightflightrate_gmc	-0.115269	0.066908	-1.723	0.08493 .
ZLDEN_cmc:ZTrend24h_gmc	-0.042994	0.043074	-0.998	0.31820
ZLDEN_cmc:ZNoiseStarts24_gmc	0.519009	0.166035	3.126	0.00177 **
ZLDEN_cmc:HRC_c	-0.792997	0.194085	-4.086	4.39e-05 ***
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	0.338630	0.177893	1.904	0.05697 .
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	0.074824	0.072484	1.032	0.30194
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.085507	0.039130	2.185	0.02887 *
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	-0.382705	0.149587	-2.558	0.01051 *
ZLog_NAT_24h_LS80_cmc:HRC_c	0.124188	0.145217	0.855	0.39245

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALdN80)
[1] NA
```

```
> performance::r2(FM_ALdN80)
Random effect variances not available. Returned R2 does not account for random effects.
# R2 for Mixed Models
```

```
Conditional R2: NA
Marginal R2: 0.220
```

```
> screenreg(FM_ALdN80)
```

```
=====
Model 1
-----
(Intercept)                -0.29
                             (0.17)
ZLDEN_cmc                   1.00 ***
                             (0.05)
ZLog_NAT_24h_LS80_cmc      -0.02
                             (0.04)
ZFlights24h_gmc           -0.12
                             (0.58)
ZNightflightrate_gmc      -0.01
                             (0.21)
ZTrend24h_gmc              -0.18
                             (0.11)
ZNoiseStarts24_gmc         0.71
                             (0.48)
HRC_c                       -0.77
                             (0.51)
ZLDEN_cmc:ZLog_NAT_24h_LS80_cmc -0.10 ***
                             (0.02)
ZLDEN_cmc:ZFlights24h_gmc  -0.09
                             (0.21)
ZLDEN_cmc:ZNightflightrate_gmc -0.12
                             (0.07)
ZLDEN_cmc:ZTrend24h_gmc    -0.04
                             (0.04)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.52 **
                             (0.17)
ZLDEN_cmc:HRC_c            -0.79 ***
                             (0.19)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc 0.34
                             (0.18)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc 0.07
                             (0.07)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc 0.09 *
                             (0.04)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc -0.38 *
                             (0.15)
ZLog_NAT_24h_LS80_cmc:HRC_c 0.12
                             (0.15)
-----
AIC                          29369.23
BIC                          29556.14
Log Likelihood                -14661.62
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.18
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALdN80)
$Airport3
  (Intercept)    ZLDEN_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.007629031 -0.0108809233 -0.23654217 0
1.1 0.007115132 -0.0711941138 0.22060843 0
1.2 -0.012982045 0.0929543866 -0.40251518 0
1.3 0.017677745 0.0071582958 0.54810786 0
2 0.016859953 -0.0036459026 0.52275179 0
3 0.001530135 0.0002092741 0.04744266 0
4 0.003747453 0.0216888881 0.11619176 0
91 -0.023771528 0.0011852696 -0.73704882 0
92 0.018314982 0.0184128907 0.56786573 0
93 -0.017603069 -0.0401664136 -0.54579250 0
94 0.002836834 -0.0028716726 0.08795755 0
95 -0.005530312 -0.0173388724 -0.17147025 0

```

with conditional variances for "Airport3"

**4.23 Modell ALqN50 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,50})$ )****4.23.1 MO\_ALqN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC    logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188  0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- MO_ALqN50@theta[1] ^ 2 / (MO_ALqN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALqN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALqN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALqN50)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALqN50)
$Airport3
(Intercept)
```



1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.23.2 CIM\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29485.2	29566.4	-14732.6	29465.2	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.8372	-0.7468	-0.4060	0.8538	7.9485

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1948	0.4413

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.272030	0.175614	-1.549	0.1214
ZLpAeq0024_cmc	0.831929	0.024220	34.349	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.010139	0.025505	0.398	0.6910
ZFlights24h_gmc	-0.081803	0.577717	-0.142	0.8874
ZNightflightrate_gmc	-0.006724	0.211115	-0.032	0.9746
ZTrend24h_gmc	-0.180503	0.106030	-1.702	0.0887 .
ZNoiseStarts24_gmc	0.772505	0.478542	1.614	0.1065
HRC_c	-0.924303	0.516757	-1.789	0.0737 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.096210	0.019591	-4.911	9.07e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.002							
ZL_NAT_24_L	-0.014	-0.724						
ZFlights24h_	0.263	-0.002	-0.002					
ZNghtflght_	0.007	0.004	-0.005	0.661				
ZTrnd24h_gm	-0.040	-0.004	0.001	0.210	0.248			
ZNsStrts24_	0.038	0.005	0.001	-0.892	-0.755	-0.181		
HRC_c	-0.539	0.001	-0.005	-0.421	0.107	-0.106	0.043	
ZLA0024_:ZL	-0.056	-0.120	0.212	-0.015	-0.016	0.002	0.013	-0.007

> performance::icc(CIM\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.251

Marginal R2: 0.207

> screenreg(CIM\_ALqN50)

=====

Model 1

```

-----
(Intercept)                -0.27
                           (0.18)
ZLpAeq0024_cmc             0.83 ***
                           (0.02)
ZLog_NAT_24h_LS50_cmc     0.01
                           (0.03)
ZFlights24h_gmc           -0.08
                           (0.58)
ZNightflightrate_gmc     -0.01
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.77
                           (0.48)
HRC_c                     -0.92
                           (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.10 ***
                           (0.02)
-----

```

```

-----
AIC                29485.17
BIC                29566.43
Log Likelihood    -14732.59
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN50)
```

```
$Airport3
```

```

(Intercept)
1 -0.26996938
1.1 0.19101274
1.2 -0.36496217
1.3 0.59390695
2 0.53257920
3 0.05031807
4 0.15871681
91 -0.76375899
92 0.59083573
93 -0.58801804
94 0.10215290
95 -0.21809567

```

with conditional variances for "Airport3"

**4.23.3 AIM1\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29389.8	29479.2	-14683.9	29367.8	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-3.4890	-0.7377	-0.4132	0.8339	5.3710

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18545	0.4306
Airport3.1	ZLpAeq0024_cmc	0.05477	0.2340

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.283797	0.171609	-1.654	0.0982 .
ZLpAeq0024_cmc	0.831361	0.074278	11.193	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.071534	0.028161	-2.540	0.0111 *
ZFlights24h_gmc	-0.091373	0.564646	-0.162	0.8714
ZNightflightrate_gmc	0.002483	0.206161	0.012	0.9904
ZTrend24h_gmc	-0.186094	0.103694	-1.795	0.0727 .
ZNoiseStarts24_gmc	0.700199	0.467817	1.497	0.1345
HRC_c	-0.760875	0.504766	-1.507	0.1317
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.108959	0.020157	-5.405	6.47e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.004							
ZL_NAT_24_L	-0.022	-0.215						
ZFlights24h_	0.262	0.005	-0.004					
ZNightflight_	0.005	0.004	-0.004	0.661				
ZTrnd24h_gm	-0.040	-0.011	0.002	0.208	0.247			
ZNsStrts24_	0.039	-0.003	0.003	-0.892	-0.754	-0.179		
HRC_c	-0.539	0.001	-0.001	-0.421	0.108	-0.105	0.043	
ZLA0024_:ZL	-0.060	-0.032	0.253	-0.013	-0.015	0.004	0.012	-0.008

> performance::icc(AIM1\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.229

Marginal R2: 0.186

> screenreg(AIM1\_ALqN50)

=====

```

-----
Model 1
-----
(Intercept)                -0.28
                             (0.17)
ZLpAeq0024_cmc              0.83 ***
                             (0.07)
ZLog_NAT_24h_LS50_cmc      -0.07 *
                             (0.03)
ZFlights24h_gmc            -0.09
                             (0.56)
ZNightflightrate_gmc       0.00
                             (0.21)
ZTrend24h_gmc              -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.70
                             (0.47)
HRC_c                       -0.76
                             (0.50)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
-----
AIC                          29389.85
BIC                          29479.24
Log Likelihood               -14683.92
Num. obs.                    24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.19
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN50)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.24022269  0.17349902
1.1 0.20521384  0.10497038
1.2 -0.41487687  0.31123391
1.3 0.57583946  0.17752963
2  0.52298402 -0.09766336
3  0.05368825 -0.07875889
4  0.15197015  0.04262921
91 -0.75406544 -0.01461146
92 0.55051720  0.18791905
93 -0.53907903 -0.05830866
94 0.11925263 -0.23432054
95 -0.20195546 -0.53622479

```

with conditional variances for "Airport3"

**4.23.4 AIM2\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS50\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29412.2	29501.5	-14695.1	29390.2	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2599	-0.7408	-0.3958	0.8364	5.7535

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18370	0.4286
Airport3.1	ZLog_NAT_24h_LS50_cmc	0.07088	0.2662

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.269130	0.171092	-1.573	0.1157
ZLpAeq0024_cmc	0.862027	0.024714	34.881	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.191896	0.090102	-2.130	0.0332 *
ZFlights24h_gmc	-0.055515	0.566275	-0.098	0.9219
ZNightflightrate_gmc	0.003463	0.206240	0.017	0.9866
ZTrend24h_gmc	-0.181699	0.103190	-1.761	0.0783 .
ZNoiseStarts24_gmc	0.699622	0.468971	1.492	0.1357
HRC_c	-0.846219	0.504497	-1.677	0.0935 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.110224	0.020122	-5.478	4.3e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.003							
ZL_NAT_24_L	-0.014	-0.273						
ZFlights24h_	0.263	-0.001	0.001					
ZNghtflght_	0.006	0.003	0.001	0.664				
ZTrnd24h_gm	-0.039	-0.006	-0.004	0.211	0.249			
ZNsStrts24_	0.037	0.004	-0.001	-0.893	-0.757	-0.182		
HRC_c	-0.541	0.000	0.002	-0.422	0.106	-0.106	0.046	
ZLA0024_:ZL	-0.062	-0.146	0.130	-0.013	-0.015	0.004	0.012	-0.008

> performance::icc(AIM2\_ALqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.044

> performance::r2(AIM2\_ALqN50)

# R2 for Mixed Models

Conditional R2: 0.217

Marginal R2: 0.173

> screenreg(AIM2\_ALqN50)

=====

```

-----
Model 1
-----
(Intercept)                -0.27
                             (0.17)
ZLpAeq0024_cmc             0.86 ***
                             (0.02)
ZLog_NAT_24h_LS50_cmc     -0.19 *
                             (0.09)
ZFlights24h_gmc           -0.06
                             (0.57)
ZNightflightrate_gmc      0.00
                             (0.21)
ZTrend24h_gmc             -0.18
                             (0.10)
ZNoiseStarts24_gmc        0.70
                             (0.47)
HRC_c                      -0.85
                             (0.50)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
-----
AIC                        29412.16
BIC                        29501.55
Log Likelihood             -14695.08
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.18
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.07
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN50)
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1 -0.24708499  0.267908708
1.1 0.20448431  0.220640984
1.2 -0.40629338  0.316499062
1.3 0.58080708  0.142230944
2 0.51447428 -0.169698395
3 0.05234132  0.006124667
4 0.15765168  0.072333018
91 -0.74256060 -0.144078112
92 0.55079631  0.174835336
93 -0.54130800 -0.273202481
94 0.11654821 -0.142383823
95 -0.20830738 -0.511603630

```

with conditional variances for "Airport3"

**4.23.5 Vergleichstests ALqN50****4.23.5.1 > anova(CIM\_ALqN50, AIM1\_ALqN50)**

Models:

CIM\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN50	10	29485	29566	-14733	29465			
AIM1_ALqN50	11	29390	29479	-14684	29368	97.321	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.23.5.2 > anova(CIM\_ALqN50, AIM2\_ALqN50)**

Models:

CIM\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN50	10	29485	29566	-14733	29465			
AIM2_ALqN50	11	29412	29502	-14695	29390	75.015	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.23.6 FM\_ALqN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS50\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS50\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS50\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS50\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS50\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS50\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29376.3	29563.2	-14665.1	29330.3	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6081	-0.7340	-0.4093	0.8252	5.7036

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.948e-02	2.224e-01
Airport3.1	ZLpAeq0024_cmc	1.223e-02	1.106e-01
Airport3.2	(Intercept)	1.387e-01	3.724e-01
Airport3.3	ZLog_NAT_24h_LS50_cmc	8.536e-10	2.922e-05

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.282067	0.172801	-1.632	0.102611
ZLpAeq0024_cmc	1.023286	0.057615	17.761	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	-0.158773	0.052502	-3.024	0.002493 **
ZFlights24h_gmc	-0.081777	0.567013	-0.144	0.885324
ZNightflightrate_gmc	0.002503	0.207282	0.012	0.990366
ZTrend24h_gmc	-0.185166	0.104328	-1.775	0.075923 .
ZNoiseStarts24_gmc	0.684946	0.469715	1.458	0.144781
HRC_c	-0.767868	0.507961	-1.512	0.130618
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc	-0.113506	0.020314	-5.588	2.3e-08 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	0.363498	0.199278	1.824	0.068140 .
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.015756	0.067903	-0.232	0.816509
ZLpAeq0024_cmc:ZTrend24h_gmc	0.037881	0.039307	0.964	0.335185
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.005803	0.163797	0.035	0.971740
ZLpAeq0024_cmc:HRC_c	-0.675837	0.184406	-3.665	0.000247 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.334384	0.209761	-1.594	0.110910
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	-0.002053	0.060738	-0.034	0.973030
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	-0.013584	0.037697	-0.360	0.718591
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.343585	0.158938	2.162	0.030636 *
ZLog_NAT_24h_LS50_cmc:HRC_c	0.251220	0.193536	1.298	0.194269

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.015
Conditional ICC: 0.012
> performance::r2(FM_ALqN50)
# R2 for Mixed Models
```

```
Conditional R2: 0.224
Marginal R2: 0.213
> screenreg(FM_ALqN50)
```

```
=====
Model 1
-----
(Intercept)                -0.28
                             (0.17)
ZLpAeq0024_cmc              1.02 ***
                             (0.06)
ZLog_NAT_24h_LS50_cmc      -0.16 **
                             (0.05)
ZFlights24h_gmc            -0.08
                             (0.57)
ZNightflightrate_gmc       0.00
                             (0.21)
ZTrend24h_gmc              -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.68
                             (0.47)
HRC_c                       -0.77
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS50_cmc -0.11 ***
                             (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc 0.36
                             (0.20)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.02
                             (0.07)
ZLpAeq0024_cmc:ZTrend24h_gmc 0.04
                             (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.01
                             (0.16)
ZLpAeq0024_cmc:HRC_c       -0.68 ***
                             (0.18)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.33
                             (0.21)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc -0.00
                             (0.06)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc -0.01
                             (0.04)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.34 *
                             (0.16)
ZLog_NAT_24h_LS50_cmc:HRC_c 0.25
                             (0.19)
-----
AIC                          29376.28
BIC                          29563.19
Log Likelihood                -14665.14
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept)    0.05
Var: Airport3.1 ZLpAeq0024_cmc    0.01
Var: Airport3.2 (Intercept)    0.14
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc    0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN50)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1 -0.06835467 -0.086384858 -0.19154093 -7.999199e-09
1.1 0.05634336 -0.104441095 0.15788329 1.195831e-09
1.2 -0.10637968 0.169448237 -0.29809323 2.144203e-08
1.3 0.15302121 0.085210259 0.42879040 -1.392340e-08
2 0.13478279 -0.029527128 0.37768338 -9.477766e-10
3 0.01426852 0.001605837 0.03998272 2.589864e-10
4 0.04211443 0.084286712 0.11801150 4.851972e-09
91 -0.19712869 0.006025383 -0.55238675 -2.022200e-09
92 0.14749676 0.084243907 0.41330998 4.960710e-09
93 -0.14856096 -0.152905219 -0.41629203 -7.352261e-09
94 0.03240233 0.002033705 0.09079660 4.818553e-09
95 -0.05406210 -0.071780626 -0.15149083 -5.900045e-09

```

with conditional variances for "Airport3"

**4.24 Modell ALqN60 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,60})$ )****4.24.1 M0\_ALqN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ (1 | Airport3)
Data: dat
```

```
      AIC      BIC   logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min      1Q  Median      3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.4188   0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544     0.1864  -3.511 0.000446 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALqN60@theta[1] ^ 2 / (M0_ALqN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALqN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALqN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALqN60)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                          (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALqN60)
$Airport3
(Intercept)
```

1	0.4686904885
1.1	0.7435390058
1.2	0.0001140482
1.3	0.6990449052
2	0.2338175059
3	0.5264938387
4	0.4750795415
91	-1.1814080555
92	0.2169198868
93	-0.4855654165
94	-0.8947654414
95	-0.7829518165

with conditional variances for "Airport3"

**4.24.2 CIM\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29426.6	29507.8	-14703.3	29406.6	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.5120	-0.7565	-0.4000	0.8520	10.5368

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1941	0.4406

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28676	0.17541	-1.635	0.102088
ZLpAeq0024_cmc	0.63082	0.03279	19.237	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.25421	0.03476	7.314	2.59e-13 ***
ZFlights24h_gmc	-0.09421	0.57857	-0.163	0.870647
ZNightflightrate_gmc	-0.01636	0.21131	-0.077	0.938273
ZTrend24h_gmc	-0.18050	0.10587	-1.705	0.088208 .
ZNoiseStarts24_gmc	0.77819	0.47962	1.623	0.104691
HRC_c	-0.93534	0.51571	-1.814	0.069722 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.06783	0.01862	-3.644	0.000269 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.009							
ZL_NAT_24_L	-0.020	-0.860						
ZFlights24h_	0.261	-0.001	0.000					
ZNghtflght_	0.006	0.001	-0.001	0.663				
ZTrnd24h_gm	-0.040	0.000	-0.002	0.211	0.249			
ZNsStrts24_	0.039	0.004	-0.001	-0.892	-0.756	-0.181		
HRC_c	-0.538	-0.001	-0.001	-0.421	0.107	-0.106	0.044	
ZLA0024_:ZL	-0.063	-0.172	0.207	-0.010	-0.008	-0.002	0.008	-0.004

> performance::icc(CIM\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.256

Marginal R2: 0.212

> screenreg(CIM\_ALqN60)

=====

Model 1

```

-----
(Intercept)                -0.29
                             (0.18)
ZLpAeq0024_cmc              0.63 ***
                             (0.03)
ZLog_NAT_24h_LS60_cmc      0.25 ***
                             (0.03)
ZFlights24h_gmc            -0.09
                             (0.58)
ZNightflightrate_gmc       -0.02
                             (0.21)
ZTrend24h_gmc              -0.18
                             (0.11)
ZNoiseStarts24_gmc         0.78
                             (0.48)
HRC_c                       -0.94
                             (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.07 ***
                             (0.02)
-----

```

```

-----
AIC                29426.56
BIC                29507.83
Log Likelihood     -14703.28
Num. obs.          24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN60)
```

```

$Airport3
  (Intercept)
1 -0.26347169
1.1 0.20201069
1.2 -0.38398680
1.3 0.59218766
2 0.54301915
3 0.04875825
4 0.14409091
91 -0.76501568
92 0.58330560
93 -0.57635620
94 0.09613805
95 -0.20611433

```

with conditional variances for "Airport3"

**4.24.3 AIM1\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29376.0	29465.4	-14677.0	29354.0	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8679	-0.7456	-0.4104	0.8371	7.0773

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18533	0.4305
Airport3.1	ZLpAeq0024_cmc	0.04466	0.2113

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.300004	0.171614	-1.748	0.080441 .
ZLpAeq0024_cmc	0.684716	0.072976	9.383	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.148858	0.042392	3.511	0.000446 ***
ZFlights24h_gmc	-0.119153	0.566850	-0.210	0.833510
ZNightflightrate_gmc	-0.008343	0.206562	-0.040	0.967782
ZTrend24h_gmc	-0.185227	0.103694	-1.786	0.074052 .
ZNoiseStarts24_gmc	0.722010	0.469207	1.539	0.123856
HRC_c	-0.766339	0.505219	-1.517	0.129306
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.082022	0.019726	-4.158	3.21e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.005							
ZL_NAT_24_L	-0.035	-0.416						
ZFlights24h_	0.262	0.006	-0.006					
ZNghtflght_	0.006	0.004	-0.001	0.662				
ZTrnd24h_gm	-0.040	-0.010	-0.002	0.209	0.249			
ZNsStrts24_	0.037	-0.004	0.005	-0.893	-0.756	-0.181		
HRC_c	-0.539	0.000	0.004	-0.423	0.105	-0.105	0.047	
ZLA0024_:ZL	-0.070	-0.118	0.310	-0.008	-0.006	0.000	0.007	-0.003

> performance::icc(AIM1\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.239

Marginal R2: 0.196

> screenreg(AIM1\_ALqN60)

=====



```

-----
                                Model 1
-----
(Intercept)                    -0.30
                                (0.17)
ZLpAeq0024_cmc                  0.68 ***
                                (0.07)
ZLog_NAT_24h_LS60_cmc          0.15 ***
                                (0.04)
ZFlights24h_gmc                 -0.12
                                (0.57)
ZNightflightrate_gmc           -0.01
                                (0.21)
ZTrend24h_gmc                   -0.19
                                (0.10)
ZNoiseStarts24_gmc             0.72
                                (0.47)
HRC_c                            -0.77
                                (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.08 ***
                                (0.02)
-----
AIC                               29376.04
BIC                               29465.43
Log Likelihood                   -14677.02
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLpAeq0024_cmc  0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN60)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1   -0.2501635  0.172128535
1.1  0.2149705  0.058316423
1.2 -0.4107185  0.205744916
1.3  0.5773066  0.105749594
2    0.5322116 -0.038498410
3    0.0503723 -0.057477569
4    0.1428292  0.051806641
91  -0.7489243 -0.007874440
92   0.5468384  0.227041511
93  -0.5398652 -0.004341702
94   0.1113387 -0.230213502
95  -0.1978746 -0.502104583

```

with conditional variances for "Airport3"

**4.24.4 AIM2\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS60\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29384.5	29473.9	-14681.2	29362.5	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-2.9710	-0.7468	-0.4105	0.8406	5.4948

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17601	0.4195
Airport3.1	ZLog_NAT_24h_LS60_cmc	0.07519	0.2742

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.304416	0.167696	-1.815	0.069481 .
ZLpAeq0024_cmc	0.667122	0.035412	18.839	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.152943	0.095523	1.601	0.109355
ZFlights24h_gmc	-0.085473	0.554117	-0.154	0.877413
ZNightflightrate_gmc	-0.000711	0.201644	-0.004	0.997187
ZTrend24h_gmc	-0.178543	0.101241	-1.764	0.077809 .
ZNoiseStarts24_gmc	0.698584	0.458422	1.524	0.127537
HRC_c	-0.796870	0.494270	-1.612	0.106915
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.070878	0.019732	-3.592	0.000328 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.022							
ZL_NAT_24_L	-0.027	-0.417						
ZFlights24h_	0.263	-0.001	0.001					
ZNghtflght_	0.006	-0.001	0.005	0.662				
ZTrnd24h_gm	-0.039	-0.001	-0.010	0.210	0.249			
ZNSstrts24_	0.036	0.004	-0.003	-0.893	-0.756	-0.181		
HRC_c	-0.541	-0.004	0.009	-0.424	0.105	-0.106	0.048	
ZLA0024_:ZL	-0.075	-0.244	0.160	-0.009	-0.004	0.000	0.007	0.000

> performance::icc(AIM2\_ALqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.041

> performance::r2(AIM2\_ALqN60)

# R2 for Mixed Models

Conditional R2: 0.232

Marginal R2: 0.191

> screenreg(AIM2\_ALqN60)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.30
                                (0.17)
ZLpAeq0024_cmc                 0.67 ***
                                (0.04)
ZLog_NAT_24h_LS60_cmc         0.15
                                (0.10)
ZFlights24h_gmc               -0.09
                                (0.55)
ZNightflightrate_gmc         -0.00
                                (0.20)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc           0.70
                                (0.46)
HRC_c                          -0.80
                                (0.49)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.07 ***
                                (0.02)
-----
AIC                             29384.47
BIC                             29473.86
Log Likelihood                  -14681.23
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.08
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.25457728 0.26635379
1.1 0.22238432 0.07423656
1.2 -0.41257100 0.15960343
1.3 0.57716685 0.08761737
2 0.53460599 -0.07146086
3 0.04532648 -0.01134099
4 0.13571325 0.17201240
91 -0.72078634 -0.11611705
92 0.50506978 0.39133805
93 -0.50564810 -0.14864016
94 0.10729278 -0.25862705
95 -0.19599579 -0.59055708

```

with conditional variances for "Airport3"

**4.24.5 Vergleichstests ALqN60****4.24.5.1 > anova(CIM\_ALqN60, AIM1\_ALqN60)**

Models:

CIM\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN60	10	29427	29508	-14703	29407			
AIM1_ALqN60	11	29376	29465	-14677	29354	52.527	1	4.244e-13 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.24.5.2 > anova(CIM\_ALqN60, AIM2\_ALqN60)**

Models:

CIM\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN60	10	29427	29508	-14703	29407			
AIM2_ALqN60	11	29385	29474	-14681	29363	44.098	1	3.123e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.24.6 FM\_ALqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS60\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS60\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS60\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS60\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS60\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29372.3	29559.2	-14663.2	29326.3	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3876	-0.7443	-0.4108	0.8376	5.5974

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	5.233e-02	2.288e-01
Airport3.1	ZLpAeq0024_cmc	6.800e-09	8.246e-05
Airport3.2	(Intercept)	1.378e-01	3.712e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	5.831e-03	7.636e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.305788	0.173957	-1.758	0.078776 .
ZLpAeq0024_cmc	0.795076	0.047774	16.642	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.179213	0.069744	2.570	0.010182 *
ZFlights24h_gmc	-0.096297	0.576923	-0.167	0.867437
ZNightflightrate_gmc	-0.003782	0.209753	-0.018	0.985616
ZTrend24h_gmc	-0.180523	0.104960	-1.720	0.085447 .
ZNoiseStarts24_gmc	0.694288	0.477574	1.454	0.146008
HRC_c	-0.768194	0.511888	-1.501	0.133432
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc	-0.076179	0.019886	-3.831	0.000128 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	0.339101	0.178337	1.901	0.057241 .
ZLpAeq0024_cmc:ZNightflightrate_gmc	0.010585	0.057352	0.185	0.853567
ZLpAeq0024_cmc:ZTrend24h_gmc	0.086583	0.038710	2.237	0.025305 *
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	-0.027138	0.148926	-0.182	0.855408
ZLpAeq0024_cmc:HRC_c	-0.600095	0.155624	-3.856	0.000115 ***
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.336228	0.274597	-1.224	0.220786
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.063800	0.087954	-0.725	0.468218
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	-0.066718	0.053512	-1.247	0.212473
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.361463	0.225354	1.604	0.108718
ZLog_NAT_24h_LS60_cmc:HRC_c	0.012440	0.239239	0.052	0.958530

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN60)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.016
Conditional ICC: 0.012
> performance::r2(FM_ALqN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.226
Marginal R2: 0.214
> screenreg(FM_ALqN60)
```

```
=====
Model 1
-----
(Intercept)                -0.31
                             (0.17)
ZLpAeq0024_cmc              0.80 ***
                             (0.05)
ZLog_NAT_24h_LS60_cmc      0.18 *
                             (0.07)
ZFlights24h_gmc            -0.10
                             (0.58)
ZNightflightrate_gmc       -0.00
                             (0.21)
ZTrend24h_gmc              -0.18
                             (0.10)
ZNoiseStarts24_gmc         0.69
                             (0.48)
HRC_c                       -0.77
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS60_cmc -0.08 ***
                             (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc 0.34
                             (0.18)
ZLpAeq0024_cmc:ZNightflightrate_gmc 0.01
                             (0.06)
ZLpAeq0024_cmc:ZTrend24h_gmc 0.09 *
                             (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc -0.03
                             (0.15)
ZLpAeq0024_cmc:HRC_c       -0.60 ***
                             (0.16)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc -0.34
                             (0.27)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.06
                             (0.09)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc -0.07
                             (0.05)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc 0.36
                             (0.23)
ZLog_NAT_24h_LS60_cmc:HRC_c 0.01
                             (0.24)
-----
AIC                          29372.34
BIC                          29559.24
Log Likelihood                -14663.17
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.05
Var: Airport3.1 ZLpAeq0024_cmc 0.00
Var: Airport3.2 (Intercept) 0.14
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN60)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.07198590 -4.555971e-08 -0.18949334 -0.015158900
1.1 0.06215144 -1.204016e-07 0.16360544 -0.084481732
1.2 -0.11195654 1.401034e-07 -0.29471077 0.081828521
1.3 0.15920993 8.447933e-08 0.41909907 0.037330382
2 0.14556512 -1.391855e-08 0.38318091 -0.024966479
3 0.01386543 -7.003698e-10 0.03649890 0.007693156
4 0.03954494 5.169029e-08 0.10409683 0.053705016
91 -0.20741662 2.233975e-10 -0.54599680 -0.014908166
92 0.15645684 8.749957e-08 0.41185191 0.052387083
93 -0.15616576 -1.307952e-07 -0.41108568 -0.078113065
94 0.03003044 -2.271528e-08 0.07905115 0.013079399
95 -0.05386954 -4.044129e-08 -0.14180443 -0.035923294

```

with conditional variances for "Airport3"

**4.25 Modell ALqN70 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,70})$ )****4.25.1 M0\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALqN70@theta[1] ^ 2 / (M0_ALqN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALqN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALqN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALqN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALqN70)
$Airport3
  (Intercept)
1    0.4686904885
```



1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.25.2 CIM\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29446.5	29527.8	-14713.3	29426.5	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9143	-0.7531	-0.4056	0.8479	8.0987

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1935	0.4399

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.27411	0.17560	-1.561	0.1185
ZLpAeq0024_cmc	0.68643	0.03506	19.577	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.19029	0.03611	5.270	1.36e-07 ***
ZFlights24h_gmc	-0.10015	0.57761	-0.173	0.8624
ZNightflightrate_gmc	-0.01695	0.21103	-0.080	0.9360
ZTrend24h_gmc	-0.18063	0.10573	-1.708	0.0876 .
ZNoiseStarts24_gmc	0.78157	0.47878	1.632	0.1026 .
HRC_c	-0.93509	0.51710	-1.808	0.0706 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.08142	0.01919	-4.243	2.20e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.028							
ZL_NAT_24_L	-0.036	-0.879						
ZFlights24h_	0.262	0.007	-0.010					
ZNghtflght_	0.004	0.001	0.000	0.662				
ZTrnd24h_gm	-0.039	0.005	-0.008	0.210	0.248			
ZNsStrts24_	0.038	-0.003	0.007	-0.892	-0.756	-0.181		
HRC_c	-0.541	-0.017	0.017	-0.421	0.109	-0.106	0.043	
ZLA0024_:ZL	-0.080	-0.293	0.291	-0.017	-0.005	-0.007	0.015	0.016

> performance::icc(CIM\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(CIM\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.253

Marginal R2: 0.209

> screenreg(CIM\_ALqN70)

=====

Model 1

```
-----
(Intercept)                -0.27
                           (0.18)
ZLpAeq0024_cmc             0.69 ***
                           (0.04)
ZLog_NAT_24h_LS70_cmc     0.19 ***
                           (0.04)
ZFlights24h_gmc           -0.10
                           (0.58)
ZNightflightrate_gmc     -0.02
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.78
                           (0.48)
HRC_c                     -0.94
                           (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.08 ***
                           (0.02)
-----
```

```
AIC                29446.54
BIC                29527.80
Log Likelihood    -14713.27
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN70)
```

```
$Airport3
  (Intercept)
1 -0.25936150
1.1 0.19935995
1.2 -0.37602160
1.3 0.57892133
2 0.53953076
3 0.05048445
4 0.14909350
91 -0.77166856
92 0.58923095
93 -0.57537241
94 0.10161307
95 -0.21131578
```

with conditional variances for "Airport3"

**4.25.3 AIM1\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29371.3	29460.7	-14674.7	29349.3	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.6506	-0.7449	-0.4086	0.8347	5.7360

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18473	0.4298
Airport3.1	ZLpAeq0024_cmc	0.04556	0.2135

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28958	0.17196	-1.684	0.0922 .
ZLpAeq0024_cmc	0.67366	0.07451	9.042	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.15070	0.03755	4.014	5.98e-05 ***
ZFlights24h_gmc	-0.11373	0.57181	-0.199	0.8423
ZNightflightrate_gmc	-0.01227	0.20724	-0.059	0.9528
ZTrend24h_gmc	-0.18520	0.10359	-1.788	0.0738 .
ZNoiseStarts24_gmc	0.71855	0.47262	1.520	0.1284
HRC_c	-0.79618	0.50704	-1.570	0.1164
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.08336	0.01988	-4.192	2.76e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.008							
ZL_NAT_24_L	-0.034	-0.439						
ZFlights24h_	0.265	0.008	-0.009					
ZNightflight_	0.008	0.004	-0.002	0.665				
ZTrnd24h_gm	-0.038	-0.008	-0.006	0.211	0.250			
ZNsStrts24_	0.032	-0.006	0.008	-0.894	-0.758	-0.182		
HRC_c	-0.542	-0.003	0.011	-0.426	0.101	-0.106	0.052	
ZLA0024_:ZL	-0.080	-0.155	0.308	-0.012	-0.004	-0.003	0.011	0.013

> performance::icc(AIM1\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.233

Marginal R2: 0.190

> screenreg(AIM1\_ALqN70)

=====

```

-----
Model 1
-----
(Intercept)                -0.29
                             (0.17)
ZLpAeq0024_cmc              0.67 ***
                             (0.07)
ZLog_NAT_24h_LS70_cmc      0.15 ***
                             (0.04)
ZFlights24h_gmc            -0.11
                             (0.57)
ZNightflightrate_gmc       -0.01
                             (0.21)
ZTrend24h_gmc              -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.72
                             (0.47)
HRC_c                       -0.80
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.08 ***
                             (0.02)
-----
AIC                          29371.34
BIC                          29460.73
Log Likelihood               -14674.67
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.18
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN70)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.23562722  0.17931098
1.1 0.21642961  0.07898207
1.2 -0.42083796 0.25881296
1.3 0.56397223  0.16904165
2  0.53358556 -0.09635210
3  0.05156362 -0.05595831
4  0.13756461  0.03076921
91 -0.75750660 -0.01344520
92 0.55102778  0.16289864
93 -0.53029113 -0.03212828
94 0.11161102 -0.20927505
95 -0.19306644 -0.49284686

```

with conditional variances for "Airport3"

**4.25.4 AIM2\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS70\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29396.3	29485.6	-14687.1	29374.3	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3417	-0.7532	-0.4042	0.8359	7.3701

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19972	0.4469
Airport3.1	ZLog_NAT_24h_LS70_cmc	0.06137	0.2477

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.29767	0.17875	-1.665	0.0959 .
ZLpAeq0024_cmc	0.74079	0.03779	19.601	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.12439	0.08462	1.470	0.1415
ZFlights24h_gmc	-0.15473	0.59513	-0.260	0.7949
ZNightflightrate_gmc	-0.01254	0.21561	-0.058	0.9536
ZTrend24h_gmc	-0.19505	0.10777	-1.810	0.0703 .
ZNoiseStarts24_gmc	0.75760	0.49194	1.540	0.1235
HRC_c	-0.75422	0.52694	-1.431	0.1523
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.09965	0.02021	-4.930	8.23e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	0.028							
ZL_NAT_24_L	-0.024	-0.428						
ZFlights24h_	0.265	0.005	0.001					
ZNghtflght_	0.008	0.002	0.002	0.665				
ZTrnd24h_gm	-0.038	0.002	-0.016	0.209	0.249			
ZNsStrts24_	0.032	-0.003	0.000	-0.894	-0.758	-0.181		
HRC_c	-0.543	-0.008	0.007	-0.426	0.102	-0.105	0.052	
ZLA0024_:ZL	-0.077	-0.349	0.164	-0.012	-0.004	-0.002	0.011	0.012

> performance::icc(AIM2\_ALqN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM2\_ALqN70)

# R2 for Mixed Models

Conditional R2: 0.251

Marginal R2: 0.206

> screenreg(AIM2\_ALqN70)

=====

```

-----
Model 1
-----
(Intercept)                -0.30
                           (0.18)
ZLpAeq0024_cmc             0.74 ***
                           (0.04)
ZLog_NAT_24h_LS70_cmc     0.12
                           (0.08)
ZFlights24h_gmc           -0.15
                           (0.60)
ZNightflightrate_gmc     -0.01
                           (0.22)
ZTrend24h_gmc             -0.20
                           (0.11)
ZNoiseStarts24_gmc       0.76
                           (0.49)
HRC_c                     -0.75
                           (0.53)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc -0.10 ***
                           (0.02)
-----
AIC                        29396.26
BIC                        29485.65
Log Likelihood            -14687.13
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.20
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.06
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.24683860 0.14580928
1.1 0.20976439 -0.03543837
1.2 -0.40372857 0.14514895
1.3 0.57160315 0.22430705
2 0.57019221 -0.11318344
3 0.05409145 -0.04086842
4 0.14222981 0.04841718
91 -0.79572667 0.13447987
92 0.57841113 0.20254218
93 -0.55650658 0.09653726
94 0.11911372 -0.19059644
95 -0.20180180 -0.65336739

```

with conditional variances for "Airport3"

**4.25.5 Vergleichstests ALqN70****4.25.5.1 > anova(CIM\_ALqN70, AIM1\_ALqN70)**

Models:

CIM\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN70	10	29447	29528	-14713	29427			
AIM1_ALqN70	11	29371	29461	-14675	29349	77.203	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.25.5.2 > anova(CIM\_ALqN70, AIM2\_ALqN70)**

Models:

CIM\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN70	10	29447	29528	-14713	29427			
AIM2_ALqN70	11	29396	29486	-14687	29374	52.281	1	4.811e-13 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.25.6 FM\_ALqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS70\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS70\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS70\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS70\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS70\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29307.1	29494.0	-14630.5	29261.1	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3333	-0.7411	-0.4073	0.8473	8.4126

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	3.458e-02	1.860e-01
Airport3.1	ZLpAeq0024_cmc	8.789e-09	9.375e-05
Airport3.2	(Intercept)	1.759e-01	4.194e-01
Airport3.3	ZLog_NAT_24h_LS70_cmc	7.758e-03	8.808e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.33955	0.18276	-1.858	0.06317 .
ZLpAeq0024_cmc	0.71003	0.05569	12.750	< 2e-16 ***
ZLog_NAT_24h_LS70_cmc	0.30379	0.07076	4.293	1.76e-05 ***
ZFlights24h_gmc	-0.21406	0.60030	-0.357	0.72140
ZNightflightrate_gmc	-0.01871	0.21916	-0.085	0.93196
ZTrend24h_gmc	-0.20031	0.11033	-1.815	0.06945 .
ZNoiseStarts24_gmc	0.78730	0.49707	1.584	0.11322
HRC_c	-0.67523	0.53460	-1.263	0.20657
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.06551	0.02051	-3.193	0.00141 **
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.11796	0.23458	-0.503	0.61505
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.09321	0.07793	-1.196	0.23166
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.04565	0.05124	-0.891	0.37301
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.53394	0.19468	2.743	0.00609 **
ZLpAeq0024_cmc:HRC_c	-0.18392	0.20271	-0.907	0.36424
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.50425	0.26903	1.874	0.06088 .
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.15590	0.09554	1.632	0.10275
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.09318	0.06206	1.502	0.13320
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.54512	0.23269	-2.343	0.01915 *
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.44892	0.27075	-1.658	0.09730 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_ALqN70)
```

```
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.010
```

```
Conditional ICC: 0.008
```

```
> performance::r2(FM_ALqN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.237
```

```
Marginal R2: 0.229
```

```
> screenreg(FM_ALqN70)
```

```
=====
                                Model 1
-----
```

(Intercept)	-0.34 (0.18)
ZLpAeq0024_cmc	0.71 *** (0.06)
ZLog_NAT_24h_LS70_cmc	0.30 *** (0.07)
ZFlights24h_gmc	-0.21 (0.60)
ZNightflightrate_gmc	-0.02 (0.22)
ZTrend24h_gmc	-0.20 (0.11)
ZNoiseStarts24_gmc	0.79 (0.50)
HRC_c	-0.68 (0.53)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS70_cmc	-0.07 ** (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.12 (0.23)
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.09 (0.08)
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.05 (0.05)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.53 ** (0.19)
ZLpAeq0024_cmc:HRC_c	-0.18 (0.20)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc	0.50 (0.27)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc	0.16 (0.10)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc	0.09 (0.06)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc	-0.55 * (0.23)
ZLog_NAT_24h_LS70_cmc:HRC_c	-0.45 (0.27)
-----	
AIC	29307.06
BIC	29493.96
Log Likelihood	-14630.53

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.03
Var: Airport3.1 ZLpAeq0024_cmc 0.00
Var: Airport3.2 (Intercept) 0.18
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN70)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.043534020 -5.803471e-08 -0.22141654 -0.042832885
1.1 0.034439064 -1.418191e-07 0.17515906 -0.096609224
1.2 -0.065994393 2.524238e-07 -0.33565129 0.077511230
1.3 0.096602809 -7.301783e-09 0.49132746 0.090829871
2 0.094527923 1.153723e-08 0.48077446 -0.050028250
3 0.009730865 -1.814316e-10 0.04949174 0.009239042
4 0.026827569 6.009099e-08 0.13644656 0.090750924
91 -0.135567330 -1.574838e-08 -0.68950325 0.007610460
92 0.096071064 4.479125e-08 0.48862297 0.024702092
93 -0.097009917 -1.057903e-07 -0.49339803 -0.088220535
94 0.023010483 9.140013e-09 0.11703264 0.030756176
95 -0.035219779 -6.057689e-08 -0.17912982 -0.064657876

```

with conditional variances for "Airport3"

**4.26 Modell ALqN80 (akustische Prädiktoren  $L_{Aeq,24h}(k = 10)$  und  $\log(NAT_{24h,80})$ )****4.26.1 M0\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALqN80@theta[1] ^ 2 / (M0_ALqN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALqN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALqN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALqN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALqN80)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.26.2 CIM\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29473.8	29555.1	-14726.9	29453.8	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5534	-0.7463	-0.4120	0.8463	8.7362

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1871	0.4326

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.254167	0.172788	-1.471	0.1413
ZLpAeq0024_cmc	0.892720	0.025327	35.247	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.039645	0.024977	-1.587	0.1125
ZFlights24h_gmc	-0.036196	0.572818	-0.063	0.9496
ZNightflightrate_gmc	-0.009326	0.208626	-0.045	0.9643
ZTrend24h_gmc	-0.174918	0.104099	-1.680	0.0929 .
ZNoiseStarts24_gmc	0.719949	0.474696	1.517	0.1294
HRC_c	-0.969577	0.510885	-1.898	0.0577 .
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.105482	0.018151	-5.811	6.2e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.003							
ZL_NAT_24_L	0.003	-0.743						
ZFlights24h_	0.263	0.004	-0.005					
ZNghtflght_	0.005	0.003	-0.002	0.665				
ZTrnd24h_gm	-0.039	0.001	-0.004	0.212	0.250			
ZNsStrts24_	0.037	-0.004	0.007	-0.893	-0.758	-0.183		
HRC_c	-0.543	-0.003	0.000	-0.422	0.106	-0.107	0.044	
ZLA0024_:ZL	-0.065	-0.063	-0.087	-0.024	-0.010	-0.006	0.027	0.010

> performance::icc(CIM\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.054

Conditional ICC: 0.043

> performance::r2(CIM\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.249

Marginal R2: 0.206

> screenreg(CIM\_ALqN80)

=====

Model 1

```
-----
(Intercept)                -0.25
                           (0.17)
ZLpAeq0024_cmc             0.89 ***
                           (0.03)
ZLog_NAT_24h_LS80_cmc     -0.04
                           (0.02)
ZFlights24h_gmc           -0.04
                           (0.57)
ZNightflightrate_gmc      -0.01
                           (0.21)
ZTrend24h_gmc             -0.17
                           (0.10)
ZNoiseStarts24_gmc        0.72
                           (0.47)
HRC_c                     -0.97
                           (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.11 ***
                           (0.02)
-----
```

```
AIC                29473.84
BIC                29555.10
Log Likelihood    -14726.92
Num. obs.         24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALqN80)
```

```
$Airport3
```

```
(Intercept)
1 -0.24328982
1.1 0.21557939
1.2 -0.39812762
1.3 0.55756940
2 0.53739383
3 0.04932552
4 0.13247560
91 -0.76490831
92 0.57730583
93 -0.54946503
94 0.09720886
95 -0.19676717
```

with conditional variances for "Airport3"

**4.26.3 AIM1\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29398.0	29487.4	-14688.0	29376.0	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8258	-0.7373	-0.4132	0.8375	5.9429

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18362	0.4285
Airport3.1	ZLpAeq0024_cmc	0.04809	0.2193

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.290289	0.171172	-1.696	0.0899 .
ZLpAeq0024_cmc	0.830570	0.071915	11.549	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.011211	0.025828	-0.434	0.6642
ZFlights24h_gmc	-0.081092	0.566778	-0.143	0.8862
ZNightflightrate_gmc	-0.005039	0.206018	-0.024	0.9805
ZTrend24h_gmc	-0.181875	0.103238	-1.762	0.0781 .
ZNoiseStarts24_gmc	0.678894	0.468798	1.448	0.1476
HRC_c	-0.793510	0.505220	-1.571	0.1163
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.088426	0.018700	-4.729	2.26e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.005							
ZL_NAT_24_L	0.002	-0.299						
ZFlights24h_	0.265	0.005	-0.002					
ZNghtflght_	0.007	0.004	-0.001	0.663				
ZTrnd24h_gm	-0.039	-0.010	-0.003	0.209	0.249			
ZNsStrts24_	0.034	-0.004	0.002	-0.893	-0.757	-0.181		
HRC_c	-0.542	0.001	0.000	-0.425	0.104	-0.105	0.049	
ZLA0024_:ZL	-0.062	-0.055	-0.032	-0.017	-0.009	-0.004	0.021	0.005

> performance::icc(AIM1\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.053

Conditional ICC: 0.043

> performance::r2(AIM1\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.233

Marginal R2: 0.190

> screenreg(AIM1\_ALqN80)

=====



```

-----
Model 1
-----
(Intercept)                -0.29
                           (0.17)
ZLpAeq0024_cmc             0.83 ***
                           (0.07)
ZLog_NAT_24h_LS80_cmc     -0.01
                           (0.03)
ZFlights24h_gmc           -0.08
                           (0.57)
ZNightflightrate_gmc      -0.01
                           (0.21)
ZTrend24h_gmc             -0.18
                           (0.10)
ZNoiseStarts24_gmc        0.68
                           (0.47)
HRC_c                     -0.79
                           (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.09 ***
                           (0.02)
-----
AIC                        29398.02
BIC                        29487.41
Log Likelihood             -14688.01
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.18
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_ALqN80)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.22400678  0.1671108653
1.1 0.22661125  0.0660084546
1.2 -0.43772393  0.2502688224
1.3 0.55184233  0.1360905003
2 0.53503691 -0.0613257637
3 0.05173578 -0.0963028165
4 0.12726108  0.0662098071
91 -0.76002588 -0.0003754544
92 0.55113567  0.1990237500
93 -0.51884952 -0.0016103142
94 0.10895118 -0.2274921590
95 -0.18350474 -0.5182775073

```

with conditional variances for "Airport3"

**4.26.4 AIM2\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_24h\_LS80\_cmc || Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29437.9	29527.3	-14708.0	29415.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.4790	-0.7503	-0.4023	0.8430	8.3099

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19671	0.4435
Airport3.1	ZLog_NAT_24h_LS80_cmc	0.02664	0.1632

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.273008	0.176939	-1.543	0.1228
ZLpAeq0024_cmc	0.925807	0.026686	34.693	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.043768	0.057587	-0.760	0.4472
ZFlights24h_gmc	-0.075797	0.586800	-0.129	0.8972
ZNightflightrate_gmc	-0.005737	0.213495	-0.027	0.9786
ZTrend24h_gmc	-0.189508	0.106823	-1.774	0.0761 .
ZNoiseStarts24_gmc	0.707011	0.485835	1.455	0.1456
HRC_c	-0.840524	0.521947	-1.610	0.1073
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.121088	0.018776	-6.449	1.13e-10 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA0024_	ZL_NAT	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLpAq0024_c	-0.003							
ZL_NAT_24_L	-0.005	-0.358						
ZFlights24h_	0.264	0.002	0.006					
ZNghtflght_	0.007	0.003	0.003	0.664				
ZTrnd24h_gm	-0.039	0.000	-0.016	0.210	0.249			
ZNsStrts24_	0.035	-0.002	-0.004	-0.893	-0.757	-0.181		
HRC_c	-0.541	-0.001	0.003	-0.423	0.105	-0.105	0.047	
ZLA0024_:ZL	-0.058	-0.114	-0.032	-0.018	-0.010	-0.002	0.024	0.001

convergence code: 0

Model failed to converge with max|grad| = 0.00236652 (tol = 0.002, component 1)

> performance::icc(AIM2\_ALqN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.044

> performance::r2(AIM2\_ALqN80)

# R2 for Mixed Models

Conditional R2: 0.258

Marginal R2: 0.214

```
> screenreg(AIM2_ALqN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.27
                                (0.18)
ZLpAeq0024_cmc                 0.93 ***
                                (0.03)
ZLog_NAT_24h_LS80_cmc         -0.04
                                (0.06)
ZFlights24h_gmc               -0.08
                                (0.59)
ZNightflightrate_gmc         -0.01
                                (0.21)
ZTrend24h_gmc                 -0.19
                                (0.11)
ZNoiseStarts24_gmc           0.71
                                (0.49)
HRC_c                          -0.84
                                (0.52)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.12 ***
                                (0.02)
-----
AIC                             29437.95
BIC                             29527.34
Log Likelihood                  -14707.97
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.20
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_ALqN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.23130288 0.08062498
1.1 0.22087096 -0.05733325
1.2 -0.41918916 0.12015851
1.3 0.55479057 0.12527605
2 0.56717173 -0.09640519
3 0.05231122 -0.19825006
4 0.12263472 0.03753375
91 -0.79651728 0.15559970
92 0.58758160 0.13638047
93 -0.54823354 0.07647946
94 0.10470026 -0.07201202
95 -0.18609610 -0.32724790
```

with conditional variances for "Airport3"

**4.26.5 Vergleichstests ALqN80****4.26.5.1 > anova(CIM\_ALqN80, AIM1\_ALqN80)**

Models:

CIM\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN80	10	29474	29555	-14727	29454			
AIM1_ALqN80	11	29398	29487	-14688	29376	77.818	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.26.5.2 > anova(CIM\_ALqN80, AIM2\_ALqN80)**

Models:

CIM\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_ALqN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALqN80	10	29474	29555	-14727	29454			
AIM2_ALqN80	11	29438	29527	-14708	29416	37.894	1	7.471e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.26.6 FM\_ALqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3) + (1 + ZLog\_NAT\_24h\_LS80\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZLog\_NAT\_24h\_LS80\_cmc + ZLpAeq0024\_cmc:ZFlights24h\_gmc +  
ZLpAeq0024\_cmc:ZNightflightrate\_gmc + ZLpAeq0024\_cmc:ZTrend24h\_gmc +  
ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c +  
ZLog\_NAT\_24h\_LS80\_cmc:ZFlights24h\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:ZTrend24h\_gmc + ZLog\_NAT\_24h\_LS80\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_24h\_LS80\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29365.8	29552.7	-14659.9	29319.8	24970

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9865	-0.7322	-0.4098	0.8436	7.5380

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	9.074e-02	0.3012331
Airport3.1	ZLpAeq0024_cmc	7.691e-03	0.0876979
Airport3.2	(Intercept)	9.939e-02	0.3152627
Airport3.3	ZLog_NAT_24h_LS80_cmc	1.353e-08	0.0001163

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.306280	0.173350	-1.767	0.077257 .
ZLpAeq0024_cmc	0.982366	0.057588	17.058	< 2e-16 ***
ZLog_NAT_24h_LS80_cmc	-0.032840	0.040555	-0.810	0.418075
ZFlights24h_gmc	-0.117472	0.568473	-0.207	0.836287
ZNightflightrate_gmc	-0.009383	0.208066	-0.045	0.964031
ZTrend24h_gmc	-0.186156	0.104876	-1.775	0.075894 .
ZNoiseStarts24_gmc	0.708776	0.471479	1.503	0.132761
HRC_c	-0.783668	0.507894	-1.543	0.122837
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc	-0.077038	0.019151	-4.023	5.75e-05 ***
ZLpAeq0024_cmc:ZFlights24h_gmc	-0.225250	0.222947	-1.010	0.312337
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.112723	0.075283	-1.497	0.134310
ZLpAeq0024_cmc:ZTrend24h_gmc	-0.030645	0.044982	-0.681	0.495694
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.658766	0.180220	3.655	0.000257 ***
ZLpAeq0024_cmc:HRC_c	-0.649699	0.202880	-3.202	0.001363 **
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	0.431361	0.184487	2.338	0.019378 *
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	0.076732	0.076620	1.001	0.316604
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.073702	0.039053	1.887	0.059126 .
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	-0.514668	0.155391	-3.312	0.000926 ***
ZLog_NAT_24h_LS80_cmc:HRC_c	0.052889	0.147366	0.359	0.719671

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

Model failed to converge with max|grad| = 0.00743024 (tol = 0.002, component 1)

```
> performance::icc(FM_ALqN80)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.027
Conditional ICC: 0.021
> performance::r2(FM_ALqN80)
# R2 for Mixed Models
```

```
Conditional R2: 0.235
Marginal R2: 0.214
> screenreg(FM_ALqN80)
```

```
=====
Model 1
-----
(Intercept)                -0.31
                             (0.17)
ZLpAeq0024_cmc              0.98 ***
                             (0.06)
ZLog_NAT_24h_LS80_cmc      -0.03
                             (0.04)
ZFlights24h_gmc            -0.12
                             (0.57)
ZNightflightrate_gmc       -0.01
                             (0.21)
ZTrend24h_gmc               -0.19
                             (0.10)
ZNoiseStarts24_gmc         0.71
                             (0.47)
HRC_c                       -0.78
                             (0.51)
ZLpAeq0024_cmc:ZLog_NAT_24h_LS80_cmc -0.08 ***
                             (0.02)
ZLpAeq0024_cmc:ZFlights24h_gmc -0.23
                             (0.22)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.11
                             (0.08)
ZLpAeq0024_cmc:ZTrend24h_gmc -0.03
                             (0.04)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.66 ***
                             (0.18)
ZLpAeq0024_cmc:HRC_c       -0.65 **
                             (0.20)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc 0.43 *
                             (0.18)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc 0.08
                             (0.08)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc 0.07
                             (0.04)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc -0.51 ***
                             (0.16)
ZLog_NAT_24h_LS80_cmc:HRC_c 0.05
                             (0.15)
-----
AIC                          29365.80
BIC                          29552.71
Log Likelihood                -14659.90
```

```

Num. obs.                24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.09
Var: Airport3.1 ZLpAeq0024_cmc 0.01
Var: Airport3.2 (Intercept) 0.10
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALqN80)
$Airport3
  (Intercept) ZLpAeq0024_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1 -0.11957193 -0.070720625 -0.13096912 -3.921127e-08
1.1 0.11076224 -0.081943197 0.12131972 -2.046162e-07
1.2 -0.19957062 0.135169147 -0.21859302 1.718722e-07
1.3 0.27294203 0.070554950 0.29895795 1.466482e-07
2 0.25684453 0.001635640 0.28132609 -1.611514e-07
3 0.02286906 -0.002804398 0.02504886 4.970290e-09
4 0.05979379 0.053296468 0.06549313 1.118443e-07
91 -0.36041476 0.003531474 -0.39476828 1.161864e-07
92 0.27505823 0.043018936 0.30127586 9.544199e-08
93 -0.26702368 -0.103002422 -0.29247548 -1.734976e-07
94 0.04498386 -0.004985992 0.04927157 -2.890393e-08
95 -0.08702771 -0.052396014 -0.09532290 -5.200275e-08

```

with conditional variances for "Airport3"

**4.27 Modell AMN50 (akustische Prädiktoren  $L_{AS,max,log,24h,50}$  und  $\log(NAT_{24h,50})$ )****4.27.1 MO\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN50@theta[1] ^ 2 / (MO_AMN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN50)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN50)
$Airport3
  (Intercept)
1    0.4686904885
```



1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.27.2 CIM\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS50\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS50\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29472.8	29554.1	-14726.4	29452.8	24983

scaled residuals:

Min	1Q	Median	3Q	Max
-2.7312	-0.7515	-0.4015	0.8529	7.4262

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1973	0.4442

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32329	0.17694	-1.827	0.0677 .
ZLAmx_24h_LS50_cmc	0.57550	0.01662	34.630	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.53448	0.01750	30.550	<2e-16 ***
ZFlights24h_gmc	-0.14042	0.58851	-0.239	0.8114
ZNightflightrate_gmc	-0.02509	0.21388	-0.117	0.9066
ZTrend24h_gmc	-0.17891	0.10678	-1.675	0.0938 .
ZNoiseStarts24_gmc	0.81578	0.48695	1.675	0.0939 .
HRC_c	-0.94253	0.52333	-1.801	0.0717 .
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.02659	0.02178	-1.221	0.2222

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS50_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS50_	-0.008							
ZL_NAT_24_L	-0.008	-0.182						
ZFlights24h_	0.264	-0.005	-0.001					
ZNightflight_	0.007	0.001	0.000	0.665				
ZTrnd24h_gm	-0.039	-0.003	-0.002	0.214	0.250			
ZNsStrts24_	0.035	0.008	0.003	-0.893	-0.758	-0.184		
HRC_c	-0.542	0.000	-0.005	-0.425	0.103	-0.108	0.049	
ZLA_24_LS50_:	-0.020	-0.040	-0.008	-0.006	-0.005	0.000	0.008	-0.001

> performance::icc(CIM\_AMN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.252

Marginal R2: 0.207

> screenreg(CIM\_AMN50)

=====

Model 1

```

-----
(Intercept)                -0.32
                           (0.18)
ZLAmox_24h_LS50_cmc        0.58 ***
                           (0.02)
ZLog_NAT_24h_LS50_cmc     0.53 ***
                           (0.02)
ZFlights24h_gmc           -0.14
                           (0.59)
ZNightflightrate_gmc     -0.03
                           (0.21)
ZTrend24h_gmc            -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.82
                           (0.49)
HRC_c                     -0.94
                           (0.52)
ZLAmox_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.03
                           (0.02)
-----

```

```

-----
AIC                        29472.84
BIC                        29554.11
Log Likelihood            -14726.42
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.20
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN50)
```

```
$Airport3
```

```

(Intercept)
1 -0.26208238
1.1 0.19734985
1.2 -0.38678624
1.3 0.60302129
2 0.53845509
3 0.04881345
4 0.14502295
91 -0.76447336
92 0.59954018
93 -0.58723248
94 0.08929431
95 -0.20589600

```

with conditional variances for "Airport3"

**4.27.3 AIM1\_AMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS50\_cmc + ZLog\_NAT\_24h\_LS50\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS50\_cmc || Airport3) + ZLAmx\_24h\_LS50\_cmc:ZLog\_NAT\_24h\_LS50\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29436.4	29525.8	-14707.2	29414.4	24982

scaled residuals:

Min	1Q	Median	3Q	Max
-2.6910	-0.7428	-0.4131	0.8424	6.1001

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19854	0.4456
Airport3.1	ZLAmx_24h_LS50_cmc	0.03147	0.1774

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34171	0.17713	-1.929	0.0537 .
ZLAmx_24h_LS50_cmc	0.59487	0.05671	10.489	<2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.53170	0.01755	30.295	<2e-16 ***
ZFlights24h_gmc	-0.15070	0.58657	-0.257	0.7972
ZNightflightrate_gmc	-0.02010	0.21386	-0.094	0.9251
ZTrend24h_gmc	-0.18669	0.10713	-1.743	0.0814 .
ZNoiseStarts24_gmc	0.77443	0.48568	1.595	0.1108
HRC_c	-0.82709	0.52186	-1.585	0.1130
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.01869	0.02212	-0.845	0.3982

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS50_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS50_	-0.005							
ZL_NAT_24_L	-0.009	-0.056						
ZFlights24h_	0.263	0.004	-0.001					
ZNightflight_	0.007	0.003	0.000	0.663				
ZTrnd24h_gm	-0.040	-0.010	-0.002	0.210	0.249			
ZNSstrts24_	0.036	-0.003	0.003	-0.893	-0.756	-0.181		
HRC_c	-0.540	0.001	-0.004	-0.423	0.105	-0.106	0.047	
ZLA_24_LS50_:	-0.019	-0.020	-0.010	-0.004	-0.004	0.001	0.005	-0.001

> performance::icc(AIM1\_AMN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(AIM1\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.252

Marginal R2: 0.207

> screenreg(AIM1\_AMN50)

=====

```

-----
Model 1
-----
(Intercept)                -0.34
                           (0.18)
ZLAmx_24h_LS50_cmc         0.59 ***
                           (0.06)
ZLog_NAT_24h_LS50_cmc     0.53 ***
                           (0.02)
ZFlights24h_gmc           -0.15
                           (0.59)
ZNightflightrate_gmc      -0.02
                           (0.21)
ZTrend24h_gmc             -0.19
                           (0.11)
ZNoiseStarts24_gmc        0.77
                           (0.49)
HRC_c                     -0.83
                           (0.52)
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.02
                           (0.02)
-----
AIC                        29436.36
BIC                        29525.75
Log Likelihood            -14707.18
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.20
Var: Airport3.1 ZLAmx_24h_LS50_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN50)
$Airport3
  (Intercept) ZLAmx_24h_LS50_cmc
1 -0.24512829  0.13500222
1.1 0.20270702 -0.03517211
1.2 -0.41087147  0.12283372
1.3 0.59476977  0.23773892
2  0.55013616 -0.05548173
3  0.05076574 -0.04905236
4  0.13514777  0.08256416
91 -0.77641491  0.07468905
92 0.59497614  0.07519657
93 -0.57252660 -0.02017281
94 0.09406605 -0.18256765
95 -0.19315365 -0.40062978

with conditional variances for "Airport3"
>

```

**4.27.4 AIM2\_AMN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS50_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS50_cmc || Airport3) + ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
29412.8 29502.2 -14695.4 29390.8   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.6079 -0.7409 -0.3998  0.8448  5.1823
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.18683  0.4322
Airport3.1  ZLog_NAT_24h_LS50_cmc    0.06685  0.2585
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.32899    0.17197  -1.913   0.0557 .
ZLAmx_24h_LS50_cmc    0.58965    0.01686  34.982 < 2e-16 ***
ZLog_NAT_24h_LS50_cmc  0.38480    0.08426   4.567 4.96e-06 ***
ZFlights24h_gmc    -0.10985    0.56718  -0.194  0.8464
ZNightflightrate_gmc -0.01567    0.20699  -0.076  0.9397
ZTrend24h_gmc     -0.17847    0.10396  -1.717  0.0860 .
ZNoiseStarts24_gmc  0.74021    0.46952   1.577  0.1149
HRC_c           -0.86840    0.50760  -1.711  0.0871 .
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.02498    0.02228  -1.121  0.2622
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
      (Intr) ZLAm_24_LS50_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS50_ -0.006
ZL_NAT_24_L   -0.008 -0.093
ZFlghts24h_  0.263 -0.004      0.002
ZNghtflght_  0.006  0.001      0.003  0.661
ZTrnd24h_gm -0.040 -0.004      -0.005  0.210  0.248
ZNSstrts24_  0.038  0.007      -0.001 -0.892 -0.755 -0.180
HRC_c        -0.541 -0.001      0.003 -0.423  0.107 -0.106  0.045
ZLA_24_LS50_: -0.024 -0.050      0.034 -0.005 -0.002  0.004  0.006  0.002
```

```
> performance::icc(AIM2_AMN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.054
```

```
Conditional ICC: 0.044
```

```
> performance::r2(AIM2_AMN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.221
```

```
Marginal R2: 0.176
```

```
> screenreg(AIM2_AMN50)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.33
                                (0.17)
ZLAmox_24h_LS50_cmc            0.59 ***
                                (0.02)
ZLog_NAT_24h_LS50_cmc         0.38 ***
                                (0.08)
ZFlights24h_gmc                -0.11
                                (0.57)
ZNightflightrate_gmc          -0.02
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.74
                                (0.47)
HRC_c                           -0.87
                                (0.51)
ZLAmox_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.02
                                (0.02)
-----
AIC                             29412.82
BIC                             29502.21
Log Likelihood                  -14695.41
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLog_NAT_24h_LS50_cmc 0.07
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN50)
$Airport3
  (Intercept) ZLog_NAT_24h_LS50_cmc
1    -0.2452059      0.29800254
1.1   0.2124697      0.20156852
1.2  -0.4178543      0.23525790
1.3   0.5871654      0.13347677
2     0.5261039     -0.09585144
3     0.0497848      0.02814072
4     0.1405594      0.13418541
91    -0.7444966     -0.13349422
92     0.5628791      0.13385961
93    -0.5446224     -0.28788368
94     0.1005489     -0.17692799
95    -0.1962905     -0.50916531

```

with conditional variances for "Airport3"

**4.27.5 Vergleichstests AMN50****4.27.5.1 > anova(CIM\_AMN50, AIM1\_AMN50)**

Models:

CIM\_AMN50: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN50	10	29473	29554	-14726	29453			
AIM1_AMN50	11	29436	29526	-14707	29414	38.479	1	5.535e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.27.5.2 > anova(CIM\_AMN50, AIM2\_AMN50)**

Models:

CIM\_AMN50: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN50: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN50	10	29473	29554	-14726	29453			
AIM2_AMN50	11	29413	29502	-14695	29391	62.025	1	3.391e-15 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.27.6 FM\_AMN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS50_cmc + ZLog_NAT_24h_LS50_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS50_cmc || Airport3) + (1 + ZLog_NAT_24h_LS50_cmc ||
  Airport3) + ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc + ZLAmx_24h_LS50_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS50_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS50_cmc:HRC_c +
  ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS50_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
29388.5 29575.4 -14671.3 29342.5  24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.6047 -0.7339 -0.4124  0.8371  4.9108
```

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.135226	0.36773
Airport3.1	ZLAmx_24h_LS50_cmc	0.006209	0.07880
Airport3.2	(Intercept)	0.060282	0.24552
Airport3.3	ZLog_NAT_24h_LS50_cmc	0.001710	0.04135

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.344872	0.175766	-1.962	0.049750 *
ZLAmx_24h_LS50_cmc	0.703768	0.042467	16.572	< 2e-16 ***
ZLog_NAT_24h_LS50_cmc	0.502307	0.044443	11.302	< 2e-16 ***
ZFlights24h_gmc	-0.136353	0.581806	-0.234	0.814704
ZNightflightrate_gmc	-0.015810	0.212316	-0.074	0.940642
ZTrend24h_gmc	-0.183174	0.106304	-1.723	0.084869 .
ZNoiseStarts24_gmc	0.724440	0.482397	1.502	0.133161
HRC_c	-0.782823	0.517488	-1.513	0.130347
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc	-0.025790	0.022483	-1.147	0.251332
ZLAmx_24h_LS50_cmc:ZFlights24h_gmc	0.117430	0.142190	0.826	0.408879
ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc	-0.027574	0.049058	-0.562	0.574068
ZLAmx_24h_LS50_cmc:ZTrend24h_gmc	0.022400	0.027790	0.806	0.420203
ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc	0.098719	0.119140	0.829	0.407335
ZLAmx_24h_LS50_cmc:HRC_c	-0.428034	0.128194	-3.339	0.000841 ***
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc	-0.082126	0.202381	-0.406	0.684890
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc	-0.006835	0.054612	-0.125	0.900400
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc	0.008650	0.030164	0.287	0.774292
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc	0.315077	0.157158	2.005	0.044979 *
ZLog_NAT_24h_LS50_cmc:HRC_c	-0.188354	0.160452	-1.174	0.240438

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0  
Model failed to converge with max|grad| = 0.00226599 (tol = 0.002, component 1)

> performance::icc(FM\_AMN50)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.039

Conditional ICC: 0.031

> performance::r2(FM\_AMN50)

# R2 for Mixed Models

Conditional R2: 0.243

Marginal R2: 0.212

> screenreg(FM\_AMN50)

```
=====
                                Model 1
-----
(Intercept)                    -0.34 *
                                (0.18)
ZLAmx_24h_LS50_cmc              0.70 ***
                                (0.04)
ZLog_NAT_24h_LS50_cmc          0.50 ***
                                (0.04)
ZFlights24h_gmc                 -0.14
                                (0.58)
ZNightflightrate_gmc           -0.02
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.72
                                (0.48)
HRC_c                           -0.78
                                (0.52)
ZLAmx_24h_LS50_cmc:ZLog_NAT_24h_LS50_cmc -0.03
                                (0.02)
ZLAmx_24h_LS50_cmc:ZFlights24h_gmc 0.12
                                (0.14)
ZLAmx_24h_LS50_cmc:ZNightflightrate_gmc -0.03
                                (0.05)
ZLAmx_24h_LS50_cmc:ZTrend24h_gmc 0.02
                                (0.03)
ZLAmx_24h_LS50_cmc:ZNoiseStarts24_gmc 0.10
                                (0.12)
ZLAmx_24h_LS50_cmc:HRC_c       -0.43 ***
                                (0.13)
ZLog_NAT_24h_LS50_cmc:ZFlights24h_gmc -0.08
                                (0.20)
ZLog_NAT_24h_LS50_cmc:ZNightflightrate_gmc -0.01
                                (0.05)
ZLog_NAT_24h_LS50_cmc:ZTrend24h_gmc 0.01
                                (0.03)
ZLog_NAT_24h_LS50_cmc:ZNoiseStarts24_gmc 0.32 *
                                (0.16)
ZLog_NAT_24h_LS50_cmc:HRC_c    -0.19
                                (0.16)
-----
AIC                               29388.53
BIC                               29575.44
```

```

Log Likelihood                -14671.27
Num. obs.                    24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.14
Var: Airport3.1 ZLamax_24h_LS50_cmc 0.01
Var: Airport3.2 (Intercept)  0.06
Var: Airport3.3 ZLog_NAT_24h_LS50_cmc 0.00

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN50)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS50_cmc (Intercept) ZLog_NAT_24h_LS50_cmc
1    -0.17688760  -0.018314825 -0.07885448  -0.014124477
1.1  0.15237306  -0.111589069  0.06792618  -0.029667736
1.2 -0.28935543   0.050770425 -0.12899135   0.045834970
1.3  0.40757122   0.115623591  0.18169061   0.007342331
2     0.36365220  -0.037047236  0.16211201  -0.001311175
3     0.03695842   0.003607352  0.01647564   0.001172849
4     0.10348704   0.057846559  0.04613334   0.018934249
91   -0.52866249   0.020892441 -0.23567171  -0.004056303
92   0.40431737   0.024493270  0.18024008   0.009896808
93   -0.39856561  -0.073872077 -0.17767601  -0.025265435
94   0.07730164  -0.005128857  0.03446019   0.005855030
95  -0.13710544  -0.034537349 -0.06112004  -0.016590175

```

```

with conditional variances for "Airport3"

```

**4.28 Modell AMN60 (akustische Prädiktoren  $L_{AS,max,log,24h,60}$  und  $\log(NAT_{24h,60})$ )****4.28.1 MO\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN60@theta[1] ^ 2 / (MO_AMN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN60)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                          32559.07
BIC                          32575.32
Log Likelihood               -16277.53
Num. obs.                    24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN60)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.28.2 CIM\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS60\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS60\_cmc:ZLog\_NAT\_24h\_LS60\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29459.6	29540.9	-14719.8	29439.6	24983

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.4626	-0.7593	-0.4029	0.8534	9.5126

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2063	0.4542

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.35662	0.18045	-1.976	0.0481 *
ZLAmx_24h_LS60_cmc	0.29019	0.01614	17.985	<2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.73551	0.01904	38.622	<2e-16 ***
ZFlights24h_gmc	-0.15448	0.59498	-0.260	0.7951
ZNightflightrate_gmc	-0.02121	0.21731	-0.098	0.9222
ZTrend24h_gmc	-0.18212	0.10895	-1.672	0.0946 .
ZNoiseStarts24_gmc	0.81381	0.49249	1.652	0.0984 .
HRC_c	-0.89703	0.53151	-1.688	0.0915 .
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.04112	0.02102	1.956	0.0504 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS60_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS60_	-0.001							
ZL_NAT_24_L	-0.019	-0.332						
ZFlights24h_	0.264	-0.006	-0.001					
ZNightflight_	0.007	-0.001	0.002	0.661				
ZTrnd24h_gm	-0.041	-0.001	-0.005	0.211	0.249			
ZNsStrts24_	0.037	0.007	0.003	-0.892	-0.755	-0.181		
HRC_c	-0.539	0.002	-0.002	-0.423	0.106	-0.106	0.046	
ZLA_24_LS60_:	-0.035	-0.143	0.188	-0.004	0.002	-0.002	0.005	0.005

> performance::icc(CIM\_AMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.059

Conditional ICC: 0.046

> performance::r2(CIM\_AMN60)

# R2 for Mixed Models

Conditional R2: 0.259

Marginal R2: 0.212

> screenreg(CIM\_AMN60)

=====

Model 1

```

-----
(Intercept)                -0.36 *
                           (0.18)
ZLAmx_24h_LS60_cmc        0.29 ***
                           (0.02)
ZLog_NAT_24h_LS60_cmc    0.74 ***
                           (0.02)
ZFlights24h_gmc          -0.15
                           (0.59)
ZNightflightrate_gmc     -0.02
                           (0.22)
ZTrend24h_gmc            -0.18
                           (0.11)
ZNoiseStarts24_gmc       0.81
                           (0.49)
HRC_c                     -0.90
                           (0.53)
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.04
                           (0.02)
-----

```

```

-----
AIC                        29459.65
BIC                        29540.91
Log Likelihood            -14719.82
Num. obs.                 24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.21
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN60)
```

```

$Airport3
  (Intercept)
1 -0.24906288
1.1 0.19566272
1.2 -0.41858388
1.3 0.61763181
2 0.55803431
3 0.05204299
4 0.14065216
91 -0.79243517
92 0.60496498
93 -0.58920904
94 0.09364629
95 -0.19862670

```

with conditional variances for "Airport3"

**4.28.3 AIM1\_AMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS60\_cmc + ZLog\_NAT\_24h\_LS60\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS60\_cmc || Airport3) + ZLAmx\_24h\_LS60\_cmc:ZLog\_NAT\_24h\_LS60\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29435.9	29525.3	-14707.0	29413.9	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8269	-0.7556	-0.4066	0.8612	9.3805

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.21121	0.4596
Airport3.1	ZLAmx_24h_LS60_cmc	0.01609	0.1268

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.37626	0.18250	-2.062	0.0392 *
ZLAmx_24h_LS60_cmc	0.31735	0.04335	7.321	2.47e-13 ***
ZLog_NAT_24h_LS60_cmc	0.74375	0.01934	38.466	< 2e-16 ***
ZFlights24h_gmc	-0.18765	0.60087	-0.312	0.7548
ZNightflightrate_gmc	-0.01909	0.21956	-0.087	0.9307
ZTrend24h_gmc	-0.18942	0.11025	-1.718	0.0858 .
ZNoiseStarts24_gmc	0.81253	0.49785	1.632	0.1027
HRC_c	-0.80802	0.53615	-1.507	0.1318
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.05043	0.02229	2.262	0.0237 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS60_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS60_	-0.002							
ZL_NAT_24_L	-0.020	-0.135						
ZFlights24h_	0.262	0.002	-0.002					
ZNightflight_	0.006	0.002	0.002	0.661				
ZTrnd24h_gm	-0.041	-0.008	-0.005	0.210	0.248			
ZNSstrts24_	0.038	-0.001	0.004	-0.892	-0.754	-0.181		
HRC_c	-0.539	0.002	-0.001	-0.422	0.107	-0.104	0.045	
ZLA_24_LS60_:	-0.033	-0.090	0.208	0.000	0.004	-0.001	0.001	0.004

> performance::icc(AIM1\_AMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.060

Conditional ICC: 0.047

> performance::r2(AIM1\_AMN60)

# R2 for Mixed Models

Conditional R2: 0.265

Marginal R2: 0.218

> screenreg(AIM1\_AMN60)

=====



```

-----
Model 1
-----
(Intercept)                -0.38 *
                             (0.18)
ZLAmx_24h_LS60_cmc         0.32 ***
                             (0.04)
ZLog_NAT_24h_LS60_cmc     0.74 ***
                             (0.02)
ZFlights24h_gmc           -0.19
                             (0.60)
ZNightflightrate_gmc      -0.02
                             (0.22)
ZTrend24h_gmc             -0.19
                             (0.11)
ZNoiseStarts24_gmc        0.81
                             (0.50)
HRC_c                      -0.81
                             (0.54)
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.05 *
                             (0.02)
-----
AIC                        29435.92
BIC                        29525.31
Log Likelihood             -14706.96
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.21
Var: Airport3.1 ZLAmx_24h_LS60_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN60)
$Airport3
  (Intercept) ZLAmx_24h_LS60_cmc
1 -0.25087381 0.111654202
1.1 0.19469730 -0.106562754
1.2 -0.41634147 -0.110658339
1.3 0.62087255 0.147585987
2 0.56830625 -0.004288533
3 0.05227870 0.045177133
4 0.13907669 0.036163579
91 -0.80206914 0.073409136
92 0.61553543 0.092742220
93 -0.59882924 0.040004214
94 0.09352819 -0.094097492
95 -0.19593385 -0.239180652

with conditional variances for "Airport3"
>

```

**4.28.4 AIM2\_AMN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS60_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS60_cmc || Airport3) + ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
29420.3 29509.7 -14699.2 29398.3   24982
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-2.5181 -0.7508 -0.4118  0.8458  5.7323
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.18453  0.4296
Airport3.1  ZLog_NAT_24h_LS60_cmc     0.08475  0.2911
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.3802246  0.1711808  -2.221  0.0263 *
ZLAmx_24h_LS60_cmc  0.2919717  0.0167559  17.425 < 2e-16 ***
ZLog_NAT_24h_LS60_cmc  0.7090989  0.0920834   7.701 1.35e-14 ***
ZFlights24h_gmc  -0.1274405  0.5657414  -0.225  0.8218
ZNightflightrate_gmc -0.0006631  0.2059396  -0.003  0.9974
ZTrend24h_gmc   -0.1788009  0.1035222  -1.727  0.0841 .
ZNoiseStarts24_gmc  0.7220717  0.4678008   1.544  0.1227
HRC_c           -0.7659884  0.5046121  -1.518  0.1290
ZLAmx_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc  0.0522715  0.0217710   2.401  0.0164 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
      (Intr) ZLAm_24_LS60_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS60_  0.007
ZL_NAT_24_L   -0.016 -0.130
ZFlghts24h_   0.264 -0.003      0.002
ZNghtflght_   0.006 -0.004      0.006  0.662
ZTrnd24h_gm  -0.039 -0.001     -0.011  0.209  0.249
ZNSstrts24_   0.036  0.006     -0.002 -0.892 -0.755 -0.180
HRC_c         -0.541 -0.005      0.009 -0.425  0.104 -0.105  0.049
ZLA_24_LS60_: -0.042 -0.169      0.062 -0.006  0.005  0.001  0.005  0.012
```

```
> performance::icc(AIM2_AMN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.053
```

```
Conditional ICC: 0.042
```

```
> performance::r2(AIM2_AMN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.243
```

```
Marginal R2: 0.200
```

```
> screenreg(AIM2_AMN60)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.38 *
                                (0.17)
ZLAmox_24h_LS60_cmc            0.29 ***
                                (0.02)
ZLog_NAT_24h_LS60_cmc         0.71 ***
                                (0.09)
ZFlights24h_gmc                -0.13
                                (0.57)
ZNightflightrate_gmc          -0.00
                                (0.21)
ZTrend24h_gmc                 -0.18
                                (0.10)
ZNoiseStarts24_gmc            0.72
                                (0.47)
HRC_c                          -0.77
                                (0.50)
ZLAmox_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.05 *
                                (0.02)
-----
AIC                             29420.32
BIC                             29509.71
Log Likelihood                  -14699.16
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.18
Var: Airport3.1 ZLog_NAT_24h_LS60_cmc 0.08
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN60)
$Airport3
  (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.25573609 0.36539847
1.1 0.21710306 0.04358737
1.2 -0.42320596 0.03620657
1.3 0.60141923 0.11090362
2 0.55396886 -0.01395007
3 0.04479878 0.02545529
4 0.13033887 0.20918972
91 -0.73532428 -0.16991386
92 0.51722759 0.41224255
93 -0.51937764 -0.19404390
94 0.09982716 -0.28589437
95 -0.19199861 -0.58716737

```

with conditional variances for "Airport3"

**4.28.5 Vergleichstests AMN60****4.28.5.1 > anova(CIM\_AMN60, AIM1\_AMN60)**

Models:

CIM\_AMN60: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN60	10	29460	29541	-14720	29440			
AIM1_AMN60	11	29436	29525	-14707	29414	25.726	1	3.934e-07 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.28.5.2 > anova(CIM\_AMN60, AIM2\_AMN60)**

Models:

CIM\_AMN60: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN60: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN60	10	29460	29541	-14720	29440			
AIM2_AMN60	11	29420	29510	-14699	29398	41.329	1	1.286e-10 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.28.6 FM\_AMN60**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLamax_24h_LS60_cmc + ZLog_NAT_24h_LS60_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLamax_24h_LS60_cmc || Airport3) + (1 + ZLog_NAT_24h_LS60_cmc ||
  Airport3) + ZLamax_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc + ZLamax_24h_LS60_cmc:ZFlights24h_gm
c +
  ZLamax_24h_LS60_cmc:ZNightflightrate_gmc + ZLamax_24h_LS60_cmc:ZTrend24h_gmc +
  ZLamax_24h_LS60_cmc:ZNoiseStarts24_gmc + ZLamax_24h_LS60_cmc:HRC_c +
  ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS60_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
29399.6 29586.5 -14676.8 29353.6 24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.8337 -0.7441 -0.4185  0.8527  5.8441
```

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	5.580e-02	2.362e-01
Airport3.1	ZLamax_24h_LS60_cmc	4.891e-09	6.993e-05
Airport3.2	(Intercept)	1.489e-01	3.859e-01
Airport3.3	ZLog_NAT_24h_LS60_cmc	6.615e-03	8.133e-02

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.386735	0.179976	-2.149	0.03165 *
ZLamax_24h_LS60_cmc	0.309104	0.022460	13.762	< 2e-16 ***
ZLog_NAT_24h_LS60_cmc	0.818469	0.053185	15.389	< 2e-16 ***
ZFlights24h_gmc	-0.135881	0.595355	-0.228	0.81946
ZNightflightrate_gmc	-0.003341	0.217166	-0.015	0.98772
ZTrend24h_gmc	-0.183725	0.108734	-1.690	0.09109 .
ZNoiseStarts24_gmc	0.718359	0.493344	1.456	0.14536
HRC_c	-0.735908	0.529665	-1.389	0.16472
ZLamax_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc	0.059140	0.023281	2.540	0.01108 *
ZLamax_24h_LS60_cmc:ZFlights24h_gmc	0.135328	0.089742	1.508	0.13156
ZLamax_24h_LS60_cmc:ZNightflightrate_gmc	0.038790	0.030249	1.282	0.19972
ZLamax_24h_LS60_cmc:ZTrend24h_gmc	0.037646	0.018715	2.012	0.04426 *
ZLamax_24h_LS60_cmc:ZNoiseStarts24_gmc	-0.083541	0.074542	-1.121	0.26240
ZLamax_24h_LS60_cmc:HRC_c	-0.231373	0.073212	-3.160	0.00158 **
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc	-0.252906	0.198689	-1.273	0.20306
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc	-0.093058	0.063349	-1.469	0.14184
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc	0.002844	0.036058	0.079	0.93712
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc	0.513736	0.160577	3.199	0.00138 **
ZLog_NAT_24h_LS60_cmc:HRC_c	-0.412724	0.178858	-2.308	0.02102 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

```
convergence code: 0
boundary (singular) fit: see ?issingular
```

```
> performance::icc(FM_AMN60)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.017
Conditional ICC: 0.013
> performance::r2(FM_AMN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.235
Marginal R2: 0.222
> screenreg(FM_AMN60)
```

```
=====
Model 1
-----
(Intercept)                -0.39 *
                           (0.18)
ZLAmox_24h_LS60_cmc         0.31 ***
                           (0.02)
ZLog_NAT_24h_LS60_cmc      0.82 ***
                           (0.05)
ZFlights24h_gmc            -0.14
                           (0.60)
ZNightflightrate_gmc       -0.00
                           (0.22)
ZTrend24h_gmc              -0.18
                           (0.11)
ZNoiseStarts24_gmc         0.72
                           (0.49)
HRC_c                       -0.74
                           (0.53)
ZLAmox_24h_LS60_cmc:ZLog_NAT_24h_LS60_cmc 0.06 *
                           (0.02)
ZLAmox_24h_LS60_cmc:ZFlights24h_gmc       0.14
                           (0.09)
ZLAmox_24h_LS60_cmc:ZNightflightrate_gmc  0.04
                           (0.03)
ZLAmox_24h_LS60_cmc:ZTrend24h_gmc          0.04 *
                           (0.02)
ZLAmox_24h_LS60_cmc:ZNoiseStarts24_gmc    -0.08
                           (0.07)
ZLAmox_24h_LS60_cmc:HRC_c                 -0.23 **
                           (0.07)
ZLog_NAT_24h_LS60_cmc:ZFlights24h_gmc     -0.25
                           (0.20)
ZLog_NAT_24h_LS60_cmc:ZNightflightrate_gmc -0.09
                           (0.06)
ZLog_NAT_24h_LS60_cmc:ZTrend24h_gmc        0.00
                           (0.04)
ZLog_NAT_24h_LS60_cmc:ZNoiseStarts24_gmc  0.51 **
                           (0.16)
ZLog_NAT_24h_LS60_cmc:HRC_c               -0.41 *
                           (0.18)
-----
AIC                                     29399.60
BIC                                     29586.51
```

```

Log Likelihood                -14676.80
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.06
Var: Airport3.1 ZLamax_24h_LS60_cmc 0.00
Var: Airport3.2 (Intercept)  0.15
Var: Airport3.3 ZLog_NAT_24h_LS60_cmc 0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN60)

```

```

$Airport3

```

```

  (Intercept) ZLamax_24h_LS60_cmc (Intercept) ZLog_NAT_24h_LS60_cmc
1 -0.06889515  7.157401e-08 -0.18383450  0.024588922
1.1 0.05859685 -1.470390e-07  0.15635530 -0.101466324
1.2 -0.11614272 -8.074517e-08 -0.30990625 -0.002863131
1.3 0.16391466  1.685739e-07  0.43737718  0.083627495
2  0.15188594 -7.652288e-08  0.40528068 -0.049187153
3  0.01455318  1.218225e-08  0.03883258  0.016649203
4  0.03899140  4.369360e-08  0.10404164  0.066609860
91 -0.21632210  2.325665e-08 -0.57721715 -0.026909605
92  0.16156083  3.894881e-08  0.43109642  0.058883799
93 -0.15873108 -4.629462e-08 -0.42354574 -0.070998501
94  0.02967233 -2.271450e-08  0.07917535  0.022153212
95 -0.05359192  7.280084e-09 -0.14300054 -0.029789595

```

```

with conditional variances for "Airport3"

```

**4.29 Modell AMN70 (akustische Prädiktoren  $L_{AS,max,log,24h,70}$  und  $\log(NAT_{24h,70})$ )****4.29.1 MO\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN70@theta[1] ^ 2 / (MO_AMN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN70)
$Airport3
  (Intercept)
1  0.4686904885
```



1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.29.2 CIM\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLAmx\_24h\_LS70\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS70\_cmc:ZLog\_NAT\_24h\_LS70\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
29825.3	29906.5	-14902.6	29805.3	24983

scaled residuals:

Min	1Q	Median	3Q	Max
-1.9891	-0.7804	-0.4108	0.8620	7.6449

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2234	0.4727

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.40636	0.18784	-2.163	0.0305 *
ZLAmx_24h_LS70_cmc	-0.04699	0.02130	-2.206	0.0274 *
ZLog_NAT_24h_LS70_cmc	0.84560	0.02045	41.357	< 2e-16 ***
ZFlights24h_gmc	-0.25137	0.61746	-0.407	0.6839
ZNightflightrate_gmc	-0.02540	0.22614	-0.112	0.9106
ZTrend24h_gmc	-0.19692	0.11324	-1.739	0.0821 .
ZNoiseStarts24_gmc	0.86767	0.51221	1.694	0.0903 .
HRC_c	-0.72637	0.55140	-1.317	0.1877
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc	0.09174	0.02195	4.179	2.93e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS70_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS70_	0.039							
ZL_NAT_24_L	-0.036	-0.525						
ZFlights24h_	0.262	0.014	-0.011					
ZNightflight_	0.006	0.003	0.001	0.662				
ZTrnd24h_gm	-0.041	0.005	-0.010	0.211	0.249			
ZNsStrts24_	0.038	-0.012	0.011	-0.892	-0.755	-0.182		
HRC_c	-0.539	-0.016	0.015	-0.419	0.109	-0.104	0.041	
ZLA_24_LS70_:	-0.057	-0.624	0.281	-0.028	-0.009	-0.007	0.028	0.021

> performance::icc(CIM\_AMN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.064

Conditional ICC: 0.051

> performance::r2(CIM\_AMN70)

# R2 for Mixed Models

Conditional R2: 0.248

Marginal R2: 0.197

> screenreg(CIM\_AMN70)

=====

Model 1

```

-----
(Intercept)                -0.41 *
                           (0.19)
ZLAmox_24h_LS70_cmc        -0.05 *
                           (0.02)
ZLog_NAT_24h_LS70_cmc      0.85 ***
                           (0.02)
ZFlights24h_gmc            -0.25
                           (0.62)
ZNightflightrate_gmc       -0.03
                           (0.23)
ZTrend24h_gmc              -0.20
                           (0.11)
ZNoiseStarts24_gmc         0.87
                           (0.51)
HRC_c                       -0.73
                           (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                           (0.02)
-----

```

```

-----
AIC                29825.26
BIC                29906.52
Log Likelihood     -14902.63
Num. obs.          24993
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.22
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN70)
```

```

$Airport3
  (Intercept)
1 -0.25271955
1.1 0.15629183
1.2 -0.38391856
1.3 0.61962842
2 0.57516548
3 0.06486016
4 0.18700642
91 -0.85813036
92 0.62694166
93 -0.62357790
94 0.13936784
95 -0.23631611

```

with conditional variances for "Airport3"

**4.29.3 AIM1\_AMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS70\_cmc + ZLog\_NAT\_24h\_LS70\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS70\_cmc || Airport3) + ZLAmx\_24h\_LS70\_cmc:ZLog\_NAT\_24h\_LS70\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
29801.7	29891.1	-14889.8	29779.7	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.3889	-0.7833	-0.4049	0.8628	8.1190

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.22924	0.4788
Airport3.1	ZLAmx_24h_LS70_cmc	0.01323	0.1150

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.42246	0.19022	-2.221	0.0264 *
ZLAmx_24h_LS70_cmc	-0.06510	0.04366	-1.491	0.1360
ZLog_NAT_24h_LS70_cmc	0.87032	0.02155	40.391	< 2e-16 ***
ZFlights24h_gmc	-0.28020	0.62663	-0.447	0.6548
ZNightflightrate_gmc	-0.02570	0.22902	-0.112	0.9107
ZTrend24h_gmc	-0.20018	0.11469	-1.745	0.0809 .
ZNoiseStarts24_gmc	0.88266	0.51930	1.700	0.0892 .
HRC_c	-0.69031	0.55711	-1.239	0.2153
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc	0.10379	0.02485	4.177	2.95e-05 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS70_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS70_	0.023							
ZL_NAT_24_L	-0.040	-0.296						
ZFlights24h_	0.263	0.009	-0.013					
ZNightflight_	0.008	0.001	0.001	0.663				
ZTrnd24h_gm	-0.041	-0.002	-0.010	0.212	0.249			
ZNsStrts24_	0.036	-0.008	0.013	-0.893	-0.755	-0.183		
HRC_c	-0.538	-0.008	0.015	-0.421	0.105	-0.105	0.046	
ZLA_24_LS70_:	-0.059	-0.343	0.292	-0.025	-0.007	-0.006	0.025	0.017

> performance::icc(AIM1\_AMN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.065

Conditional ICC: 0.052

> performance::r2(AIM1\_AMN70)

# R2 for Mixed Models

Conditional R2: 0.254

Marginal R2: 0.202

> screenreg(AIM1\_AMN70)

=====

```

-----
                                Model 1
-----
(Intercept)                    -0.42 *
                                (0.19)
ZLAmx_24h_LS70_cmc             -0.07
                                (0.04)
ZLog_NAT_24h_LS70_cmc         0.87 ***
                                (0.02)
ZFlights24h_gmc                -0.28
                                (0.63)
ZNightflightrate_gmc          -0.03
                                (0.23)
ZTrend24h_gmc                 -0.20
                                (0.11)
ZNoiseStarts24_gmc            0.88
                                (0.52)
HRC_c                          -0.69
                                (0.56)
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.10 ***
                                (0.02)
-----
AIC                             29801.69
BIC                             29891.08
Log Likelihood                  -14889.84
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.23
Var: Airport3.1 ZLAmx_24h_LS70_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN70)
$Airport3
  (Intercept) ZLAmx_24h_LS70_cmc
1 -0.25775101  0.175190156
1.1 0.15637933 -0.065120928
1.2 -0.38545855 -0.208843201
1.3 0.62944049 -0.020921289
2 0.58371285 -0.077001587
3 0.06552157  0.125980684
4 0.18867902  0.009586129
91 -0.86785203 0.032403319
92 0.63385979 0.055665215
93 -0.63460232 0.036471903
94 0.14157543 -0.008184130
95 -0.23590951 -0.059256554

with conditional variances for "Airport3"
>

```

**4.29.4 AIM2\_AMN70**

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS70_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS70_cmc || Airport3) + ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cm
c
Data: dat

      AIC      BIC  logLik deviance df.resid
29782.5 29871.9 -14880.3 29760.5   24982

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.1769 -0.7720 -0.4264  0.8555  7.6076

Random effects:
 Groups      Name                Variance Std.Dev.
Airport3    (Intercept)             0.21732  0.4662
Airport3.1  ZLog_NAT_24h_LS70_cmc  0.04843  0.2201
Number of obs: 24993, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)    -0.42546    0.18557  -2.293   0.0219 *
ZLAmx_24h_LS70_cmc -0.04557    0.02274  -2.004   0.0451 *
ZLog_NAT_24h_LS70_cmc  0.86904    0.07048  12.331 < 2e-16 ***
ZFlights24h_gmc    -0.28337    0.61423  -0.461   0.6446
ZNightflightrate_gmc -0.02722    0.22345  -0.122   0.9031
ZTrend24h_gmc     -0.20780    0.11222  -1.852   0.0641 .
ZNoiseStarts24_gmc  0.85488    0.50808   1.683   0.0925 .
HRC_c            -0.63365    0.54526  -1.162   0.2452
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc  0.09270    0.02290   4.049 5.15e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
              (Intr) ZLAm_24_LS70_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS70_  0.046
ZL_NAT_24_L    -0.020 -0.190
ZFlghts24h_   0.264  0.024      0.001
ZNghtflght_   0.008  0.007      0.003  0.662
ZTrnd24h_gm  -0.039  0.006     -0.022  0.206  0.247
ZNSStrts24_   0.033 -0.024      0.002 -0.893 -0.755 -0.179
HRC_c         -0.540 -0.018      0.007 -0.424  0.104 -0.104  0.050
ZLA_24_LS70_: -0.059 -0.647      0.099 -0.033 -0.011 -0.007  0.034  0.020
> performance::icc(AIM2_AMN70)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.062
Conditional ICC: 0.049
> performance::r2(AIM2_AMN70)
# R2 for Mixed Models

Conditional R2: 0.251
Marginal R2: 0.202
> screenreg(AIM2_AMN70)

```

```

=====
                                Model 1
-----
(Intercept)                    -0.43 *
                                (0.19)
ZLAmox_24h_LS70_cmc            -0.05 *
                                (0.02)
ZLog_NAT_24h_LS70_cmc         0.87 ***
                                (0.07)
ZFlights24h_gmc                -0.28
                                (0.61)
ZNightflightrate_gmc          -0.03
                                (0.22)
ZTrend24h_gmc                  -0.21
                                (0.11)
ZNoiseStarts24_gmc            0.85
                                (0.51)
HRC_c                           -0.63
                                (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                                (0.02)
-----
AIC                             29782.55
BIC                             29871.94
Log Likelihood                  -14880.27
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.22
Var: Airport3.1 ZLog_NAT_24h_LS70_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN70)
$Airport3
  (Intercept) ZLog_NAT_24h_LS70_cmc
1 -0.26864109 0.34149470
1.1 0.16441877 -0.05013580
1.2 -0.36712612 -0.08058397
1.3 0.61768128 0.23972202
2 0.59746980 -0.14612449
3 0.05865704 0.17467642
4 0.17394480 -0.01984087
91 -0.83472475 -0.03456748
92 0.59096939 0.12839984
93 -0.59940656 -0.02690696
94 0.13554496 -0.08027279
95 -0.23003537 -0.47918455

```

with conditional variances for "Airport3"

**4.29.5 Vergleichstests AMN70****4.29.5.1 > anova(CIM\_AMN70, AIM1\_AMN70)**

Models:

CIM\_AMN70: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN70	10	29825	29907	-14903	29805			
AIM1_AMN70	11	29802	29891	-14890	29780	25.569	1	4.268e-07 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.29.5.2 > anova(CIM\_AMN70, AIM2\_AMN70)**

Models:

CIM\_AMN70: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN70: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN70	10	29825	29907	-14903	29805			
AIM2_AMN70	11	29783	29872	-14880	29761	44.711	1	2.284e-11 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.29.6 FM\_AMN70**

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS70_cmc + ZLog_NAT_24h_LS70_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS70_cmc || Airport3) + (1 + ZLog_NAT_24h_LS70_cmc ||
  Airport3) + ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc + ZLAmx_24h_LS70_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS70_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS70_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS70_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS70_cmc:HRC_c +
  ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS70_cmc:HRC_c
Data: dat

```

```

      AIC      BIC   logLik deviance df.resid
29771.3 29958.2 -14862.6 29725.3   24970

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-2.4256 -0.7736 -0.4283  0.8558  7.5026

```

Random effects:

```

Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                2.241e-01 4.734e-01
Airport3.1  ZLAmx_24h_LS70_cmc          1.382e-09 3.717e-05
Airport3.2  (Intercept)                6.857e-05 8.281e-03
Airport3.3  ZLog_NAT_24h_LS70_cmc      1.495e-02 1.223e-01
Number of obs: 24993, groups: Airport3, 12

```

Fixed effects:

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.423280   0.188417  -2.247 0.024671 *
ZLAmx_24h_LS70_cmc -0.092358   0.029912  -3.088 0.002017 **
ZLog_NAT_24h_LS70_cmc  1.017375   0.060545  16.804 < 2e-16 ***
ZFlights24h_gmc  -0.272303   0.621840  -0.438 0.661459
ZNightflightrate_gmc -0.027578   0.226698  -0.122 0.903176
ZTrend24h_gmc   -0.209383   0.113865  -1.839 0.065933 .
ZNoiseStarts24_gmc  0.842304   0.515262   1.635 0.102110
HRC_c           -0.638586   0.551634  -1.158 0.247016
ZLAmx_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc  0.088544   0.026405   3.353 0.000798 ***
ZLAmx_24h_LS70_cmc:ZFlights24h_gmc -0.039974   0.103374  -0.387 0.698985
ZLAmx_24h_LS70_cmc:ZNightflightrate_gmc  0.015494   0.034111   0.454 0.649659
ZLAmx_24h_LS70_cmc:ZTrend24h_gmc -0.006604   0.018096  -0.365 0.715165
ZLAmx_24h_LS70_cmc:ZNoiseStarts24_gmc -0.057451   0.086926  -0.661 0.508670
ZLAmx_24h_LS70_cmc:HRC_c  0.032041   0.064690   0.495 0.620389
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc  0.217667   0.203850   1.068 0.285620
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc  0.057835   0.069586   0.831 0.405902
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc  0.073809   0.040672   1.815 0.069566 .
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc  0.146593   0.169984   0.862 0.388471
ZLog_NAT_24h_LS70_cmc:HRC_c -0.550532   0.197103  -2.793 0.005220 **
---

```

```

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Correlation matrix not shown by default, as p = 19 &gt; 12.

```

Use print(x, correlation=TRUE) or
vcov(x)      if you need it

```

```
convergence code: 0
boundary (singular) fit: see ?issingular
```

```
> performance::icc(FM_AMN70)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.064
Conditional ICC: 0.050
> performance::r2(FM_AMN70)
# R2 for Mixed Models
```

```
Conditional R2: 0.266
Marginal R2: 0.216
> screenreg(FM_AMN70)
```

```
=====
Model 1
-----
(Intercept)                -0.42 *
                           (0.19)
ZLAmox_24h_LS70_cmc        -0.09 **
                           (0.03)
ZLog_NAT_24h_LS70_cmc      1.02 ***
                           (0.06)
ZFlights24h_gmc           -0.27
                           (0.62)
ZNightflightrate_gmc      -0.03
                           (0.23)
ZTrend24h_gmc             -0.21
                           (0.11)
ZNoiseStarts24_gmc        0.84
                           (0.52)
HRC_c                     -0.64
                           (0.55)
ZLAmox_24h_LS70_cmc:ZLog_NAT_24h_LS70_cmc 0.09 ***
                           (0.03)
ZLAmox_24h_LS70_cmc:ZFlights24h_gmc      -0.04
                           (0.10)
ZLAmox_24h_LS70_cmc:ZNightflightrate_gmc 0.02
                           (0.03)
ZLAmox_24h_LS70_cmc:ZTrend24h_gmc        -0.01
                           (0.02)
ZLAmox_24h_LS70_cmc:ZNoiseStarts24_gmc   -0.06
                           (0.09)
ZLAmox_24h_LS70_cmc:HRC_c                0.03
                           (0.06)
ZLog_NAT_24h_LS70_cmc:ZFlights24h_gmc    0.22
                           (0.20)
ZLog_NAT_24h_LS70_cmc:ZNightflightrate_gmc 0.06
                           (0.07)
ZLog_NAT_24h_LS70_cmc:ZTrend24h_gmc      0.07
                           (0.04)
ZLog_NAT_24h_LS70_cmc:ZNoiseStarts24_gmc 0.15
                           (0.17)
ZLog_NAT_24h_LS70_cmc:HRC_c             -0.55 **
                           (0.20)
-----
AIC                                29771.29
BIC                                29958.20
```

```

Log Likelihood                -14862.65
Num. obs.                    24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.22
Var: Airport3.1 ZLamax_24h_LS70_cmc 0.00
Var: Airport3.2 (Intercept) 0.00
Var: Airport3.3 ZLog_NAT_24h_LS70_cmc 0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN70)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS70_cmc  (Intercept) ZLog_NAT_24h_LS70_cmc
1    -0.26482805    2.156243e-08 -8.103101e-05    0.09463495
1.1  0.16579174    2.559115e-08  5.072828e-05   -0.14206340
1.2 -0.37673322   -5.079642e-08 -1.152713e-04   -0.14421096
1.3  0.61470467   -1.560692e-08  1.880848e-04    0.16168350
2     0.59753689   -2.378627e-08  1.828319e-04   -0.13501459
3     0.06414298    3.896391e-09  1.962621e-05    0.03528893
4     0.18272915   -1.734617e-09  5.591072e-05    0.11335605
91   -0.86114700    3.312826e-09 -2.634903e-04   -0.02229470
92    0.60421915   -1.126083e-09  1.848765e-04    0.05773625
93   -0.61730913    1.931111e-08 -1.888817e-04   -0.05911664
94    0.15033981    9.170575e-09  4.600036e-05    0.05230031
95   -0.23079719    9.923060e-09 -7.061839e-05   -0.03037671

```

```

with conditional variances for "Airport3"

```

**4.30 Modell AMN80 (akustische Prädiktoren  $L_{AS,max,log,24h,80}$  und  $\log(NAT_{24h,80})$ )****4.30.1 MO\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_AMN80@theta[1] ^ 2 / (MO_AMN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_AMN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_AMN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_AMN80)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_AMN80)
$Airport3
  (Intercept)
1    0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.30.2 CIM\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS80\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 | Airport3) + ZLAmx\_24h\_LS80\_cmc:ZLog\_NAT\_24h\_LS80\_cmc

Data: dat

AIC	BIC	logLik	deviance	df.resid
30778.5	30859.8	-15379.3	30758.5	24983

scaled residuals:

Min	1Q	Median	3Q	Max
-1.8033	-0.7887	-0.4860	0.9150	6.7990

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2175	0.4663

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.35481	0.18537	-1.914	0.0556 .
ZLAmx_24h_LS80_cmc	-0.14016	0.02153	-6.509	7.55e-11 ***
ZLog_NAT_24h_LS80_cmc	0.70367	0.01877	37.488	< 2e-16 ***
ZFlights24h_gmc	-0.30335	0.61330	-0.495	0.6209
ZNightflightrate_gmc	-0.06017	0.22367	-0.269	0.7879
ZTrend24h_gmc	-0.18741	0.11172	-1.677	0.0935 .
ZNoiseStarts24_gmc	0.95600	0.50791	1.882	0.0598 .
HRC_c	-0.85793	0.54632	-1.570	0.1163
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.08270	0.01601	5.167	2.38e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS80_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS80_	0.024							
ZL_NAT_24_L	-0.020	-0.494						
ZFlights24h_	0.265	0.019	-0.016					
ZNightflight_	0.008	0.011	-0.006	0.663				
ZTrnd24h_gm	-0.040	0.003	-0.008	0.213	0.249			
ZNsStrts24_	0.034	-0.020	0.020	-0.893	-0.756	-0.183		
HRC_c	-0.540	-0.007	0.003	-0.423	0.105	-0.107	0.047	
ZLA_24_LS80_:	-0.043	-0.564	0.215	-0.036	-0.020	-0.005	0.042	0.009

> performance::icc(CIM\_AMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.062

Conditional ICC: 0.053

> performance::r2(CIM\_AMN80)

# R2 for Mixed Models

Conditional R2: 0.202

Marginal R2: 0.150

> screenreg(CIM\_AMN80)

=====

Model 1

```

-----
(Intercept)                -0.35
                           (0.19)
ZLAmox_24h_LS80_cmc        -0.14 ***
                           (0.02)
ZLog_NAT_24h_LS80_cmc      0.70 ***
                           (0.02)
ZFlights24h_gmc            -0.30
                           (0.61)
ZNightflightrate_gmc       -0.06
                           (0.22)
ZTrend24h_gmc              -0.19
                           (0.11)
ZNoiseStarts24_gmc         0.96
                           (0.51)
HRC_c                       -0.86
                           (0.55)
ZLAmox_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.08 ***
                           (0.02)
-----

```

```

-----
AIC                          30778.53
BIC                          30859.79
Log Likelihood                -15379.26
Num. obs.                     24993
Num. groups: Airport3         12
Var: Airport3 (Intercept)     0.22
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_AMN80)
```

```
$Airport3
```

```

(Intercept)
1 -0.28491459
1.1 0.15653551
1.2 -0.32791574
1.3 0.62503884
2 0.54210011
3 0.05588391
4 0.18546803
91 -0.80313415
92 0.65739397
93 -0.65908467
94 0.10612812
95 -0.23786535

```

with conditional variances for "Airport3"

**4.30.3 AIM1\_AMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

Formula: HA ~ ZLAmx\_24h\_LS80\_cmc + ZLog\_NAT\_24h\_LS80\_cmc + ZFlights24h\_gmc +  
ZNightflightrate\_gmc + ZTrend24h\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_24h\_LS80\_cmc || Airport3) + ZLAmx\_24h\_LS80\_cmc:ZLog\_NAT\_24h\_LS80\_cmc  
Data: dat

AIC	BIC	logLik	deviance	df.resid
30712.7	30802.1	-15345.3	30690.7	24982

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.9562	-0.7682	-0.4962	0.9016	13.2869

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.24372	0.4937
Airport3.1	ZLAmx_24h_LS80_cmc	0.05125	0.2264

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.39431	0.19662	-2.005	0.044915 *
ZLAmx_24h_LS80_cmc	-0.26481	0.07409	-3.574	0.000351 ***
ZLog_NAT_24h_LS80_cmc	0.77141	0.02083	37.027	< 2e-16 ***
ZFlights24h_gmc	-0.37513	0.65507	-0.573	0.566877
ZNightflightrate_gmc	-0.07717	0.23828	-0.324	0.746026
ZTrend24h_gmc	-0.19974	0.11829	-1.688	0.091320 .
ZNoiseStarts24_gmc	1.01984	0.54273	1.879	0.060231 .
HRC_c	-0.81080	0.58030	-1.397	0.162350
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.15526	0.02273	6.832	8.37e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm_24_LS80_	ZL_NAT_24_L	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c
ZLAm_24_LS80_	0.011							
ZL_NAT_24_L	-0.028	-0.231						
ZFlights24h_	0.265	0.016	-0.019					
ZNightflight_	0.009	0.008	-0.010	0.667				
ZTrnd24h_gm	-0.039	-0.007	-0.011	0.215	0.251			
ZNSstrts24_	0.033	-0.016	0.025	-0.894	-0.760	-0.186		
HRC_c	-0.542	-0.004	0.005	-0.423	0.103	-0.107	0.048	
ZLA_24_LS80_:	-0.052	-0.223	0.333	-0.038	-0.025	-0.010	0.045	0.010

> performance::icc(AIM1\_AMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.069

Conditional ICC: 0.058

> performance::r2(AIM1\_AMN80)

# R2 for Mixed Models

Conditional R2: 0.214

Marginal R2: 0.156

> screenreg(AIM1\_AMN80)

=====



```

-----
                                Model 1
-----
(Intercept)                    -0.39 *
                                (0.20)
ZLAmx_24h_LS80_cmc             -0.26 ***
                                (0.07)
ZLog_NAT_24h_LS80_cmc         0.77 ***
                                (0.02)
ZFlights24h_gmc                -0.38
                                (0.66)
ZNightflightrate_gmc          -0.08
                                (0.24)
ZTrend24h_gmc                 -0.20
                                (0.12)
ZNoiseStarts24_gmc            1.02
                                (0.54)
HRC_c                          -0.81
                                (0.58)
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.16 ***
                                (0.02)
-----
AIC                             30712.68
BIC                             30802.07
Log Likelihood                  -15345.34
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.24
Var: Airport3.1 ZLAmx_24h_LS80_cmc 0.05
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_AMN80)
$Airport3
  (Intercept) ZLAmx_24h_LS80_cmc
1 -0.29675556  0.21141729
1.1 0.14670595 -0.08506906
1.2 -0.31933983 -0.12838530
1.3 0.64751371 -0.10014425
2 0.58280574 -0.45526248
3 0.06067045 0.21539138
4 0.19958167 0.31755458
91 -0.86050253 0.24982150
92 0.70031607 0.00298865
93 -0.70057114 -0.04637649
94 0.11704084 -0.04486228
95 -0.25472706 -0.14071079

```

with conditional variances for "Airport3"

**4.30.4 AIM2\_AMN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS80_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_24h_LS80_cmc || Airport3) + ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cm
c
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
30668.7 30758.1 -15323.3 30646.7   24982
```

```
Scaled residuals:
```

```
      Min      1Q  Median      3Q      Max
-2.3462 -0.7614 -0.4988  0.8995  5.3359
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.2422  0.4922
Airport3.1  ZLog_NAT_24h_LS80_cmc    0.0902  0.3003
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.38437    0.19528  -1.968  0.0490 *
ZLAmx_24h_LS80_cmc -0.19055    0.02402  -7.933 2.14e-15 ***
ZLog_NAT_24h_LS80_cmc  0.83701    0.09242   9.057 < 2e-16 ***
ZFlights24h_gmc   -0.29377    0.64913  -0.453  0.6509
ZNightflightrate_gmc -0.06565    0.23606  -0.278  0.7809
ZTrend24h_gmc    -0.21411    0.11824  -1.811  0.0702 .
ZNoiseStarts24_gmc  0.92834    0.53733   1.728  0.0840 .
HRC_c           -0.77711    0.57363  -1.355  0.1755
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc  0.12487    0.01715   7.279 3.36e-13 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
              (Intr) ZLAm_24_LS80_ ZL_NAT ZFl24_ ZNght_ ZTr24_ ZNS24_ HRC_c
ZLAm_24_LS80_  0.026
ZL_NAT_24_L    -0.009 -0.140
ZFlghts24h_   0.263  0.021      0.008
ZNghtflght_   0.010  0.013      0.002  0.665
ZTrnd24h_gm  -0.040  0.006     -0.022  0.208  0.248
ZNsStrts24_  0.034 -0.025     -0.004 -0.894 -0.757 -0.180
HRC_c         -0.539 -0.004     -0.001 -0.423  0.102 -0.104  0.050
ZLA_24_LS80_: -0.040 -0.576      0.073 -0.030 -0.019 -0.006  0.038  0.004
```

```
> performance::icc(AIM2_AMN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.069
```

```
Conditional ICC: 0.056
```

```
> performance::r2(AIM2_AMN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.233
```

```
Marginal R2: 0.177
```

```
> screenreg(AIM2_AMN80)
```

```

=====
                                Model 1
-----
(Intercept)                    -0.38 *
                                (0.20)
ZLAmox_24h_LS80_cmc            -0.19 ***
                                (0.02)
ZLog_NAT_24h_LS80_cmc          0.84 ***
                                (0.09)
ZFlights24h_gmc                -0.29
                                (0.65)
ZNightflightrate_gmc           -0.07
                                (0.24)
ZTrend24h_gmc                  -0.21
                                (0.12)
ZNoiseStarts24_gmc             0.93
                                (0.54)
HRC_c                           -0.78
                                (0.57)
ZLAmox_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.12 ***
                                (0.02)
-----
AIC                             30668.70
BIC                             30758.09
Log Likelihood                  -15323.35
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.24
Var: Airport3.1 ZLog_NAT_24h_LS80_cmc 0.09
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_AMN80)
$Airport3
  (Intercept) ZLog_NAT_24h_LS80_cmc
1   -0.27536833      0.43896770
1.1  0.14675643     -0.13274800
1.2 -0.33230691     -0.22525727
1.3  0.61681899     -0.07969079
2    0.62260078     -0.23013887
3    0.06453456      0.31510921
4    0.18891335      0.45503786
91   -0.89392691      0.24554992
92   0.66533306      0.03305311
93   -0.66100336     -0.19487721
94   0.14199778     -0.19705398
95   -0.24734466     -0.45928384

```

with conditional variances for "Airport3"

**4.30.5 Vergleichstests AMN80****4.30.5.1 > anova(CIM\_AMN80, AIM1\_AMN80)**

Models:

CIM\_AMN80: [hier gekürzt, Spezifikation siehe oben]

AIM1\_AMN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN80	10	30779	30860	-15379	30759			
AIM1_AMN80	11	30713	30802	-15345	30691	67.849	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.30.5.2 > anova(CIM\_AMN80, AIM2\_AMN80)**

Models:

CIM\_AMN80: [hier gekürzt, Spezifikation siehe oben]

AIM2\_AMN80: [hier gekürzt, Spezifikation siehe oben]

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_AMN80	10	30779	30860	-15379	30759			
AIM2_AMN80	11	30669	30758	-15323	30647	111.83	1	< 2.2e-16 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.30.6 FM\_AMN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLAmx_24h_LS80_cmc + ZLog_NAT_24h_LS80_cmc + ZFlights24h_gmc +
  ZNightflightrate_gmc + ZTrend24h_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_24h_LS80_cmc || Airport3) + (1 + ZLog_NAT_24h_LS80_cmc ||
  Airport3) + ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc + ZLAmx_24h_LS80_cmc:ZFlights24h_gm
c +
  ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc + ZLAmx_24h_LS80_cmc:ZTrend24h_gmc +
  ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc + ZLAmx_24h_LS80_cmc:HRC_c +
  ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc + ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc +
  ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc + ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_24h_LS80_cmc:HRC_c
Data: dat
```

```
AIC      BIC    logLik deviance df.resid
30651.6 30838.5 -15302.8 30605.6 24970
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.3932 -0.7570 -0.4996  0.8893  7.5228
```

Random effects:

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.009548 0.09771
Airport3.1  ZLAmx_24h_LS80_cmc         0.014083 0.11867
Airport3.2  (Intercept)                0.246181 0.49617
Airport3.3  ZLog_NAT_24h_LS80_cmc     0.039840 0.19960
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-0.405892	0.200844	-2.021	0.0433	*
ZLAmx_24h_LS80_cmc	-0.307144	0.062537	-4.911	9.04e-07	***
ZLog_NAT_24h_LS80_cmc	0.972874	0.086982	11.185	< 2e-16	***
ZFlights24h_gmc	-0.323666	0.666707	-0.485	0.6273	
ZNightflightrate_gmc	-0.069958	0.242072	-0.289	0.7726	
ZTrend24h_gmc	-0.215324	0.121289	-1.775	0.0758	.
ZNoiseStarts24_gmc	0.961046	0.551910	1.741	0.0816	.
HRC_c	-0.765842	0.589841	-1.298	0.1942	
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc	0.162664	0.026068	6.240	4.37e-10	***
ZLAmx_24h_LS80_cmc:ZFlights24h_gmc	-0.057407	0.225951	-0.254	0.7994	
ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc	-0.011639	0.067812	-0.172	0.8637	
ZLAmx_24h_LS80_cmc:ZTrend24h_gmc	-0.072327	0.037802	-1.913	0.0557	.
ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc	0.002337	0.191820	0.012	0.9903	
ZLAmx_24h_LS80_cmc:HRC_c	0.019299	0.160882	0.120	0.9045	
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc	-0.485303	0.296913	-1.634	0.1022	
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc	-0.094629	0.106504	-0.889	0.3743	
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc	0.015074	0.055812	0.270	0.7871	
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc	0.596419	0.248240	2.403	0.0163	*
ZLog_NAT_24h_LS80_cmc:HRC_c	-0.380883	0.256637	-1.484	0.1378	

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 &gt; 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

```
convergence code: 0
Model failed to converge with max|grad| = 0.00328461 (tol = 0.002, component 1)
```

```
> performance::icc(FM_AMN80)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.003
Conditional ICC: 0.002
> performance::r2(FM_AMN80)
# R2 for Mixed Models
```

```
Conditional R2: 0.191
Marginal R2: 0.189
> screenreg(FM_AMN80)
```

```
=====
Model 1
-----
(Intercept)                -0.41 *
                             (0.20)
ZLAmx_24h_LS80_cmc         -0.31 ***
                             (0.06)
ZLog_NAT_24h_LS80_cmc      0.97 ***
                             (0.09)
ZFlights24h_gmc           -0.32
                             (0.67)
ZNightflightrate_gmc      -0.07
                             (0.24)
ZTrend24h_gmc             -0.22
                             (0.12)
ZNoiseStarts24_gmc        0.96
                             (0.55)
HRC_c                     -0.77
                             (0.59)
ZLAmx_24h_LS80_cmc:ZLog_NAT_24h_LS80_cmc 0.16 ***
                             (0.03)
ZLAmx_24h_LS80_cmc:ZFlights24h_gmc      -0.06
                             (0.23)
ZLAmx_24h_LS80_cmc:ZNightflightrate_gmc -0.01
                             (0.07)
ZLAmx_24h_LS80_cmc:ZTrend24h_gmc        -0.07
                             (0.04)
ZLAmx_24h_LS80_cmc:ZNoiseStarts24_gmc   0.00
                             (0.19)
ZLAmx_24h_LS80_cmc:HRC_c                0.02
                             (0.16)
ZLog_NAT_24h_LS80_cmc:ZFlights24h_gmc  -0.49
                             (0.30)
ZLog_NAT_24h_LS80_cmc:ZNightflightrate_gmc -0.09
                             (0.11)
ZLog_NAT_24h_LS80_cmc:ZTrend24h_gmc     0.02
                             (0.06)
ZLog_NAT_24h_LS80_cmc:ZNoiseStarts24_gmc 0.60 *
                             (0.25)
ZLog_NAT_24h_LS80_cmc:HRC_c            -0.38
                             (0.26)
-----
AIC                                     30651.61
BIC                                     30838.51
```

```

Log Likelihood                -15302.80
Num. obs.                    24993
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.01
Var: Airport3.1 ZLamax_24h_LS80_cmc 0.01
Var: Airport3.2 (Intercept) 0.25
Var: Airport3.3 ZLog_NAT_24h_LS80_cmc 0.04

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(FM_AMN80)

```

```

$Airport3

```

```

      (Intercept) ZLamax_24h_LS80_cmc (Intercept) ZLog_NAT_24h_LS80_cmc
1   -0.010777932   -0.023210249 -0.27789798      0.19419918
1.1  0.005406782   -0.008210485  0.13940837     -0.20525094
1.2 -0.012071883    0.019975162 -0.31126119     -0.15423245
1.3  0.023556961   -0.031507810  0.60739224      0.05405708
2    0.023842057   -0.202739100  0.61474314     -0.42745151
3    0.002479890    0.032016542  0.06394144      0.07010611
4    0.007335552    0.165778759  0.18913974      0.22724394
91  -0.034393052    0.054457816 -0.88678977      0.09299232
92   0.025702606   -0.016956600  0.66271548      0.07393941
93  -0.025830920   -0.035550162 -0.66602394     -0.04882515
94   0.005478073    0.140117841  0.14124653      0.14086898
95  -0.009426841   -0.090835436 -0.24306148     -0.04417381

```

```

with conditional variances for "Airport3"

```

**4.31 Modell ALd (akustischer Prädiktor  $L_{den}$ )****4.31.1 MO\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_ALd@theta[1] ^ 2 / (MO_ALd@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(MO_ALd)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(MO_ALd)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_ALd)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_ALd)
$Airport3
  (Intercept)
1  0.4686904885
```



1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.31.2 CIM\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29488.1	29553.1	-14736.0	29472.1	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.2373	-0.7385	-0.4208	0.8607	7.3603

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1971	0.4439

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32065	0.17672	-1.814	0.0696 .
ZLDEN_cmc	0.85151	0.01657	51.385	<2e-16 ***
ZFlights24h_gmc	-0.12316	0.58490	-0.211	0.8332
ZNightflightrate_gmc	-0.02191	0.21320	-0.103	0.9181
ZTrend24h_gmc	-0.18040	0.10670	-1.691	0.0909 .
ZNoiseStarts24_gmc	0.79896	0.48396	1.651	0.0988 .
HRC_c	-0.92226	0.52318	-1.763	0.0779 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLDEN_cmc		-0.012				
ZFlights24h_	0.264		-0.004			
ZNightflight_	0.006	0.001		0.662		
ZTrnd24h_gm	-0.039	-0.005	0.212		0.249	
ZNsStrts24_	0.037	0.007	-0.892	-0.756		-0.182
HRC_c	-0.542	-0.002	-0.424	0.106	-0.106	0.046

> performance::icc(CIM\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_ALd)

# R2 for Mixed Models

Conditional R2: 0.247

Marginal R2: 0.201

> screenreg(CIM\_ALd)

```
=====
                        Model 1
-----
(Intercept)                -0.32
                           (0.18)
ZLDEN_cmc                   0.85 ***
                           (0.02)
```

ZFlights24h_gmc	-0.12 (0.58)
ZNightflightrate_gmc	-0.02 (0.21)
ZTrend24h_gmc	-0.18 (0.11)
ZNoiseStarts24_gmc	0.80 (0.48)
HRC_c	-0.92 (0.52)

```
-----
AIC                29488.06
BIC                29553.07
Log Likelihood    -14736.03
Num. obs.         24993
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.20
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALd)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.25820363
1.1 0.19235508
1.2 -0.37716158
1.3 0.58962897
2 0.54473625
3 0.05061758
4 0.14856821
91 -0.77723703
92 0.59747789
93 -0.58348411
94 0.09778671
95 -0.21015933
```

with conditional variances for "Airport3"

**4.31.3 AIM1\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29418.3	29491.4	-14700.1	29400.3	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.7387	-0.7317	-0.4238	0.8468	4.7265

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.19194	0.4381
Airport3.1	ZLDEN_cmc	0.04703	0.2169

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34401	0.17473	-1.969	0.0490 *
ZLDEN_cmc	0.80894	0.06771	11.948	<2e-16 ***
ZFlights24h_gmc	-0.14490	0.57685	-0.251	0.8017
ZNightflightrate_gmc	-0.01364	0.21021	-0.065	0.9483
ZTrend24h_gmc	-0.18247	0.10542	-1.731	0.0835 .
ZNoiseStarts24_gmc	0.74116	0.47727	1.553	0.1204
HRC_c	-0.76240	0.51712	-1.474	0.1404

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLDEN_cmc		-0.008				
ZFlights24h_	0.265	0.004				
ZNightflight_	0.005	0.003	0.661			
ZTrnd24h_gm	-0.039	-0.011	0.209	0.248		
ZNsStrts24_	0.037	-0.002	-0.892	-0.756	-0.180	
HRC_c	-0.544	0.002	-0.424	0.108	-0.105	0.045

> performance::icc(AIM1\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.055

Conditional ICC: 0.045

> performance::r2(AIM1\_ALd)

# R2 for Mixed Models

Conditional R2: 0.229

Marginal R2: 0.185

> screenreg(AIM1\_ALd)

```
=====
                        Model 1
-----
(Intercept)                -0.34 *
                           (0.17)
ZLDEN_cmc                   0.81 ***
                           (0.07)
```

ZFlights24h_gmc	-0.14 (0.58)
ZNightflightrate_gmc	-0.01 (0.21)
ZTrend24h_gmc	-0.18 (0.11)
ZNoiseStarts24_gmc	0.74 (0.48)
HRC_c	-0.76 (0.52)

```
-----
AIC                29418.29
BIC                29491.43
Log Likelihood    -14700.14
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)   0.19
Var: Airport3.1 ZLDEN_cmc   0.05
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(AIM1_ALd)
```

```
$Airport3
```

```
  (Intercept)  ZLDEN_cmc
1  -0.24491710  0.24478675
1.1  0.20932131  0.09415148
1.2 -0.40972879  0.20927969
1.3  0.57817431  0.06057048
2   0.54050175 -0.08026785
3   0.05195586 -0.07261168
4   0.14260191  0.10611651
91 -0.76766950 -0.01913233
92  0.57269977  0.16409313
93 -0.55502453  0.02342523
94  0.10847265 -0.25367226
95 -0.19768447 -0.49855488
```

```
with conditional variances for "Airport3"
```

#### 4.31.4 Vergleichstest ALd

##### 4.31.4.1 > *anova(CIM\_ALd, AIM1\_ALd)*

Data: dat

Models:

CIM\_ALd: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +

CIM\_ALd: ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALd: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +

AIM1\_ALd: ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALd	8	29488	29553	-14736	29472			
AIM1_ALd	9	29418	29491	-14700	29400	71.771	1	< 2.2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.31.5 FM\_ALd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLDEN\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc + ZTrend24h\_gmc +  
ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3) +  
ZLDEN\_cmc:ZFlights24h\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
ZLDEN\_cmc:ZTrend24h\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29404.5	29518.2	-14688.2	29376.5	24979

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.7177	-0.7305	-0.4288	0.8466	5.1469

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.196462	0.44324
Airport3.1	ZLDEN_cmc	0.002649	0.05147

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34705	0.17613	-1.970	0.0488 *
ZLDEN_cmc	0.98083	0.03357	29.217	< 2e-16 ***
ZFlights24h_gmc	-0.16238	0.58185	-0.279	0.7802
ZNightflightrate_gmc	-0.01588	0.21231	-0.075	0.9404
ZTrend24h_gmc	-0.18129	0.10652	-1.702	0.0888 .
ZNoiseStarts24_gmc	0.74968	0.48169	1.556	0.1196
HRC_c	-0.74640	0.51879	-1.439	0.1502
ZLDEN_cmc:ZFlights24h_gmc	0.13166	0.12402	1.062	0.2884
ZLDEN_cmc:ZNightflightrate_gmc	-0.06187	0.03954	-1.565	0.1176
ZLDEN_cmc:ZTrend24h_gmc	0.02305	0.02445	0.943	0.3458
ZLDEN_cmc:ZNoiseStarts24_gmc	0.24952	0.10216	2.442	0.0146 *
ZLDEN_cmc:HRC_c	-0.68260	0.11640	-5.864	4.52e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZF124_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLDEN_:ZF	ZLDEN_:ZN_	ZLDEN_:ZT	Z
ZLDEN_:ZNS											
ZLDEN_cmc	-0.025										
ZFlights24h_	0.263	-0.012									
ZNightflght_	0.007	0.003	0.662								
ZTrnd24h_gm	-0.041	-0.006	0.210	0.249							
ZNsStrts24_	0.036	0.005	-0.892	-0.755	-0.182						
HRC_c	-0.540	0.025	-0.423	0.105	-0.104	0.047					
ZLDEN_:ZF24	-0.013	0.212	-0.038	-0.015	-0.003	0.033	0.024				
ZLDEN_c:ZN_	0.004	-0.125	-0.018	-0.014	-0.009	0.019	0.000	0.695			
ZLDEN_:ZT24	-0.004	0.104	-0.003	-0.008	-0.035	0.004	0.000	0.233	0.328		
ZLDEN_:ZNS2	0.006	0.086	0.034	0.016	0.004	-0.034	-0.013	-0.896	-0.771	-0.165	
ZLDEN_:HRC_	0.024	-0.644	0.022	0.000	0.002	-0.011	-0.037	-0.432	0.088	-0.187	

0.049

> performance::icc(FM\_ALd)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.056

Conditional ICC: 0.045

```
> performance::r2(FM_ALd)
# R2 for Mixed Models

Conditional R2: 0.245
Marginal R2: 0.200
> screenreg(FM_ALd)
```

```
=====
Model 1
-----
(Intercept)                -0.35 *
                             (0.18)
ZLDEN_cmc                   0.98 ***
                             (0.03)
ZFlights24h_gmc            -0.16
                             (0.58)
ZNightflightrate_gmc      -0.02
                             (0.21)
ZTrend24h_gmc              -0.18
                             (0.11)
ZNoiseStarts24_gmc        0.75
                             (0.48)
HRC_c                       -0.75
                             (0.52)
ZLDEN_cmc:ZFlights24h_gmc  0.13
                             (0.12)
ZLDEN_cmc:ZNightflightrate_gmc -0.06
                             (0.04)
ZLDEN_cmc:ZTrend24h_gmc   0.02
                             (0.02)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.25 *
                             (0.10)
ZLDEN_cmc:HRC_c           -0.68 ***
                             (0.12)
-----
AIC                          29404.47
BIC                          29518.23
Log Likelihood                -14688.23
Num. obs.                     24993
Num. groups: Airport3        12
Var: Airport3 (Intercept)    0.20
Var: Airport3.1 ZLDEN_cmc    0.00
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(FM_ALd)
$Airport3
  (Intercept)    ZLDEN_cmc
1 -0.25638727 -0.0034343830
1.1 0.21120655 -0.0563050473
1.2 -0.39982527 0.0700734255
1.3 0.58095846 -0.0010048125
2 0.53190170 -0.0182547049
3 0.05412985 0.0032581128
4 0.15001678 0.0256552073
91 -0.77373611 -0.0005577526
92 0.59226929 0.0264004710
93 -0.58620430 -0.0384775813
94 0.11238124 0.0047108103
95 -0.19866574 -0.0159387949
```



with conditional variances for “Airport3”

**4.32 Modell ALq10 (akustischer Prädiktor  $L_{Aeq,24h}(k = 10)$ )****4.32.1 M0\_ALq10**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
```

```
Family: binomial (logit)
```

```
Formula: HA ~ (1 | Airport3)
```

```
Data: dat
```

```
      AIC      BIC  logLik deviance df.resid
32559.1 32575.3 -16277.5 32555.1   24991
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0456 -0.9113 -0.5655  0.9779  2.5041
```

```
Random effects:
```

```
Groups   Name             Variance Std.Dev.
Airport3 (Intercept) 0.4188  0.6471
Number of obs: 24993, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.6544      0.1864  -3.511 0.000446 ***
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- M0_ALq10@theta[1] ^ 2 / (M0_ALq10@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq10)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq10)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq10)
```

```
=====
                        Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALq10)
$Airport3
  (Intercept)
1  0.4686904885
1.1 0.7435390058
```

```
1.2 0.0001140482
1.3 0.6990449052
2 0.2338175059
3 0.5264938387
4 0.4750795415
91 -1.1814080555
92 0.2169198868
93 -0.4855654165
94 -0.8947654414
95 -0.7829518165
```

```
with conditional variances for "Airport3"
>
```

**4.32.2 CIM\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29508.3	29573.3	-14746.2	29492.3	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6083	-0.7396	-0.4200	0.8517	6.5857

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1982	0.4452

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32113	0.17724	-1.812	0.0700 .
ZLpAeq0024_cmc	0.84621	0.01653	51.179	<2e-16 ***
ZFlights24h_gmc	-0.12549	0.58740	-0.214	0.8308
ZNightflightrate_gmc	-0.02247	0.21410	-0.105	0.9164
ZTrend24h_gmc	-0.17999	0.10695	-1.683	0.0924 .
ZNoiseStarts24_gmc	0.80563	0.48658	1.656	0.0978 .
HRC_c	-0.94040	0.52532	-1.790	0.0734 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA002	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq0024_c	-0.012					
ZFlights24h_	0.263	-0.004				
ZNghtflight_	0.005	0.001	0.663			
ZTrnd24h_gm	-0.039	-0.005	0.212	0.249		
ZNsStrts24_	0.038	0.008	-0.892	-0.757	-0.182	
HRC_c	-0.543	-0.004	-0.422	0.107	-0.107	0.044

> performance::icc(CIM\_ALq10)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.057

Conditional ICC: 0.045

> performance::r2(CIM\_ALq10)

# R2 for Mixed Models

Conditional R2: 0.247

Marginal R2: 0.201

> screenreg(CIM\_ALq10)

```
=====
                        Model 1
-----
(Intercept)                -0.32
                          (0.18)
ZLpAeq0024_cmc              0.85 ***
                          (0.02)
```

ZFlights24h_gmc	-0.13 (0.59)
ZNightflightrate_gmc	-0.02 (0.21)
ZTrend24h_gmc	-0.18 (0.11)
ZNoiseStarts24_gmc	0.81 (0.49)
HRC_c	-0.94 (0.53)

```
-----
AIC                29508.31
BIC                29573.32
Log Likelihood    -14746.15
Num. obs.         24993
Num. groups: Airport3    12
Var: Airport3 (Intercept)  0.20
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_ALq10)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.26640206
1.1 0.19352413
1.2 -0.37084306
1.3 0.59555047
2 0.54227890
3 0.04963420
4 0.15074346
91 -0.77220656
92 0.60220849
93 -0.59164740
94 0.09494711
95 -0.21293850
```

with conditional variances for "Airport3"

**4.32.3 AIM1\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29417.0	29490.2	-14699.5	29399.0	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9100	-0.7301	-0.4198	0.8397	4.3930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.18853	0.4342
Airport3.1	ZLpAeq0024_cmc	0.05308	0.2304

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34126	0.17314	-1.971	0.0487 *
ZLpAeq0024_cmc	0.80154	0.07142	11.223	<2e-16 ***
ZFlights24h_gmc	-0.13119	0.57624	-0.228	0.8199
ZNightflightrate_gmc	-0.01431	0.20922	-0.068	0.9455
ZTrend24h_gmc	-0.18414	0.10460	-1.760	0.0783 .
ZNoiseStarts24_gmc	0.73002	0.47637	1.532	0.1254
HRC_c	-0.78214	0.51294	-1.525	0.1273

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA002	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq0024_c	-0.007					
ZFlights24h_	0.265	0.004				
ZNghtflight_	0.007	0.003	0.664			
ZTrnd24h_gm	-0.038	-0.011	0.211	0.250		
ZNsStrts24_	0.035	-0.003	-0.893	-0.758	-0.182	
HRC_c	-0.543	0.001	-0.426	0.103	-0.106	0.050

> performance::icc(AIM1\_ALq10)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.054

Conditional ICC: 0.044

> performance::r2(AIM1\_ALq10)

# R2 for Mixed Models

Conditional R2: 0.228

Marginal R2: 0.184

> screenreg(AIM1\_ALq10)

```
=====
                                Model 1
-----
(Intercept)                    -0.34 *
                                (0.17)
ZLpAeq0024_cmc                  0.80 ***
                                (0.07)
```

ZFlights24h_gmc	-0.13 (0.58)
ZNightflightrate_gmc	-0.01 (0.21)
ZTrend24h_gmc	-0.18 (0.10)
ZNoiseStarts24_gmc	0.73 (0.48)
HRC_c	-0.78 (0.51)

```
-----
AIC                29417.03
BIC                29490.17
Log Likelihood     -14699.51
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)   0.19
Var: Airport3.1 ZLpAeq0024_cmc 0.05
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM1_ALq10)
```

```
$Airport3
```

```
  (Intercept) ZLpAeq0024_cmc
1  -0.24084685  0.20329686
1.1 0.21058517  0.09271405
1.2 -0.41688565  0.25035035
1.3 0.57737516  0.15678943
2   0.53757723 -0.07070689
3   0.05124066 -0.09047446
4   0.13959651  0.09192527
91 -0.76019171 -0.01360524
92  0.56059279  0.19929063
93 -0.54275440 -0.05706820
94  0.10779476 -0.25108821
95 -0.19524728 -0.53368472
```

with conditional variances for "Airport3"

**4.32.4 Vergleichstest ALq10****4.32.4.1 > anova(CIM\_ALq10, AIM1\_ALq10)**

Data: dat

Models:

CIM\_ALq10: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq10: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq10: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq10: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc ||

AIM1\_ALq10: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq10	8	29508	29573	-14746	29492			
AIM1_ALq10	9	29417	29490	-14700	29399	93.279	1	< 2.2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1



**4.32.5 FM\_ALq10**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq0024\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq0024\_cmc ||  
Airport3) + ZLpAeq0024\_cmc:ZFlights24h\_gmc + ZLpAeq0024\_cmc:ZNightflightrate\_gmc +  
ZLpAeq0024\_cmc:ZTrend24h\_gmc + ZLpAeq0024\_cmc:ZNoiseStarts24\_gmc + ZLpAeq0024\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29408.9	29522.7	-14690.5	29380.9	24979

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8933	-0.7301	-0.4219	0.8383	4.8328

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.192812	0.43910
Airport3.1	ZLpAeq0024_cmc	0.006843	0.08272

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.34461	0.17487	-1.971	0.0488 *
ZLpAeq0024_cmc	0.97299	0.04245	22.923	< 2e-16 ***
ZFlights24h_gmc	-0.14042	0.58138	-0.242	0.8091
ZNightflightrate_gmc	-0.01529	0.21152	-0.072	0.9424
ZTrend24h_gmc	-0.18324	0.10564	-1.734	0.0828 .
ZNoiseStarts24_gmc	0.73227	0.48112	1.522	0.1280
HRC_c	-0.77276	0.51605	-1.497	0.1343
ZLpAeq0024_cmc:ZFlights24h_gmc	0.12026	0.14987	0.802	0.4223
ZLpAeq0024_cmc:ZNightflightrate_gmc	-0.06034	0.05016	-1.203	0.2289
ZLpAeq0024_cmc:ZTrend24h_gmc	0.03084	0.02916	1.058	0.2902
ZLpAeq0024_cmc:ZNoiseStarts24_gmc	0.25883	0.12311	2.102	0.0355 *
ZLpAeq0024_cmc:HRC_c	-0.64953	0.13708	-4.738	2.15e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLpA0024_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA0024_:ZF	ZLA0024_:ZN_	ZLA0
024_:ZT	ZLA0024_:ZNS								
ZLpAq0024_c	-0.019								
ZFlights24h_	0.264	-0.006							
ZNghtflght_	0.007	0.004	0.665						
ZTrnd24h_gm	-0.040	-0.005	0.211	0.250					
ZNsStrts24_	0.035	0.001	-0.893	-0.758	-0.182				
HRC_c	-0.542	0.017	-0.424	0.103	-0.105	0.049			
ZLA0024_:ZF	-0.008	0.219	-0.027	-0.011	0.000	0.024	0.016		
ZLA0024_:ZN_	0.004	-0.082	-0.012	-0.010	-0.006	0.013	-0.001	0.681	
ZLA0024_:ZT	-0.003	0.058	0.001	-0.005	-0.032	0.002	-0.002	0.203	0.285
ZLA0024_:ZNS	0.002	0.074	0.025	0.012	0.001	-0.026	-0.007	-0.896	-0.766
62									
ZLA0024_:HR	0.017	-0.600	0.014	-0.001	0.000	-0.006	-0.027	-0.422	0.102
57	0.050								-0.1

> performance::icc(FM\_ALq10)

# Intraclass Correlation Coefficient

```

Adjusted ICC: 0.055
Conditional ICC: 0.044
> performance::r2(FM_ALq10)
# R2 for Mixed Models

Conditional R2: 0.245
Marginal R2: 0.201
> screenreg(FM_ALq10)

=====
                                Model 1
-----
(Intercept)                    -0.34 *
                                (0.17)
ZLpAeq0024_cmc                  0.97 ***
                                (0.04)
ZFlights24h_gmc                 -0.14
                                (0.58)
ZNightflightrate_gmc           -0.02
                                (0.21)
ZTrend24h_gmc                  -0.18
                                (0.11)
ZNoiseStarts24_gmc             0.73
                                (0.48)
HRC_c                           -0.77
                                (0.52)
ZLpAeq0024_cmc:ZFlights24h_gmc  0.12
                                (0.15)
ZLpAeq0024_cmc:ZNightflightrate_gmc -0.06
                                (0.05)
ZLpAeq0024_cmc:ZTrend24h_gmc    0.03
                                (0.03)
ZLpAeq0024_cmc:ZNoiseStarts24_gmc 0.26 *
                                (0.12)
ZLpAeq0024_cmc:HRC_c           -0.65 ***
                                (0.14)
-----
AIC                             29408.91
BIC                             29522.68
Log Likelihood                   -14690.45
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.19
Var: Airport3.1 ZLpAeq0024_cmc   0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALq10)
$Airport3
  (Intercept) ZLpAeq0024_cmc
1 -0.25334613 -0.0471558946
1.1 0.21491658 -0.0803715106
1.2 -0.40824651 0.1157329535
1.3 0.58135891 0.0538531886
2 0.53201636 -0.0194725962
3 0.05246919 0.0015147288
4 0.14498613 0.0519308251
91 -0.76454650 -0.0003872135
92 0.57773436 0.0686540544
93 -0.57081440 -0.1064919061

```

94	0.10973133	-0.0043863862
95	-0.19549766	-0.0418357342

**4.33 Modell ALq20 (akustischer Prädiktor  $L_{Aeq,24h}(k = 20)$ )****4.33.1 M0\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALq20@theta[1] ^ 2 / (M0_ALq20@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq20)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq20)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq20)
```

```
=====
                                Model 1
-----
(Intercept)                    -0.65 ***
                                (0.19)
-----
AIC                             32559.07
BIC                             32575.32
Log Likelihood                  -16277.53
Num. obs.                       24993
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALq20)
$Airport3
  (Intercept)
1  0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

**4.33.2 CIM\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30021.3	30086.3	-15002.7	30005.3	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.6882	-0.7571	-0.4386	0.8933	4.3525

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1752	0.4185

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.29961	0.16668	-1.798	0.0722 .
ZLpAeq24h_k20_cmc	0.79460	0.01696	46.859	<2e-16 ***
ZFlights24h_gmc	-0.06808	0.55296	-0.123	0.9020
ZNightflightrate_gmc	-0.02426	0.20140	-0.120	0.9041
ZTrend24h_gmc	-0.16867	0.10075	-1.674	0.0941 .
ZNoiseStarts24_gmc	0.71608	0.45778	1.564	0.1178
HRC_c	-0.91562	0.49320	-1.856	0.0634 .

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq24_20_	-0.009					
ZFlights24h_	0.263	-0.001				
ZNghtflght_	0.006	0.001	0.664			
ZTrnd24h_gm	-0.039	-0.001	0.210	0.249		
ZNsStrts24_	0.037	0.002	-0.893	-0.757	-0.181	
HRC_c	-0.542	-0.002	-0.422	0.106	-0.106	0.045

> performance::icc(CIM\_ALq20)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.051

Conditional ICC: 0.042

> performance::r2(CIM\_ALq20)

# R2 for Mixed Models

Conditional R2: 0.214

Marginal R2: 0.172

> screenreg(CIM\_ALq20)

```
=====
                        Model 1
-----
(Intercept)                -0.30
                           (0.17)
ZLpAeq24h_k20_cmc          0.79 ***
                           (0.02)
ZFlights24h_gmc            -0.07
```

```

                                (0.55)
ZNightflightrate_gmc          -0.02
                                (0.20)
ZTrend24h_gmc                  -0.17
                                (0.10)
ZNoiseStarts24_gmc            0.72
                                (0.46)
HRC_c                           -0.92
                                (0.49)
-----
AIC                               30021.32
BIC                               30086.33
Log Likelihood                   -15002.66
Num. obs.                         24993
Num. groups: Airport3             12
Var: Airport3 (Intercept)         0.18
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALq20)
$Airport3
  (Intercept)
1  -0.21596904
1.1 0.19613884
1.2 -0.41168400
1.3 0.54853257
2   0.51126708
3   0.05219998
4   0.13344879
91 -0.74438530
92  0.54996891
93 -0.52331170
94  0.10373884
95 -0.18499936

with conditional variances for "Airport3"
>

```

**4.33.3 AIM1\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
29974.4	30047.5	-14978.2	29956.4	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.9057	-0.7542	-0.4455	0.8749	5.2182

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.17417	0.4173
Airport3.1	ZLpAeq24h_k20_cmc	0.08941	0.2990

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32613	0.16609	-1.964	0.0496 *
ZLpAeq24h_k20_cmc	0.85019	0.09366	9.078	<2e-16 ***
ZFlights24h_gmc	-0.08178	0.54770	-0.149	0.8813
ZNightflightrate_gmc	-0.01225	0.19996	-0.061	0.9512
ZTrend24h_gmc	-0.17553	0.10054	-1.746	0.0808 .
ZNoiseStarts24_gmc	0.68726	0.45365	1.515	0.1298
HRC_c	-0.81652	0.49025	-1.666	0.0958 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAq24_20_	-0.008					
ZFlights24h_	0.261	0.002				
ZNghtflight_	0.004	0.003	0.661			
ZTrnd24h_gm	-0.040	-0.009	0.208	0.248		
ZNsStrts24_	0.040	-0.002	-0.892	-0.755	-0.180	
HRC_c	-0.541	0.003	-0.422	0.109	-0.105	0.043

> performance::icc(AIM1\_ALq20)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.050

Conditional ICC: 0.041

> performance::r2(AIM1\_ALq20)

# R2 for Mixed Models

Conditional R2: 0.226

Marginal R2: 0.185

> screenreg(AIM1\_ALq20)

```
=====
                                Model 1
-----
(Intercept)                    -0.33 *
                                (0.17)
ZLpAeq24h_k20_cmc              0.85 ***
                                (0.09)
```



ZFlights24h_gmc	-0.08 (0.55)
ZNightflightrate_gmc	-0.01 (0.20)
ZTrend24h_gmc	-0.18 (0.10)
ZNoiseStarts24_gmc	0.69 (0.45)
HRC_c	-0.82 (0.49)

```
-----
AIC                29974.38
BIC                30047.52
Log Likelihood    -14978.19
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.17
Var: Airport3.1 ZLpAeq24h_k20_cmc  0.09
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM1_ALq20)
```

```
$Airport3
```

```
  (Intercept) ZLpAeq24h_k20_cmc
1 -0.23062650  0.33086453
1.1 0.21056789 -0.06296706
1.2 -0.41405461 -0.01137870
1.3 0.55746225 -0.14949144
2 0.51446029  0.24367337
3 0.04921218 -0.19492610
4 0.13342417  0.07684406
91 -0.72756998 -0.03734508
92 0.53420746  0.47467661
93 -0.51633002  0.10938877
94 0.10416713 -0.17818044
95 -0.18589077 -0.62908580
```

with conditional variances for "Airport3"

**4.33.4 Vergleichstest ALq20****4.33.4.1 > anova(CIM\_ALq20, AIM1\_ALq20)**

Data: dat

Models:

CIM\_ALq20: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq20: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq20: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq20: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc ||

AIM1\_ALq20: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq20	8	30021	30086	-15003	30005			
AIM1_ALq20	9	29974	30048	-14978	29956	48.943	1	2.635e-12 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.33.5 FM\_ALq20**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq24h\_k20\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
 ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k20\_cmc ||  
 Airport3) + ZLpAeq24h\_k20\_cmc:ZFlights24h\_gmc + ZLpAeq24h\_k20\_cmc:ZNightflightrate\_gmc +  
 ZLpAeq24h\_k20\_cmc:ZTrend24h\_gmc + ZLpAeq24h\_k20\_cmc:ZNoiseStarts24\_gmc + ZLpAeq24h\_k20\_cmc:HRC\_c

Data: dat

AIC	BIC	logLik	deviance	df.resid
29955.9	30069.7	-14963.9	29927.9	24979

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.8786	-0.7545	-0.4530	0.8773	6.0448

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.185562	0.43077
Airport3.1	ZLpAeq24h_k20_cmc	0.001462	0.03824

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.32606	0.17109	-1.906	0.056683 .
ZLpAeq24h_k20_cmc	1.00466	0.03833	26.211	< 2e-16 ***
ZFlights24h_gmc	-0.06656	0.56202	-0.118	0.905724
ZNightflightrate_gmc	-0.01120	0.20566	-0.054	0.956557
ZTrend24h_gmc	-0.18082	0.10357	-1.746	0.080843 .
ZNoiseStarts24_gmc	0.67996	0.46558	1.460	0.144162
HRC_c	-0.81480	0.50309	-1.620	0.105321
ZLpAeq24h_k20_cmc:ZFlights24h_gmc	-0.04134	0.15085	-0.274	0.784036
ZLpAeq24h_k20_cmc:ZNightflightrate_gmc	-0.14427	0.04116	-3.505	0.000456 ***
ZLpAeq24h_k20_cmc:ZTrend24h_gmc	0.12474	0.03099	4.025	5.69e-05 ***
ZLpAeq24h_k20_cmc:ZNoiseStarts24_gmc	0.38430	0.11804	3.256	0.001131 **
ZLpAeq24h_k20_cmc:HRC_c	-0.95624	0.16079	-5.947	2.73e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA24_20_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA24_20_:ZF	ZLA24_20_:ZN_
ZLA24_20_:ZT									
ZLpAq24_20_	-0.025								
ZFlights24h_	0.261	-0.010							
ZNghtflght_	0.005	0.005	0.660						
ZTrnd24h_gm	-0.041	-0.004	0.207	0.247					
ZNsStrts24_	0.040	0.004	-0.891	-0.753	-0.179				
HRC_c	-0.539	0.024	-0.421	0.109	-0.103	0.043			
ZLA24_20_:ZF	-0.008	0.311	-0.033	-0.015	-0.003	0.031	0.018		
ZLA24_20_:ZN_	0.008	-0.165	-0.019	-0.019	-0.012	0.022	-0.004	0.678	
ZLA24_20_:ZT	-0.004	0.239	-0.003	-0.008	-0.034	0.006	-0.005	0.233	0.353
ZLA24_20_:ZNS	0.001	0.000	0.031	0.017	0.006	-0.032	-0.009	-0.881	-0.756
-0.151									
ZLA24_20_:H	0.020	-0.763	0.017	-0.002	-0.004	-0.009	-0.028	-0.532	0.042
-0.231									
ZLA24_20_:ZNS									
ZLpAq24_20_									
ZFlights24h_									

```

ZNghtflight_
ZTrnd24h_gm
ZNsStrts24_
HRC_c
ZLA24_20_:ZF
ZLA24_20_:ZN_
ZLA24_20_:ZT
ZLA24_20_:ZNS
ZLA24_20_:H    0.119
convergence code: 0
Model failed to converge with max|grad| = 0.00273955 (tol = 0.002, component 1)

```

```

> performance::icc(FM_ALq20)
# Intraclass Correlation Coefficient

```

```

    Adjusted ICC: 0.053
    Conditional ICC: 0.044
> performance::r2(FM_ALq20)
# R2 for Mixed Models

```

```

    Conditional R2: 0.220
    Marginal R2: 0.176
> screenreg(FM_ALq20)

```

```

=====
                                     Model 1
-----
(Intercept)                        -0.33
                                     (0.17)
ZLpAeq24h_k20_cmc                   1.00 ***
                                     (0.04)
ZFlights24h_gmc                     -0.07
                                     (0.56)
ZNightflightrate_gmc                -0.01
                                     (0.21)
ZTrend24h_gmc                       -0.18
                                     (0.10)
ZNoiseStarts24_gmc                 0.68
                                     (0.47)
HRC_c                               -0.81
                                     (0.50)
ZLpAeq24h_k20_cmc:ZFlights24h_gmc  -0.04
                                     (0.15)
ZLpAeq24h_k20_cmc:ZNightflightrate_gmc -0.14 ***
                                     (0.04)
ZLpAeq24h_k20_cmc:ZTrend24h_gmc     0.12 ***
                                     (0.03)
ZLpAeq24h_k20_cmc:ZNoiseStarts24_gmc 0.38 **
                                     (0.12)
ZLpAeq24h_k20_cmc:HRC_c             -0.96 ***
                                     (0.16)
-----
AIC                                  29955.89
BIC                                  30069.66
Log Likelihood                       -14963.94
Num. obs.                             24993
Num. groups: Airport3                 12
Var: Airport3 (Intercept)              0.19
Var: Airport3.1 ZLpAeq24h_k20_cmc     0.00

```

```
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_ALq20)
$Airport3
  (Intercept) ZLpAeq24h_k20_cmc
1 -0.22339623 0.0116126208
1.1 0.20332764 -0.0340498744
1.2 -0.41378385 0.0427952121
1.3 0.54992811 -0.0202666390
2 0.53459469 -0.0023110969
3 0.05538077 0.0010407137
4 0.13701720 0.0008035294
91 -0.77713055 -0.0040835323
92 0.56292112 0.0135751292
93 -0.54073823 -0.0097008431
94 0.11601427 -0.0030258975
95 -0.18836257 0.0019866955
```

with conditional variances for "Airport3"

**4.34 Modell ALq30 (akustischer Prädiktor  $L_{Aeq,24h}(k = 30)$ )****4.34.1 M0\_ALq30**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
32559.1	32575.3	-16277.5	32555.1	24991

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0456	-0.9113	-0.5655	0.9779	2.5041

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.4188	0.6471

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.6544	0.1864	-3.511	0.000446 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_ALq30@theta[1] ^ 2 / (M0_ALq30@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.1129236
```

```
> performance::icc(M0_ALq30)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.113
```

```
Conditional ICC: 0.113
```

```
> performance::r2(M0_ALq30)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.113
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_ALq30)
```

```
=====
Model 1
-----
(Intercept)                -0.65 ***
                           (0.19)
-----
AIC                        32559.07
BIC                        32575.32
Log Likelihood             -16277.53
Num. obs.                  24993
Num. groups: Airport3     12
Var: Airport3 (Intercept) 0.42
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_ALq30)
$Airport3
  (Intercept)
1 0.4686904885
```

1.1 0.7435390058  
1.2 0.0001140482  
1.3 0.6990449052  
2 0.2338175059  
3 0.5264938387  
4 0.4750795415  
91 -1.1814080555  
92 0.2169198868  
93 -0.4855654165  
94 -0.8947654414  
95 -0.7829518165

with conditional variances for "Airport3"

>

**4.34.2 CIM\_ALq30**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30605.2	30670.3	-15294.6	30589.2	24985

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.0385	-0.7874	-0.4686	0.9354	4.5588

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1656	0.4069

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.28778	0.16201	-1.776	0.0757 .
ZLpAeq24h_k30_cmc	0.75596	0.01822	41.499	<2e-16 ***
ZFlights24h_gmc	-0.06529	0.53744	-0.121	0.9033
ZNightflightrate_gmc	-0.02665	0.19559	-0.136	0.8916
ZTrend24h_gmc	-0.16390	0.09803	-1.672	0.0945 .
ZNoiseStarts24_gmc	0.69671	0.44474	1.567	0.1172
HRC_c	-0.89605	0.47882	-1.871	0.0613 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAeq24_30_	-0.007					
ZFlights24h_	0.263	-0.001				
ZNightflight_	0.006	0.000	0.663			
ZTrnd24h_gm	-0.039	0.001	0.210	0.249		
ZNsStrts24_	0.037	0.001	-0.893	-0.757	-0.181	
HRC_c	-0.542	0.000	-0.423	0.105	-0.106	0.046

> performance::icc(CIM\_ALq30)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.048

Conditional ICC: 0.041

> performance::r2(CIM\_ALq30)

# R2 for Mixed Models

Conditional R2: 0.185

Marginal R2: 0.144

> screenreg(CIM\_ALq30)

```
=====
                        Model 1
-----
(Intercept)                -0.29
                          (0.16)
ZLpAeq24h_k30_cmc          0.76 ***
                          (0.02)
ZFlights24h_gmc           -0.07
```



```

                                (0.54)
ZNightflightrate_gmc          -0.03
                                (0.20)
ZTrend24h_gmc                  -0.16
                                (0.10)
ZNoiseStarts24_gmc            0.70
                                (0.44)
HRC_c                           -0.90
                                (0.48)
-----
AIC                               30605.24
BIC                               30670.26
Log Likelihood                   -15294.62
Num. obs.                        24993
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.17
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_ALq30)
$Airport3
  (Intercept)
1 -0.20118043
1.1 0.18928365
1.2 -0.41226965
1.3 0.53091864
2 0.49109690
3 0.05343206
4 0.13309191
91 -0.72695316
92 0.53211731
93 -0.50508930
94 0.10837165
95 -0.17762085

with conditional variances for "Airport3"
>

```

**4.34.3 AIM1\_ALq30**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +  
ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k30\_cmc || Airport3)

Data: dat

AIC	BIC	logLik	deviance	df.resid
30545.8	30619.0	-15263.9	30527.8	24984

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.5442	-0.7880	-0.4691	0.9195	5.4819

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.1694	0.4116
Airport3.1	ZLpAeq24h_k30_cmc	0.1862	0.4315

Number of obs: 24993, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.30784	0.16420	-1.875	0.0608 .
ZLpAeq24h_k30_cmc	0.89883	0.13597	6.611	3.83e-11 ***
ZFlights24h_gmc	-0.05692	0.54506	-0.104	0.9168
ZNightflightrate_gmc	-0.01528	0.19812	-0.077	0.9385
ZTrend24h_gmc	-0.16915	0.09918	-1.706	0.0881 .
ZNoiseStarts24_gmc	0.66905	0.45052	1.485	0.1375
HRC_c	-0.84977	0.48649	-1.747	0.0807 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLA24_	ZFl24_	ZNght_	ZTr24_	ZNS24_
ZLpAq24_30_	-0.006					
ZFlights24h_	0.265	0.002				
ZNghtflight_	0.006	0.002	0.663			
ZTrnd24h_gm	-0.039	-0.006	0.210	0.249		
ZNsStrts24_	0.036	-0.001	-0.892	-0.757	-0.181	
HRC_c	-0.544	0.002	-0.425	0.104	-0.106	0.048

> performance::icc(AIM1\_ALq30)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.049

Conditional ICC: 0.040

> performance::r2(AIM1\_ALq30)

# R2 for Mixed Models

Conditional R2: 0.215

Marginal R2: 0.175

> screenreg(AIM1\_ALq30)

```
=====
                                Model 1
-----
(Intercept)                    -0.31
                                (0.16)
ZLpAeq24h_k30_cmc                0.90 ***
                                (0.14)
```

ZFlights24h_gmc	-0.06 (0.55)
ZNightflightrate_gmc	-0.02 (0.20)
ZTrend24h_gmc	-0.17 (0.10)
ZNoiseStarts24_gmc	0.67 (0.45)
HRC_c	-0.85 (0.49)

```
-----
AIC                30545.83
BIC                30618.96
Log Likelihood    -15263.91
Num. obs.         24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)   0.17
Var: Airport3.1 ZLpAeq24h_k30_cmc 0.19
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM1_ALq30)
```

```
$Airport3
```

```
  (Intercept) ZLpAeq24h_k30_cmc
1 -0.22304373  0.522061600
1.1 0.20507972 -0.163101520
1.2 -0.40741223 -0.118386500
1.3 0.54353006 -0.254968756
2  0.49100214  0.647702528
3  0.05136319 -0.257987227
4  0.13920245 -0.009924774
91 -0.71770888  0.046952971
92  0.54047090  0.288821187
93 -0.52034079  0.294418144
94  0.10805410 -0.126600132
95 -0.18363919 -0.901574262
```

with conditional variances for "Airport3"

**4.34.4 Vergleichstest ALq30****4.34.4.1 > anova(CIM\_ALq30, AIM1\_ALq30)**

Data: dat

Models:

CIM\_ALq30: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

CIM\_ALq30: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)

AIM1\_ALq30: HA ~ ZLpAeq24h\_k30\_cmc + ZFlights24h\_gmc + ZNightflightrate\_gmc +

AIM1\_ALq30: ZTrend24h\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLpAeq24h\_k30\_cmc ||

AIM1\_ALq30: Airport3)

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_ALq30	8	30605	30670	-15295	30589			
AIM1_ALq30	9	30546	30619	-15264	30528	61.418	1	4.615e-15 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.34.5 > summary(FM\_ALq30)**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HA ~ ZLpAeq24h_k30_cmc + ZFlights24h_gmc + ZNightflightrate_gmc +
  ZTrend24h_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLpAeq24h_k30_cmc |
  Airport3) + ZLpAeq24h_k30_cmc:ZFlights24h_gmc + ZLpAeq24h_k30_cmc:ZNightflightrate_gmc +
  ZLpAeq24h_k30_cmc:ZTrend24h_gmc + ZLpAeq24h_k30_cmc:ZNoiseStarts24_gmc +
  ZLpAeq24h_k30_cmc:HRC_c
Data: dat
```

```
      AIC      BIC    logLik deviance df.resid
30523.2 30636.9 -15247.6 30495.2   24979
```

scaled residuals:

```
      Min       1Q   Median       3Q      Max
-2.5352 -0.7857 -0.4637   0.9226   5.7256
```

Random effects:

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.174145 0.41731
Airport3.1  ZLpAeq24h_k30_cmc          0.003073 0.05543
Number of obs: 24993, groups: Airport3, 12
```

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-0.30702	0.16601	-1.849	0.064399 .
ZLpAeq24h_k30_cmc	1.11172	0.05621	19.778	< 2e-16 ***
ZFlights24h_gmc	-0.04222	0.55119	-0.077	0.938940
ZNightflightrate_gmc	-0.01369	0.20069	-0.068	0.945621
ZTrend24h_gmc	-0.17322	0.10050	-1.724	0.084765 .
ZNoiseStarts24_gmc	0.66428	0.45629	1.456	0.145440
HRC_c	-0.85488	0.48955	-1.746	0.080768 .
ZLpAeq24h_k30_cmc:ZFlights24h_gmc	-0.16526	0.21387	-0.773	0.439673
ZLpAeq24h_k30_cmc:ZNightflightrate_gmc	-0.19233	0.05202	-3.697	0.000218 ***
ZLpAeq24h_k30_cmc:ZTrend24h_gmc	0.26935	0.04615	5.836	5.34e-09 ***
ZLpAeq24h_k30_cmc:ZNoiseStarts24_gmc	0.59987	0.16128	3.719	0.000200 ***
ZLpAeq24h_k30_cmc:HRC_c	-1.38132	0.25855	-5.342	9.17e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA24_30_	ZFl24_	ZNght_	ZTr24_	ZNS24_	HRC_c	ZLA24_30_:ZF	ZLA24_30_:ZN_
ZLA24_30_:ZT									
ZLpAq24_30_	-0.018								
ZFlghts24h_	0.262	-0.004							
ZNghtflght_	0.007	0.005	0.664						
ZTrnd24h_gm	-0.040	0.000	0.210	0.249					
ZNsstrts24_	0.037	0.002	-0.893	-0.757	-0.181				
HRC_c	-0.540	0.013	-0.423	0.104	-0.105	0.047			
ZLA24_30_:ZF	-0.004	0.379	-0.023	-0.010	0.003	0.022	0.011		
ZLA24_30_:ZN_	0.007	-0.143	-0.015	-0.015	-0.007	0.017	-0.003	0.646	
ZLA24_30_:ZT	-0.004	0.360	0.000	-0.004	-0.022	0.003	-0.006	0.165	0.258
ZLA24_30_:ZNS	-0.001	-0.015	0.023	0.013	0.004	-0.024	-0.008	-0.841	-0.739
-0.072									
ZLA24_30_:H	0.012	-0.794	0.009	-0.003	-0.008	-0.006	-0.013	-0.595	0.012
-0.266									
ZLA24_30_:ZNS									
ZLpAq24_30_									

```

ZFlights24h_
ZNightflight_
ZTrnd24h_gm
ZNsStrts24_
HRC_c
ZLA24_30_:ZF
ZLA24_30_:ZN_
ZLA24_30_:ZT
ZLA24_30_:ZNS
ZLA24_30_:H    0.113
> performance::icc(FM_ALq30)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.050
Conditional ICC: 0.043
> performance::r2(FM_ALq30)
# R2 for Mixed Models

Conditional R2: 0.194
Marginal R2: 0.151
> screenreg(FM_ALq30)

=====
-----
Model 1
-----
(Intercept)                -0.31
                             (0.17)
ZLpAeq24h_k30_cmc          1.11 ***
                             (0.06)
ZFlights24h_gmc            -0.04
                             (0.55)
ZNightflightrate_gmc       -0.01
                             (0.20)
ZTrend24h_gmc              -0.17
                             (0.10)
ZNoiseStarts24_gmc         0.66
                             (0.46)
HRC_c                      -0.85
                             (0.49)
ZLpAeq24h_k30_cmc:ZFlights24h_gmc -0.17
                             (0.21)
ZLpAeq24h_k30_cmc:ZNightflightrate_gmc -0.19 ***
                             (0.05)
ZLpAeq24h_k30_cmc:ZTrend24h_gmc 0.27 ***
                             (0.05)
ZLpAeq24h_k30_cmc:ZNoiseStarts24_gmc 0.60 ***
                             (0.16)
ZLpAeq24h_k30_cmc:HRC_c     -1.38 ***
                             (0.26)
-----
AIC                        30523.17
BIC                        30636.93
Log Likelihood             -15247.58
Num. obs.                  24993
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.17
Var: Airport3.1 ZLpAeq24h_k30_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

---

```
> ranef(FM_ALq30)
$Airport3
  (Intercept) ZLpAeq24h_k30_cmc
1 -0.21793642  0.018403042
1.1 0.19878313 -0.056113205
1.2 -0.40720841 0.070934977
1.3 0.53788381 -0.033470981
2  0.51060225  0.011742220
3  0.05456613 -0.001103001
4  0.14034239 -0.008039282
91 -0.74938076 -0.003333157
92 0.54059314 -0.004865364
93 -0.52154383 0.004546625
94 0.11749974 -0.007249751
95 -0.18792857 0.006187764

with conditional variances for "Airport3"
```

## 4.35 Modell SLdN50 (akustische Prädiktoren $L_{den}$ und $\log(NAT_{22-06h,50})$ )

### 4.35.1 MO\_SLdN50

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLdN50@theta[1] ^ 2 / (MO_SLdN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.07528805
```

```
> performance::icc(MO_SLdN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SLdN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SLdN50)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SLdN50)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.06300428
```

```
1.1 0.25571838
```

```
1.2 0.03926869
```

```
1.3 -0.25208466
```

```
2 -0.22400173
```

```
3 0.18283767
```

```
4 -0.82791041
```

```
91 0.17410584
```

```
92 0.56598494
```

```
93 0.45689415
```

```
94 -0.99572180
```

```
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```



**4.35.2 CIM\_SLdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS50\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3) +  
 ZLDEN\_cmc:ZLog\_NAT\_n\_LS50\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16298.8	16377.1	-8139.4	16278.8	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1078	-0.5090	-0.3861	-0.2638	5.3326

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.00926	0.09623

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.75071	0.04629	-37.824	< 2e-16 ***
ZLDEN_cmc	0.45102	0.02896	15.574	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.15590	0.03433	4.541	5.60e-06 ***
ZFlights2206_gmc	2.93445	0.28079	10.451	< 2e-16 ***
ZNightflightrate_gmc	-0.87038	0.09888	-8.802	< 2e-16 ***
ZTrend2206_gmc	-0.30268	0.03761	-8.048	8.42e-16 ***
ZNoiseStarts24_gmc	-3.10151	0.28941	-10.717	< 2e-16 ***
HRC_c	0.82118	0.15654	5.246	1.56e-07 ***
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc	-0.05996	0.02645	-2.267	0.0234 *

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.043							
ZL_NAT_LS5	-0.031	-0.636						
ZFlght2206_	-0.174	0.018	-0.014					
ZNghtflght_	0.088	-0.018	0.008	-0.876				
ZTrnd2206_g	0.066	-0.015	-0.003	-0.214	0.184			
ZNSStrts24_	0.276	-0.015	0.009	-0.972	0.796	0.239		
HRC_c	-0.422	0.011	-0.010	0.354	-0.031	-0.139	-0.522	
ZLDEN_:ZL_N	-0.201	-0.174	0.002	-0.055	0.002	-0.034	0.051	-0.058

> performance::icc(CIM\_SLdN50)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.002  
 > performance::r2(CIM\_SLdN50)  
 # R2 for Mixed Models

Conditional R2: 0.124  
 Marginal R2: 0.121  
 > screenreg(CIM\_SLdN50)

```
=====
                                Model 1
-----
(Intercept)                    -1.75 ***
                                (0.05)
ZLDEN_cmc                       0.45 ***
                                (0.03)
ZLog_NAT_n_LS50_cmc            0.16 ***
                                (0.03)
ZFlights2206_gmc               2.93 ***
                                (0.28)
ZNightflightrate_gmc           -0.87 ***
                                (0.10)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc             -3.10 ***
                                (0.29)
HRC_c                           0.82 ***
                                (0.16)
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc -0.06 *
                                (0.03)
-----
AIC                             16298.83
BIC                             16377.10
Log Likelihood                  -8139.41
Num. obs.                       18532
```

---

```
Num. groups: Airport3          12
Var: Airport3 (Intercept)      0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_SLDn50)
$Airport3
  (Intercept)
1      0.024719676
1.1    0.017555060
1.2    0.029532425
1.3   -0.061549028
2      0.144120280
3     -0.041757881
4     -0.168288225
91     0.028543363
92     0.007116947
93     0.033388942
94     0.007751384
95    -0.014222711

with conditional variances for "Airport3"
>
```

**4.35.3 AIM1\_SLdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS50\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLDEN\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS50\_cmc  
Data: data

AIC	BIC	logLik	deviance	df.resid
16296.8	16382.9	-8137.4	16274.8	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1090	-0.5105	-0.3866	-0.2568	5.2896

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.006168	0.07853
Airport3.1	ZLDEN_cmc	0.009799	0.09899

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.76014	0.04241	-41.502	< 2e-16 ***
ZLDEN_cmc	0.45067	0.04550	9.904	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.17977	0.03675	4.891	1.00e-06 ***
ZFlights2206_gmc	2.96120	0.25702	11.521	< 2e-16 ***
ZNightflightrate_gmc	-0.87798	0.09041	-9.711	< 2e-16 ***
ZTrend2206_gmc	-0.30886	0.03593	-8.596	< 2e-16 ***
ZNoiseStarts24_gmc	-3.13355	0.26482	-11.833	< 2e-16 ***
HRC_c	0.83115	0.14301	5.812	6.18e-09 ***
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc	-0.05165	0.02677	-1.930	0.0537 .

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.066							
ZL_NAT_LS5	-0.069	-0.362						
ZFlght2206_	-0.193	0.029	-0.004					
ZNghtflght_	0.089	-0.014	-0.003	-0.881				
ZTrnd2206_g	0.082	-0.044	-0.029	-0.227	0.201			
ZNsStrts24_	0.294	-0.029	0.000	-0.973	0.801	0.243		
HRC_c	-0.441	0.020	-0.005	0.339	-0.017	-0.099	-0.507	
ZLDEN_:ZL_N	-0.243	-0.080	0.054	-0.057	0.004	-0.041	0.051	-0.057

> performance::icc(AIM1\_SLdN50)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.002  
Conditional ICC: 0.002  
> performance::r2(AIM1\_SLdN50)  
# R2 for Mixed Models

Conditional R2: 0.128  
Marginal R2: 0.126  
> screenreg(AIM1\_SLdN50)

```
=====
Model 1
-----
(Intercept)                -1.76 ***
                           (0.04)
ZLDEN_cmc                   0.45 ***
                           (0.05)
ZLog_NAT_n_LS50_cmc        0.18 ***
                           (0.04)
ZFlights2206_gmc           2.96 ***
                           (0.26)
ZNightflightrate_gmc      -0.88 ***
                           (0.09)
ZTrend2206_gmc             -0.31 ***
                           (0.04)
ZNoiseStarts24_gmc        -3.13 ***
                           (0.26)
HRC_c                       0.83 ***
                           (0.14)
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc -0.05
                           (0.03)
-----
AIC                          16296.84
BIC                          16382.94
Log Likelihood               -8137.42
```

---

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLDEN_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SLDn50)
$Airport3
  (Intercept)    ZLDEN_cmc
1      0.004284747  0.113803739
1.1    0.021457476 -0.031485630
1.2    0.024620237 -0.012814226
1.3   -0.037522876 -0.113834307
2      0.105042032  0.141153936
3     -0.028339215 -0.049558103
4     -0.126923617 -0.017650949
91    0.019316923  0.003456661
92    0.002773178  0.021743718
93    0.032279484 -0.065110804
94    0.008434760  0.015045874
95   -0.016395052 -0.005905980

with conditional variances for "Airport3"
```

**4.35.4 AIM2\_SLdN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS50\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLog\_NAT\_n\_LS50\_cmc | Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS50\_cmc  
 Data: dats

AIC BIC logLik deviance df.resid  
 16288.8 16374.9 -8133.4 16266.8 18521

Scaled residuals:  
 Min 1Q Median 3Q Max  
 -1.1417 -0.5056 -0.3886 -0.2554 5.8234

Random effects:  
 Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 0.008002 0.08945  
 Airport3.1 ZLog\_NAT\_n\_LS50\_cmc 0.064670 0.25430  
 Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.74680	0.04509	-38.744	< 2e-16 ***
ZLDEN_cmc	0.45298	0.02970	15.254	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.17903	0.09398	1.905	0.05678 .
ZFlights2206_gmc	2.98083	0.27365	10.893	< 2e-16 ***
ZNightflightrate_gmc	-0.88881	0.09616	-9.243	< 2e-16 ***
ZTrend2206_gmc	-0.31989	0.03829	-8.355	< 2e-16 ***
ZNoiseStarts24_gmc	-3.14163	0.28170	-11.152	< 2e-16 ***
HRC_c	0.80208	0.15223	5.269	1.37e-07 ***
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc	-0.07740	0.02765	-2.799	0.00512 **

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.032							
ZL_NAT_LS5	-0.053	-0.240						
ZFlght2206_	-0.179	0.026	0.021					
ZNghtflght_	0.087	-0.018	-0.019	-0.878				
ZTrnd2206_g	0.074	-0.022	-0.047	-0.235	0.207			
ZNsStrts24_	0.282	-0.022	-0.022	-0.972	0.798	0.252		
HRC_c	-0.427	0.012	-0.001	0.343	-0.022	-0.106	-0.513	
ZLDEN_:ZL_N	-0.225	-0.194	0.027	-0.074	0.025	-0.008	0.065	-0.047

convergence code: 0  
 Model failed to converge with max|grad| = 0.00851887 (tol = 0.002, component 1)

> performance::icc(AIM2\_SLdN50)  
 # IntraClass Correlation Coefficient

Adjusted ICC: 0.002  
 Conditional ICC: 0.002  
 > performance::r2(AIM2\_SLdN50)  
 # R2 for Mixed Models

Conditional R2: 0.131  
 Marginal R2: 0.129  
 > screenreg(AIM2\_SLdN50)

```
=====
-----
Model 1
-----
(Intercept)                -1.75 ***
                           (0.05)
ZLDEN_cmc                   0.45 ***
                           (0.03)
ZLog_NAT_n_LS50_cmc        0.18
                           (0.09)
ZFlights2206_gmc           2.98 ***
                           (0.27)
ZNightflightrate_gmc      -0.89 ***
                           (0.10)
ZTrend2206_gmc             -0.32 ***
                           (0.04)
ZNoiseStarts24_gmc        -3.14 ***
                           (0.28)
HRC_c                       0.80 ***
                           (0.15)
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc -0.08 **
                           (0.03)
-----
```

```

AIC                16288.77
BIC                16374.87
Log Likelihood     -8133.39
Num. obs.         18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLog_NAT_n_LS50_cmc 0.06
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_SLDn50)
$Airport3
  (Intercept) ZLog_NAT_n_LS50_cmc
1      0.001277301      0.194709060
1.1    0.017321288     -0.002554978
1.2    0.031270337     -0.208643835
1.3   -0.025893549     -0.228581440
2      0.121992827      0.319504960
3     -0.032304586     -0.027172334
4     -0.159706046      0.101639065
91    0.024741827      0.006874062
92    0.011953049     -0.182247877
93    0.040968254     -0.399431304
94    0.011048313      0.189240829
95   -0.025721738      0.217212549

with conditional variances for "Airport3"

```

**4.35.5 Vergleichstest SLdN50****4.35.5.1 > anova(CIM\_SLdN50, AIM1\_SLdN50)**

```

Data: dats
Models:
CIM_SLdN50: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
CIM_SLdN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN50:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS50_cmc
AIM1_SLdN50: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
AIM1_SLdN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SLdN50:   HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS50_cmc
npar  AIC  BIC  logLik  deviance  Chisq  Df  Pr(>Chisq)
CIM_SLdN50  10 16299 16377 -8139.4  16279
AIM1_SLdN50  11 16297 16383 -8137.4  16275 3.9811  1  0.04601 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

**4.35.5.2 > anova(CIM\_SLdN50, AIM2\_SLdN50)**

```

Data: dats
Models:
CIM_SLdN50: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
CIM_SLdN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN50:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS50_cmc
AIM2_SLdN50: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
AIM2_SLdN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLdN50:   HRC_c + (1 + ZLog_NAT_n_LS50_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS50_cmc
npar  AIC  BIC  logLik  deviance  Chisq  Df  Pr(>Chisq)
CIM_SLdN50  10 16299 16377 -8139.4  16279
AIM2_SLdN50  11 16289 16375 -8133.4  16267 12.056  1  0.0005164 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

**4.35.6 FM\_SLdN50**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc
|| Airport3) + (1 + ZLog_NAT_n_LS50_cmc ||
  Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS50_cmc + ZLDEN_cmc:ZFlights2206_gmc +
  ZLDEN_cmc:ZNightflightrate_gmc + ZLDEN_cmc:ZTrend2206_gmc +
  ZLDEN_cmc:ZNoiseStarts24_gmc + ZLDEN_cmc:HRC_c + ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc +
  ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc + ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc +
  ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc + ZLog_NAT_n_LS50_cmc:HRC_c
Data: dats
```

```
AIC      BIC      logLik deviance df.resid
16299.8  16479.8  -8126.9  16253.8   18509
```

Scaled residuals:

```
      Min      1Q  Median      3Q      Max
-1.0301 -0.5103 -0.3897 -0.2465  6.1285
```

Random effects:

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept)         5.886e-03 0.0767213
Airport3.1  ZLDEN_cmc            1.637e-08 0.0001279
Airport3.2  (Intercept)         1.404e-03 0.0374684
Airport3.3  ZLog_NAT_n_LS50_cmc 4.107e-02 0.2026517
Number of obs: 18532, groups: Airport3, 12
```

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.7551334	0.0443271	-39.595	< 2e-16	***
ZLDEN_cmc	0.4989440	0.0362237	13.774	< 2e-16	***
ZLog_NAT_n_LS50_cmc	0.1356519	0.1045746	1.297	0.19457	
ZFlights2206_gmc	3.0474204	0.2723704	11.189	< 2e-16	***
ZNightflightrate_gmc	-0.9022064	0.0955197	-9.445	< 2e-16	***
ZTrend2206_gmc	-0.3214610	0.0391322	-8.215	< 2e-16	***
ZNoiseStarts24_gmc	-3.2086791	0.2795603	-11.478	< 2e-16	***
HRC_c	0.8388299	0.1505077	5.573	2.5e-08	***
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc	-0.0732317	0.0279002	-2.625	0.00867	**
ZLDEN_cmc:ZFlights2206_gmc	-0.1908986	0.2455410	-0.777	0.43689	
ZLDEN_cmc:ZNightflightrate_gmc	-0.0188411	0.0896983	-0.210	0.83363	
ZLDEN_cmc:ZTrend2206_gmc	0.0004834	0.0347514	0.014	0.98890	
ZLDEN_cmc:ZNoiseStarts24_gmc	0.2619659	0.2500501	1.048	0.29480	
ZLDEN_cmc:HRC_c	-0.3150363	0.1229769	-2.562	0.01041	*
ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc	-0.8018751	0.7173905	-1.118	0.26367	
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc	0.3908165	0.2381661	1.641	0.10081	
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc	0.0247439	0.0653711	0.379	0.70505	
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc	0.6074557	0.7246054	0.838	0.40185	
ZLog_NAT_n_LS50_cmc:HRC_c	0.3335386	0.3533656	0.944	0.34523	

```
---
signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Correlation matrix not shown by default, as p = 19 &gt; 12.

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

convergence code: 0

unable to evaluate scaled gradient

Model failed to converge: degenerate Hessian with 1 negative eigenvalues

```
> performance::icc(FM_SLdN50)
# Intraclass Correlation Coefficient
```

Adjusted ICC: 0.002

Conditional ICC: 0.002

```
> performance::r2(FM_SLdN50)
```

# R2 for Mixed Models

Conditional R2: 0.130

Marginal R2: 0.129

```
> screenreg(FM_SLdN50)
```

```
=====
-----
Model 1
-----
(Intercept)          -1.76 ***
                    (0.04)
ZLDEN_cmc             0.50 ***
                    (0.04)
ZLog_NAT_n_LS50_cmc  0.14
                    (0.10)
ZFlights2206_gmc     3.05 ***
```



```

(0.27)
ZNightflightrate_gmc -0.90 ***
(0.10)
ZTrend2206_gmc -0.32 ***
(0.04)
ZNoiseStarts24_gmc -3.21 ***
(0.28)
HRC_c 0.84 ***
(0.15)
ZLDEN_cmc:ZLog_NAT_n_LS50_cmc -0.07 **
(0.03)
ZLDEN_cmc:ZFlights2206_gmc -0.19
(0.25)
ZLDEN_cmc:ZNightflightrate_gmc -0.02
(0.09)
ZLDEN_cmc:ZTrend2206_gmc 0.00
(0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.26
(0.25)
ZLDEN_cmc:HRC_c -0.32 *
(0.12)
ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc -0.80
(0.72)
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc 0.39
(0.24)
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc 0.02
(0.07)
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc 0.61
(0.72)
ZLog_NAT_n_LS50_cmc:HRC_c 0.33
(0.35)
-----
AIC 16299.82
BIC 16479.85
Log Likelihood -8126.91
Num. obs. 18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.00
Var: Airport3.3 ZLog_NAT_n_LS50_cmc 0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLDn50)
$Airport3
      (Intercept)      ZLDEN_cmc      (Intercept)      ZLog_NAT_n_LS50_cmc
1      0.005925237      2.725562e-07      0.001413202      0.240749190
1.1    0.008469724     -2.097497e-07      0.002020076      0.116264793
1.2    0.023396655      7.748738e-09      0.005580231     -0.187390816
1.3   -0.021106195     -1.080693e-07     -0.005033944     -0.298262834
2      0.093556266      1.853537e-07      0.022313684      0.140277582
3     -0.025060024     -6.308166e-08     -0.005976954     -0.074533575
4     -0.120727987     -1.345556e-07     -0.028794290     0.112880938
91     0.018605451      5.299128e-09      0.004437503      0.004187297
92     0.010580060      1.075856e-07      0.002523402      0.003184893
93     0.027839555     -1.052157e-07      0.006639887     -0.192827680
94     0.007386287     -2.654010e-08      0.001761670     -0.032817193
95    -0.017721804      6.420496e-08     -0.004226748      0.154295105

```

with conditional variances for "Airport3"

**4.36 Modell SLdN60 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{22-06h,60})$ )****4.36.1 MO\_SLdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ (1 | Airport3)  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLdN60@theta[1] ^ 2 / (MO_SLdN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1]
```

```
> performance::icc(MO_SLdN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SLdN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SLdN60)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SLdN60)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.06300428
```

```
1.1 0.25571838
```

```
1.2 0.03926869
```

```
1.3 -0.25208466
```

```
2 -0.22400173
```

```
3 0.18283767
```

```
4 -0.82791041
```

```
91 0.17410584
```

```
92 0.56598494
```

```
93 0.45689415
```

```
94 -0.99572180
```

```
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```

**4.36.2 CIM\_SLdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3) +  
 ZLDEN\_cmc:ZLog\_NAT\_n\_LS60\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16257.2	16335.4	-8118.6	16237.2	18522

Scaled residuals:  
 Min 1Q Median 3Q Max  
 -1.0044 -0.5093 -0.3890 -0.2481 5.3943

Random effects:  
 Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 0.009493 0.09743  
 Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.74996	0.04676	-37.422	< 2e-16 ***
ZLDEN_cmc	0.35722	0.03182	11.225	< 2e-16 ***
ZLog_NAT_n_LS60_cmc	0.27444	0.03553	7.725	1.12e-14 ***
ZFlights2206_gmc	2.93684	0.28232	10.403	< 2e-16 ***
ZNightflightrate_gmc	-0.86839	0.09952	-8.726	< 2e-16 ***
ZTrend2206_gmc	-0.30153	0.03775	-7.988	1.37e-15 ***
ZNoiseStarts24_gmc	-3.10714	0.29095	-10.679	< 2e-16 ***
HRC_c	0.82153	0.15720	5.226	1.73e-07 ***
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc	-0.06317	0.02280	-2.771	0.00559 **

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.039							
ZL_NAT_LS6	-0.024	-0.703						
ZFlght2206_	-0.179	0.004	0.003					
ZNghtflght_	0.090	-0.014	0.004	-0.877				
ZTrnd2206_g	0.061	-0.011	-0.005	-0.215	0.183			
ZNSStrts24_	0.281	-0.002	-0.006	-0.972	0.796	0.241		
HRC_c	-0.429	0.001	0.002	0.353	-0.032	-0.143	-0.521	
ZLDEN_:ZL_N	-0.211	-0.087	-0.112	-0.026	-0.007	-0.016	0.020	-0.015

convergence code: 0  
 Model failed to converge with max|grad| = 0.00240599 (tol = 0.002, component 1)

> performance::icc(CIM\_SLdN60)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.003  
 > performance::r2(CIM\_SLdN60)  
 # R2 for Mixed Models

Conditional R2: 0.132  
 Marginal R2: 0.129  
 > screenreg(CIM\_SLdN60)

```
=====
                                Model 1
-----
(Intercept)                    -1.75 ***
                                (0.05)
ZLDEN_cmc                       0.36 ***
                                (0.03)
ZLog_NAT_n_LS60_cmc            0.27 ***
                                (0.04)
ZFlights2206_gmc               2.94 ***
                                (0.28)
ZNightflightrate_gmc          -0.87 ***
                                (0.10)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.11 ***
                                (0.29)
HRC_c                           0.82 ***
                                (0.16)
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc -0.06 **
                                (0.02)
-----
AIC                               16257.16
```

---

```
BIC 16335.44
Log Likelihood -8118.58
Num. obs. 18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_SLDn60)
$Airport3
  (Intercept)
1 0.030265557
1.1 0.013301934
1.2 0.028988833
1.3 -0.063199326
2 0.146963147
3 -0.042727491
4 -0.170785723
91 0.029185783
92 0.007997742
93 0.032710887
94 0.007118706
95 -0.012709789

with conditional variances for "Airport3"
>
```

**4.36.3 AIM1\_SLdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLDEN\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS60\_cmc  
 Data: datas

AIC	BIC	logLik	deviance	df.resid
16253.3	16339.4	-8115.6	16231.3	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0772	-0.5105	-0.3886	-0.2406	6.0410

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.006188	0.07867
Airport3.1	ZLDEN_cmc	0.011183	0.10575

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.76150	0.04271	-41.247	< 2e-16	***
ZLDEN_cmc	0.36222	0.04904	7.386	1.51e-13	***
ZLog_NAT_n_LS60_cmc	0.30721	0.03876	7.926	2.26e-15	***
ZFlights2206_gmc	2.96266	0.25716	11.521	< 2e-16	***
ZNightflightrate_gmc	-0.87923	0.09057	-9.708	< 2e-16	***
ZTrend2206_gmc	-0.31069	0.03598	-8.634	< 2e-16	***
ZNoiseStarts24_gmc	-3.13224	0.26500	-11.820	< 2e-16	***
HRC_c	0.82593	0.14294	5.778	7.56e-09	***
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc	-0.05695	0.02307	-2.469	0.0136	*

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.064							
ZL_NAT__LS6	-0.057	-0.426						
ZFlght2206_	-0.200	0.025	0.005					
ZNghtflght_	0.092	-0.011	-0.007	-0.881				
ZTrnd2206_g	0.078	-0.032	-0.042	-0.226	0.199			
ZNsStrts24_	0.302	-0.027	-0.005	-0.973	0.802	0.242		
HRC_c	-0.451	0.022	-0.005	0.337	-0.017	-0.100	-0.506	
ZLDEN_:ZL_N	-0.250	-0.035	-0.068	-0.027	-0.007	-0.023	0.017	-0.014

convergence code: 0

Model failed to converge with max|grad| = 0.00693462 (tol = 0.002, component 1)

> performance::icc(AIM1\_SLdN60)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.002  
 Conditional ICC: 0.002  
 > performance::r2(AIM1\_SLdN60)  
 # R2 for Mixed Models

Conditional R2: 0.140  
 Marginal R2: 0.139  
 > screenreg(AIM1\_SLdN60)

```
=====
Model 1
-----
(Intercept)          -1.76 ***
                    (0.04)
ZLDEN_cmc             0.36 ***
                    (0.05)
ZLog_NAT_n_LS60_cmc  0.31 ***
                    (0.04)
ZFlights2206_gmc     2.96 ***
                    (0.26)
ZNightflightrate_gmc -0.88 ***
                    (0.09)
ZTrend2206_gmc       -0.31 ***
                    (0.04)
ZNoiseStarts24_gmc   -3.13 ***
                    (0.27)
HRC_c                 0.83 ***
                    (0.14)
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc -0.06 *
                    (0.02)
-----
```

```
AIC                16253.29
BIC                16339.39
Log Likelihood     -8115.64
Num. obs.         18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
Var: Airport3.1 ZLDEN_cmc  0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SLDN60)
$Airport3
  (Intercept)    ZLDEN_cmc
1    0.003856195  0.122698892
1.1  0.023970045 -0.081954050
1.2  0.022476561 -0.021599694
1.3 -0.037005032 -0.143329800
2    0.106147610  0.126499226
3   -0.028872557 -0.028745909
4   -0.126866743 -0.035265342
91   0.019461444  0.004220259
92   0.005373752  0.005569537
93   0.029142951 -0.031605838
94   0.008368420  0.043126453
95  -0.016585393  0.039434427

with conditional variances for "Airport3"
>
```

#### 4.36.4 AIM2\_SLdN60

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLog\_NAT\_n\_LS60\_cmc | Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS60\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16249.7	16335.8	-8113.9	16227.7	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0362	-0.5081	-0.3936	-0.2341	6.4298

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.004842	0.06959
Airport3.1	ZLog_NAT_n_LS60_cmc	0.034705	0.18629

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.75858	0.04099	-42.905	< 2e-16 ***
ZLDEN_cmc	0.34414	0.03379	10.184	< 2e-16 ***
ZLog_NAT_n_LS60_cmc	0.33628	0.07350	4.575	4.75e-06 ***
ZFlights2206_gmc	2.96303	0.24743	11.975	< 2e-16 ***
ZNightflightrate_gmc	-0.88144	0.08693	-10.140	< 2e-16 ***
ZTrend2206_gmc	-0.31631	0.03525	-8.972	< 2e-16 ***
ZNoiseStarts24_gmc	-3.13000	0.25488	-12.280	< 2e-16 ***
HRC_c	0.83203	0.13726	6.062	1.35e-09 ***
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc	-0.06487	0.02400	-2.703	0.00688 **

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.004							
ZL_NAT_LS6	-0.089	-0.361						
ZFlght2206_	-0.214	-0.004	0.035					
ZNghtflght_	0.093	0.001	-0.019	-0.885				
ZTrnd2206_g	0.073	-0.014	-0.047	-0.235	0.211			
ZNsStrts24_	0.317	0.010	-0.039	-0.974	0.807	0.244		
HRC_c	-0.472	-0.012	0.036	0.332	-0.012	-0.073	-0.500	
ZLDEN_:ZL_N	-0.277	-0.148	0.001	-0.031	0.005	0.006	0.015	0.004

convergence code: 0  
 Model failed to converge with max|grad| = 0.00360899 (tol = 0.002, component 1)

```
> performance::icc(AIM2_SLdN60)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.001
Conditional ICC: 0.001
> performance::r2(AIM2_SLdN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.143
Marginal R2: 0.142
> screenreg(AIM2_SLdN60)
```

```
=====
Model 1
-----
(Intercept) -1.76 ***
              (0.04)
ZLDEN_cmc    0.34 ***
              (0.03)
ZLog_NAT_n_LS60_cmc 0.34 ***
              (0.07)
ZFlights2206_gmc 2.96 ***
              (0.25)
ZNightflightrate_gmc -0.88 ***
              (0.09)
ZTrend2206_gmc -0.32 ***
              (0.04)
ZNoiseStarts24_gmc -3.13 ***
              (0.25)
HRC_c        0.83 ***
              (0.14)
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc -0.06 **
              (0.02)
-----
```

---

```
AIC 16249.70
BIC 16335.80
Log Likelihood -8113.85
Num. obs. 18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLog_NAT_n_LS60_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_SLDn60)
$Airport3
  (Intercept) ZLog_NAT_n_LS60_cmc
1 -0.001773107 0.202649317
1.1 0.018319310 -0.079602009
1.2 0.020546369 -0.177141076
1.3 -0.022571985 -0.268856113
2 0.085869873 0.304636788
3 -0.021914912 -0.019488155
4 -0.107593284 -0.015025040
91 0.015337642 0.001216703
92 0.003106211 0.068116012
93 0.030208651 -0.105759766
94 0.008171800 0.063882527
95 -0.016719311 0.011188602

with conditional variances for "Airport3"
>
```



**4.36.5 Vergleichstests SLdN60****4.36.5.1 > anova(CIM\_SLdN60, AIM1\_SLdN60)**

Data: dats

Models:

```

CIM_SLdN60: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
CIM_SLdN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN60:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS60_cmc
AIM1_SLdN60: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
AIM1_SLdN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SLdN60:   HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS60_cmc
npar  AIC  BIC  logLik  deviance  Chisq  Df  Pr(>Chisq)
CIM_SLdN60   10 16257 16335 -8118.6    16237
AIM1_SLdN60  11 16253 16339 -8115.6    16231 5.8778  1    0.01533 *
```

```

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

**4.36.5.2 > anova(CIM\_SLdN60, AIM2\_SLdN60)**

Data: dats

Models:

```

CIM_SLdN60: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
CIM_SLdN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN60:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS60_cmc
AIM2_SLdN60: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
AIM2_SLdN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLdN60:   HRC_c + (1 + ZLog_NAT_n_LS60_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS60_cmc
npar  AIC  BIC  logLik  deviance  Chisq  Df  Pr(>Chisq)
CIM_SLdN60   10 16257 16335 -8118.6    16237
AIM2_SLdN60  11 16250 16336 -8113.9    16228 9.4605  1    0.002099 **
```

```

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

&gt;

**4.36.6 FM\_SLdN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial ( logit )  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc  
 || Airport3) + (1 + ZLog\_NAT\_n\_LS60\_cmc ||  
 Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS60\_cmc + ZLDEN\_cmc:ZFlights2206\_gmc +  
 ZLDEN\_cmc:ZNightflightrate\_gmc + ZLDEN\_cmc:ZTrend2206\_gmc +  
 ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c + ZLog\_NAT\_n\_LS60\_cmc:ZFlights2206\_gmc +  
 ZLog\_NAT\_n\_LS60\_cmc:ZNightflightrate\_gmc + ZLog\_NAT\_n\_LS60\_cmc:ZTrend2206\_gmc +  
 ZLog\_NAT\_n\_LS60\_cmc:ZNoiseStarts24\_gmc + ZLog\_NAT\_n\_LS60\_cmc:HRC\_c  
 Data: dats

AIC BIC logLik deviance df.resid  
 16269.4 16449.4 -8111.7 16223.4 18509

Scaled residuals:  
 Min 1Q Median 3Q Max  
 -1.0547 -0.5097 -0.3950 -0.2335 6.3900

Random effects:  
 Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 4.522e-03 0.0672464  
 Airport3.1 ZLDEN\_cmc 2.681e-08 0.0001637  
 Airport3.2 (Intercept) 6.261e-04 0.0250216  
 Airport3.3 ZLog\_NAT\_n\_LS60\_cmc 2.264e-02 0.1504672  
 Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.756542	0.041686	-42.137	< 2e-16	***
ZLDEN_cmc	0.351731	0.050681	6.940	3.92e-12	***
ZLog_NAT_n_LS60_cmc	0.326827	0.090057	3.629	0.000284	***
ZFlights2206_gmc	3.002391	0.254828	11.782	< 2e-16	***
ZNightflightrate_gmc	-0.893740	0.089448	-9.992	< 2e-16	***
ZTrend2206_gmc	-0.324100	0.037225	-8.707	< 2e-16	***
ZNoiseStarts24_gmc	-3.158400	0.261581	-12.074	< 2e-16	***
HRC_c	0.823374	0.140534	5.859	4.66e-09	***
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc	-0.066973	0.024831	-2.697	0.006994	**
ZLDEN_cmc:ZFlights2206_gmc	-0.304234	0.316055	-0.963	0.335749	
ZLDEN_cmc:ZNightflightrate_gmc	0.092666	0.104090	0.890	0.373331	
ZLDEN_cmc:ZTrend2206_gmc	0.008534	0.032836	0.260	0.794939	
ZLDEN_cmc:ZNoiseStarts24_gmc	0.266934	0.322473	0.828	0.407801	
ZLDEN_cmc:HRC_c	0.032399	0.138963	0.233	0.815649	
ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc	0.033675	0.556380	0.061	0.951737	
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc	0.002258	0.184269	0.012	0.990223	
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc	0.044051	0.049868	0.883	0.377044	
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc	-0.035907	0.568913	-0.063	0.949675	
ZLog_NAT_n_LS60_cmc:HRC_c	-0.132678	0.273320	-0.485	0.627369	

signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.  
 Use print(x, correlation=TRUE) or  
 vcov(x) if you need it

convergence code: 0  
 unable to evaluate scaled gradient  
 Model failed to converge: degenerate Hessian with 1 negative eigenvalues

> performance::icc(FM\_SLdN60)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.001  
 Conditional ICC: 0.001  
 > performance::r2(FM\_SLdN60)  
 # R2 for Mixed Models

Conditional R2: 0.138  
 Marginal R2: 0.137  
 > screenreg(FM\_SLdN60)

```
=====
-----
Model 1
-----
(Intercept)          -1.76 ***
                    (0.04)
ZLDEN_cmc             0.35 ***
                    (0.05)
ZLog_NAT_n_LS60_cmc  0.33 ***
                    (0.09)
ZFlights2206_gmc     3.00 ***
```

```

(0.25)
ZNightflightrate_gmc -0.89 ***
(0.09)
ZTrend2206_gmc -0.32 ***
(0.04)
ZNoiseStarts24_gmc -3.16 ***
(0.26)
HRC_c 0.82 ***
(0.14)
ZLDEN_cmc:ZLog_NAT_n_LS60_cmc -0.07 **
(0.02)
ZLDEN_cmc:ZFlights2206_gmc -0.30
(0.32)
ZLDEN_cmc:ZNightflightrate_gmc 0.09
(0.10)
ZLDEN_cmc:ZTrend2206_gmc 0.01
(0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.27
(0.32)
ZLDEN_cmc:HRC_c 0.03
(0.14)
ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc 0.03
(0.56)
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc 0.00
(0.18)
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc 0.04
(0.05)
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc -0.04
(0.57)
ZLog_NAT_n_LS60_cmc:HRC_c -0.13
(0.27)
-----
AIC 16269.41
BIC 16449.44
Log Likelihood -8111.70
Num. obs. 18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLDEN_cmc 0.00
Var: Airport3.2 (Intercept) 0.00
Var: Airport3.3 ZLog_NAT_n_LS60_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLDn60)
$Airport3
 (Intercept) ZLDEN_cmc (Intercept) ZLog_NAT_n_LS60_cmc
1 0.004228093 4.308009e-07 0.0005853799 0.1999569401
1.1 0.011165852 -3.864541e-07 0.0015459133 0.0202484242
1.2 0.018030837 2.252453e-09 0.0024963710 -0.1004411004
1.3 -0.021638942 -1.364543e-07 -0.0029959136 -0.1914861996
2 0.079751664 1.888805e-07 0.0110416255 0.1841781010
3 -0.020720341 -4.906629e-08 -0.0028687331 -0.0700697232
4 -0.099803355 -1.594250e-07 -0.0138177840 -0.0371821850
91 0.014417280 9.904378e-09 0.0019960738 0.0007584231
92 0.002990371 -2.759324e-08 0.0004140171 0.0374566201
93 0.027364754 3.865436e-08 0.0037886528 -0.1213335675
94 0.006565515 -3.537834e-08 0.0009089962 -0.0207506479
95 -0.013492530 1.314613e-07 -0.0018680420 0.0871872694

```

with conditional variances for "Airport3"

**4.37 Modell SLdN70 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{22-06h,70})$ )****4.37.1 MO\_SLdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ (1 | Airport3)  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLdN70@theta[1] ^ 2 / (MO_SLdN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.07528805
```

```
> performance::icc(MO_SLdN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SLdN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SLdN70)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SLdN70)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.06300428
```

```
1.1 0.25571838
```

```
1.2 0.03926869
```

```
1.3 -0.25208466
```

```
2 -0.22400173
```

```
3 0.18283767
```

```
4 -0.82791041
```

```
91 0.17410584
```

```
92 0.56598494
```

```
93 0.45689415
```

```
94 -0.99572180
```

```
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```

**4.37.2 CIM\_SLdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLDEN_cmc:ZLog_NAT_n_LS70_cmc
Data: dats
```

```
      AIC      BIC    logLik deviance df.resid
16268.5 16346.7  -8124.2 16248.5    18522
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-1.0212 -0.5117 -0.3856 -0.2551  4.9997
```

Random effects:

```
Groups Name          Variance Std.Dev.
Airport3 (Intercept) 0.009153 0.09567
Number of obs: 18532, groups: Airport3, 12
```

Fixed effects:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.75260    0.04670  -37.526 < 2e-16 ***
ZLDEN_cmc      0.34570    0.03569   9.687 < 2e-16 ***
ZLog_NAT_n_LS70_cmc 0.25891    0.03680   7.036 1.98e-12 ***
ZFlights2206_gmc 2.94187    0.27999  10.507 < 2e-16 ***
ZNightflightrate_gmc -0.86862    0.09868  -8.802 < 2e-16 ***
ZTrend2206_gmc -0.29916    0.03744  -7.989 1.36e-15 ***
ZNoiseStarts24_gmc -3.11257    0.28854 -10.787 < 2e-16 ***
HRC_c          0.83432    0.15584   5.354 8.62e-08 ***
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.04864    0.02208  -2.203 0.0276 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Correlation of Fixed Effects:

```
              (Intr) ZLDEN_c ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLDEN_cmc      0.011
ZL_NAT_LS7    -0.051 -0.765
ZFlght2206_   -0.179  0.005  0.003
ZNghtflght_   0.088 -0.017  0.009 -0.878
ZTrnd2206_g  0.056 -0.024  0.014 -0.216  0.184
ZNSStrts24_  0.281 -0.001 -0.007 -0.973  0.797  0.241
HRC_c         -0.435 -0.017  0.023  0.352 -0.031 -0.141 -0.520
ZLDEN_:ZL_N -0.250 -0.218  0.010 -0.021 -0.004  0.003  0.014  0.014
```

```
> performance::icc(CIM_SLdN70)
```

# Intraclass Correlation Coefficient

Adjusted ICC: 0.003

Conditional ICC: 0.002

```
> performance::r2(CIM_SLdN70)
```

# R2 for Mixed Models

Conditional R2: 0.128

Marginal R2: 0.125

```
> screenreg(CIM_SLdN70)
```

```
=====
Model 1
-----
(Intercept)          -1.75 ***
                    (0.05)
ZLDEN_cmc             0.35 ***
                    (0.04)
ZLog_NAT_n_LS70_cmc  0.26 ***
                    (0.04)
ZFlights2206_gmc     2.94 ***
                    (0.28)
ZNightflightrate_gmc -0.87 ***
                    (0.10)
ZTrend2206_gmc      -0.30 ***
                    (0.04)
ZNoiseStarts24_gmc  -3.11 ***
                    (0.29)
HRC_c                 0.83 ***
                    (0.16)
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.05 *
                    (0.02)
-----
AIC                  16268.47
BIC                  16346.75
Log Likelihood       -8124.24
Num. obs.            18532
```

```
Num. groups: Airport3          12
Var: Airport3 (Intercept)      0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_SLDn70)
$Airport3
  (Intercept)
1      0.028674901
1.1    0.010863882
1.2    0.029728492
1.3   -0.059779792
2      0.142207873
3     -0.040909884
4     -0.167639352
91     0.028337256
92     0.005623961
93     0.035489867
94     0.007221823
95    -0.012959085

with conditional variances for "Airport3"
>
```

**4.37.3 AIM1\_SLdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS70\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLDEN\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS70\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16270.3	16356.4	-8124.2	16248.3	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0446	-0.5130	-0.3857	-0.2538	5.2560

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.008298	0.09110
Airport3.1	ZLDEN_cmc	0.001822	0.04269

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.75603	0.04615	-38.047	< 2e-16	***
ZLDEN_cmc	0.34984	0.04010	8.724	< 2e-16	***
ZLog_NAT_n_LS70_cmc	0.26406	0.03872	6.820	9.08e-12	***
ZFlights2206_gmc	2.94975	0.27402	10.765	< 2e-16	***
ZNightflightrate_gmc	-0.87208	0.09667	-9.022	< 2e-16	***
ZTrend2206_gmc	-0.30128	0.03731	-8.076	6.70e-16	***
ZNoiseStarts24_gmc	-3.12006	0.28232	-11.051	< 2e-16	***
HRC_c	0.83527	0.15223	5.487	4.09e-08	***
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc	-0.04688	0.02243	-2.090	0.0366	*

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.028							
ZL_NAT_LS7	-0.089	-0.617						
ZFlght2206_	-0.188	0.022	0.012					
ZNghtflght_	0.096	-0.025	-0.009	-0.879				
ZTrnd2206_g	0.079	-0.053	-0.024	-0.223	0.194			
ZNsStrts24_	0.288	-0.020	-0.015	-0.973	0.799	0.245		
HRC_c	-0.435	-0.005	0.019	0.348	-0.028	-0.131	-0.516	
ZLDEN_:ZL_N	-0.277	-0.158	0.055	-0.013	-0.013	-0.021	0.007	0.015

> performance::icc(AIM1\_SLdN70)  
 # IntraClass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.002  
 > performance::r2(AIM1\_SLdN70)  
 # R2 for Mixed Models

Conditional R2: 0.130  
 Marginal R2: 0.128  
 > screenreg(AIM1\_SLdN70)

```
=====
Model 1
-----
(Intercept)          -1.76 ***
                    (0.05)
ZLDEN_cmc             0.35 ***
                    (0.04)
ZLog_NAT_n_LS70_cmc  0.26 ***
                    (0.04)
ZFlights2206_gmc     2.95 ***
                    (0.27)
ZNightflightrate_gmc -0.87 ***
                    (0.10)
ZTrend2206_gmc       -0.30 ***
                    (0.04)
ZNoiseStarts24_gmc   -3.12 ***
                    (0.28)
HRC_c                 0.84 ***
                    (0.15)
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.05 *
                    (0.02)
-----
AIC                   16270.34
BIC                   16356.44
Log Likelihood        -8124.17
```

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLDEN_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SLdN70)
$Airport3
  (Intercept)    ZLDEN_cmc
1      0.020866609  0.0357260076
1.1    0.015105471 -0.0246632072
1.2    0.028406432 -0.0027932310
1.3   -0.053479802 -0.0303346672
2      0.132282706  0.0267562463
3     -0.037336774 -0.0065317211
4     -0.156791688 -0.0122281865
91    0.025850147  0.0006352723
92    0.004909123 -0.0017432505
93    0.034744937 -0.0118372169
94    0.007777640  0.0135323625
95   -0.014325562  0.0130361706

with conditional variances for "Airport3"
>
```



**4.37.4 AIM2\_SLdN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS70\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLog\_NAT\_n\_LS70\_cmc | Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS70\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16260.2	16346.3	-8119.1	16238.2	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0406	-0.5121	-0.3861	-0.2499	6.3469

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.002306	0.04802
Airport3.1	ZLog_NAT_n_LS70_cmc	0.024859	0.15767

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.75841	0.03788	-46.421	< 2e-16	***
ZLDEN_cmc	0.34030	0.03711	9.171	< 2e-16	***
ZLog_NAT_n_LS70_cmc	0.30148	0.06542	4.608	4.06e-06	***
ZFlights2206_gmc	2.93292	0.22426	13.078	< 2e-16	***
ZNightflightrate_gmc	-0.87029	0.07815	-11.136	< 2e-16	***
ZTrend2206_gmc	-0.31590	0.03313	-9.536	< 2e-16	***
ZNoiseStarts24_gmc	-3.09663	0.23263	-13.311	< 2e-16	***
HRC_c	0.83087	0.12664	6.561	5.35e-11	***
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc	-0.04756	0.02259	-2.105	0.0353	*

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	0.029							
ZL_NAT_LS7	-0.092	-0.439						
ZFlght2206_	-0.265	0.005	0.023					
ZNghtflght_	0.093	-0.006	-0.005	-0.886				
ZTrnd2206_g	0.051	-0.016	-0.057	-0.213	0.209			
ZNsStrts24_	0.364	0.001	-0.026	-0.975	0.807	0.208		
HRC_c	-0.537	-0.019	0.036	0.330	0.007	-0.003	-0.498	
ZLDEN_:ZL_N	-0.321	-0.235	0.034	-0.039	0.010	0.007	0.026	0.013

> performance::icc(AIM2\_SLdN70)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.001  
 Conditional ICC: 0.001  
 > performance::r2(AIM2\_SLdN70)  
 # R2 for Mixed Models

Conditional R2: 0.136  
 Marginal R2: 0.136  
 > screenreg(AIM2\_SLdN70)

```
=====
-----
Model 1
-----
(Intercept)                -1.76 ***
                           (0.04)
ZLDEN_cmc                   0.34 ***
                           (0.04)
ZLog_NAT_n_LS70_cmc        0.30 ***
                           (0.07)
ZFlights2206_gmc           2.93 ***
                           (0.22)
ZNightflightrate_gmc       -0.87 ***
                           (0.08)
ZTrend2206_gmc             -0.32 ***
                           (0.03)
ZNoiseStarts24_gmc        -3.10 ***
                           (0.23)
HRC_c                       0.83 ***
                           (0.13)
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.05 *
                           (0.02)
-----
AIC                          16260.16
BIC                          16346.26
Log Likelihood               -8119.08
```

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLog_NAT_n_LS70_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_SLDn70)
$Airport3
  (Intercept) ZLog_NAT_n_LS70_cmc
1      0.0006475379      0.16917859
1.1    0.0135543430     -0.07573877
1.2    0.0093986832     -0.06613445
1.3   -0.0172021993     -0.26136717
2      0.0503078830      0.15821814
3     -0.0131133973     -0.03457145
4     -0.0574902555     -0.14691372
91    0.0073450253      0.00551090
92    0.0027910002      0.03192640
93    0.0127614638      0.07825528
94    0.0041024872      0.15180280
95   -0.0078224399     -0.01678306

with conditional variances for "Airport3"
>
```

**4.37.5 Vergleichstests SLdN70****4.37.5.1 > anova(CIM\_SLdN70, AIM1\_SLdN70)**

```
Data: dats
Models:
CIM_SLdN70: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
CIM_SLdN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN70:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS70_cmc
AIM1_SLdN70: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
AIM1_SLdN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SLdN70:   HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS70_cmc
      npar  AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLdN70    10 16268 16347 -8124.2    16248
AIM1_SLdN70   11 16270 16356 -8124.2    16248 0.1355  1    0.7128
```

**4.37.5.2 > anova(CIM\_SLdN70, AIM2\_SLdN70)**

```
Data: dats
Models:
CIM_SLdN70: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
CIM_SLdN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLdN70:   HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS70_cmc
AIM2_SLdN70: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
AIM2_SLdN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLdN70:   HRC_c + (1 + ZLog_NAT_n_LS70_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS70_cmc
      npar  AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLdN70    10 16268 16347 -8124.2    16248
AIM2_SLdN70   11 16260 16346 -8119.1    16238 10.316  1    0.001318 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
```

**4.37.6 FM\_SLdN70**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc
|| Airport3) + (1 + ZLog_NAT_n_LS70_cmc ||
  Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS70_cmc + ZLDEN_cmc:ZFlights2206_gmc +
  ZLDEN_cmc:ZNightflightrate_gmc + ZLDEN_cmc:ZTrend2206_gmc +
  ZLDEN_cmc:ZNoiseStarts24_gmc + ZLDEN_cmc:HRC_c + ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc +
  ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc + ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc +
  ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc + ZLog_NAT_n_LS70_cmc:HRC_c
Data: dats
```

```
AIC      BIC      logLik deviance df.resid
16270.7 16450.7 -8112.3 16224.7 18509
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
-1.0513 -0.5114 -0.3877 -0.2492  6.3450
```

Random effects:

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                 3.455e-03 0.0587791
Airport3.1  ZLDEN_cmc                   7.229e-08 0.0002689
Airport3.2  (Intercept)                 3.378e-05 0.0058116
Airport3.3  ZLog_NAT_n_LS70_cmc        1.327e-02 0.1151963
Number of obs: 18532, groups: Airport3, 12
```

Fixed effects:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.7590050    0.0392710 -44.791 < 2e-16 ***
ZLDEN_cmc    0.2894551    0.0711943  4.066 4.79e-05 ***
ZLog_NAT_n_LS70_cmc 0.3202987    0.0854095  3.750 0.000177 ***
ZFlights2206_gmc 2.9549711    0.2410708 12.258 < 2e-16 ***
ZNightflightrate_gmc -0.8756806    0.0845685 -10.355 < 2e-16 ***
ZTrend2206_gmc -0.3285749    0.0360996 -9.102 < 2e-16 ***
ZNoiseStarts24_gmc -3.1119531    0.2474939 -12.574 < 2e-16 ***
HRC_c        0.8193835    0.1335214  6.137 8.42e-10 ***
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.0503510    0.0233159 -2.160 0.030811 *
ZLDEN_cmc:ZFlights2206_gmc 0.1476644    0.4679388  0.316 0.752334
ZLDEN_cmc:ZNightflightrate_gmc 0.0189260    0.1404137  0.135 0.892780
ZLDEN_cmc:ZTrend2206_gmc 0.0048457    0.0344889  0.141 0.888264
ZLDEN_cmc:ZNoiseStarts24_gmc -0.1530876    0.4753206 -0.322 0.747398
ZLDEN_cmc:HRC_c 0.3440307    0.1909700  1.801 0.071626 .
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc -0.1502930    0.5316796 -0.283 0.777425
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc -0.0009744    0.1691439 -0.006 0.995404
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc 0.0776220    0.0492948  1.575 0.115338
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc 0.1171138    0.5409769  0.216 0.828609
ZLog_NAT_n_LS70_cmc:HRC_c -0.2944982    0.2462141 -1.196 0.231655
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Correlation matrix not shown by default, as p = 19 &gt; 12.

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

convergence code: 0

Model failed to converge with max|grad| = 0.00970512 (tol = 0.002, component 1)

```
> performance::icc(FM_SLdN70)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.001
Conditional ICC: 0.001
> performance::r2(FM_SLdN70)
# R2 for Mixed Models
```

```
Conditional R2: 0.133
Marginal R2: 0.132
> screenreg(FM_SLdN70)
```

```
=====
Model 1
-----
(Intercept) -1.76 ***
              (0.04)
ZLDEN_cmc    0.29 ***
              (0.07)
ZLog_NAT_n_LS70_cmc 0.32 ***
              (0.09)
ZFlights2206_gmc 2.95 ***
              (0.24)
```

```

ZNightflightrate_gmc          -0.88 ***
                               (0.08)
ZTrend2206_gmc                -0.33 ***
                               (0.04)
ZNoiseStarts24_gmc           -3.11 ***
                               (0.25)
HRC_c                          0.82 ***
                               (0.13)
ZLDEN_cmc:ZLog_NAT_n_LS70_cmc -0.05 *
                               (0.02)
ZLDEN_cmc:ZFlights2206_gmc    0.15
                               (0.47)
ZLDEN_cmc:ZNightflightrate_gmc 0.02
                               (0.14)
ZLDEN_cmc:ZTrend2206_gmc      0.00
                               (0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc -0.15
                               (0.48)
ZLDEN_cmc:HRC_c               0.34
                               (0.19)
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc -0.15
                               (0.53)
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc -0.00
                               (0.17)
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc 0.08
                               (0.05)
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc 0.12
                               (0.54)
ZLog_NAT_n_LS70_cmc:HRC_c     -0.29
                               (0.25)
-----
AIC                             16270.67
BIC                             16450.69
Log Likelihood                  -8112.33
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.00
Var: Airport3.1 ZLDEN_cmc       0.00
Var: Airport3.2 (Intercept)     0.00
Var: Airport3.3 ZLog_NAT_n_LS70_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLdN70)
$Airport3
  (Intercept)      ZLDEN_cmc  (Intercept) ZLog_NAT_n_LS70_cmc
1    0.005708696  9.227110e-07  5.580717e-05  0.111780933
1.1  0.012016804 -1.024603e-06  1.174741e-04  0.008514855
1.2  0.013531319 -1.911257e-08  1.322797e-04 -0.012266587
1.3 -0.023713953 -7.290909e-08 -2.318233e-04 -0.146743523
2    0.068973431  2.243855e-07  6.742716e-04  0.170902496
3   -0.018099217 -2.387758e-08 -1.769346e-04 -0.051450012
4   -0.081025818 -3.286895e-07 -7.920936e-04 -0.107293693
91  0.011051131  2.715378e-08  1.080338e-04  0.003069866
92  0.002526008  -2.800117e-07  2.469380e-05 -0.015297013
93  0.019688421  3.903746e-07  1.924704e-04 -0.002984604
94  0.004913694  -8.174267e-08  4.803538e-05 -0.002561432
95 -0.009315446  2.799429e-07 -9.106609e-05  0.039605018

```

with conditional variances for "Airport3"

**4.38 Modell SLdN80 (akustische Prädiktoren  $L_{den}$  und  $\log(NAT_{22-06h,80})$ )**

```

> summary(M0_SLdN80)
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ (1 | Airport3)
Data: dats

      AIC      BIC   logLik deviance df.resid
16986.6 17002.2 -8491.3 16982.6   18530

Scaled residuals:
   Min       1Q   Median       3Q      Max
-0.6437 -0.5062 -0.4317 -0.2945  3.6930

Random effects:
 Groups   Name      Variance Std.Dev.
Airport3 (Intercept) 0.2679   0.5176
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -1.6172     0.1541  -10.49  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> icc <- M0_SLdN80@theta[1] ^ 2 / (M0_SLdN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
> icc
[1] 0.075292
> performance::icc(M0_SLdN80)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.075
Conditional ICC: 0.075
> performance::r2(M0_SLdN80)
# R2 for Mixed Models

Conditional R2: 0.075
Marginal R2: 0.000
> screenreg(M0_SLdN80)

=====
                                Model 1
-----
(Intercept)                    -1.62 ***
                                (0.15)
-----
AIC                             16986.58
BIC                             17002.24
Log Likelihood                   -8491.29
Num. obs.                        18532
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_SLdN80)
$Airport3
  (Intercept)

```

```

1 -0.06300806
1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

```

>
> summary(CIM_SLdN80)
Generalized linear mixed model fit by maximum likelihood (Laplace Approxima
tion) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c
+ (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS80_cmc
Data: dats

```

AIC	BIC	logLik	deviance	df.resid
16317.3	16395.6	-8148.7	16297.3	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.3016	-0.5038	-0.3867	-0.2672	5.7466

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.009575	0.09785

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.74009	0.04702	-37.003	< 2e-16	***
ZLDEN_cmc	0.52548	0.03542	14.834	< 2e-16	***
ZLog_NAT_n_LS80_cmc	0.03313	0.03407	0.972	0.33088	
ZFlights2206_gmc	2.96928	0.28401	10.455	< 2e-16	***
ZNightflightrate_gmc	-0.88418	0.10003	-8.839	< 2e-16	***
ZTrend2206_gmc	-0.30303	0.03787	-8.002	1.22e-15	***
ZNoiseStarts24_gmc	-3.14298	0.29315	-10.721	< 2e-16	***
HRC_c	0.83259	0.15813	5.265	1.40e-07	***
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc	-0.05932	0.02225	-2.667	0.00766	**

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_c	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLDEN_cmc	-0.029							
ZL_NAT_LS8	0.014	-0.744						
ZFlght2206_	-0.168	0.031	-0.015					
ZNghtflight_	0.078	-0.043	0.028	-0.877				
ZTrnd2206_g	0.064	-0.013	0.001	-0.213	0.182			
ZNsStrts24_	0.265	-0.035	0.016	-0.972	0.796	0.238		
HRC_c	-0.417	0.012	0.000	0.356	-0.035	-0.142	-0.524	

```
ZLDEN_:ZL_N -0.228 -0.235 -0.044 -0.072 0.045 -0.024 0.084 -0.058
> performance::icc(CIM_SLdN80)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.003
Conditional ICC: 0.003
> performance::r2(CIM_SLdN80)
# R2 for Mixed Models
```

```
Conditional R2: 0.121
Marginal R2: 0.118
> screenreg(CIM_SLdN80)
```

```
=====
Model 1
-----
(Intercept) -1.74 ***
(0.05)
ZLDEN_cmc 0.53 ***
(0.04)
ZLog_NAT_n_LS80_cmc 0.03
(0.03)
ZFlights2206_gmc 2.97 ***
(0.28)
ZNightflightrate_gmc -0.88 ***
(0.10)
ZTrend2206_gmc -0.30 ***
(0.04)
ZNoiseStarts24_gmc -3.14 ***
(0.29)
HRC_c 0.83 ***
(0.16)
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc -0.06 **
(0.02)
-----
AIC 16317.35
BIC 16395.62
Log Likelihood -8148.67
Num. obs. 18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_SLdN80)
```

```
$Airport3
(Intercept)
1 0.023475526
1.1 0.018972271
1.2 0.029172836
1.3 -0.059655724
2 0.147790145
3 -0.042905048
4 -0.173446308
91 0.029276291
92 0.010820924
93 0.031722743
94 0.008047166
95 -0.016115898
```



```

with conditional variances for "Airport3"
>
> summary(AIM1_SLdN80)
Generalized linear mixed model fit by maximum likelihood (Laplace Approxima
tion) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS80_cmc
Data: dats

      AIC      BIC   logLik deviance df.resid
16318.6 16404.7 -8148.3 16296.6   18521

Scaled residuals:
    Min       1Q   Median       3Q      Max
-1.2419 -0.5058 -0.3867 -0.2644  5.7952

Random effects:
 Groups      Name      Variance Std.Dev.
Airport3    (Intercept) 0.007731 0.08793
Airport3.1  ZLDEN_cmc   0.004133 0.06429
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.74280    0.04472  -38.969 < 2e-16 ***
ZLDEN_cmc      0.52787    0.04443   11.881 < 2e-16 ***
ZLog_NAT_n_LS80_cmc 0.03068    0.03446    0.890 0.37337
ZFlights2206_gmc 2.99052    0.27107  11.032 < 2e-16 ***
ZNightflightrate_gmc -0.88871    0.09532  -9.324 < 2e-16 ***
ZTrend2206_gmc -0.30556    0.03686  -8.289 < 2e-16 ***
ZNoiseStarts24_gmc -3.16900    0.27989 -11.322 < 2e-16 ***
HRC_c          0.84078    0.15036    5.592 2.25e-08 ***
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc -0.05898    0.02229  -2.647 0.00813 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
              (Intr) ZLDEN_c ZL_NAT  ZF2206  ZNght_  ZT2206  ZNS24_  HRC_c
ZLDEN_cmc    -0.049
ZL_NAT__LS8  0.015 -0.621
ZFlght2206_ -0.178  0.040 -0.015
ZNghtflght_  0.079 -0.035  0.021 -0.880
ZTrnd2206_g  0.075 -0.035  0.002 -0.223  0.193
ZNSstrts24_  0.274 -0.044  0.017 -0.973  0.801  0.244
HRC_c        -0.428  0.022 -0.003  0.351 -0.031 -0.125 -0.518
ZLDEN_:ZL_N -0.244 -0.178 -0.043 -0.080  0.054 -0.023  0.091 -0.059
> performance::icc(AIM1_SLdN80)
# Intraclass Correlation Coefficient

      Adjusted ICC: 0.002
      Conditional ICC: 0.002
> performance::r2(AIM1_SLdN80)
# R2 for Mixed Models

      Conditional R2: 0.121
      Marginal R2: 0.119
> screenreg(AIM1_SLdN80)

```

```

=====
                                Model 1
-----
(Intercept)                    -1.74 ***
                                (0.04)
ZLDEN_cmc                      0.53 ***
                                (0.04)
ZLog_NAT_n_LS80_cmc           0.03
                                (0.03)
ZFlights2206_gmc              2.99 ***
                                (0.27)
ZNightflightrate_gmc         -0.89 ***
                                (0.10)
ZTrend2206_gmc                -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc           -3.17 ***
                                (0.28)
HRC_c                          0.84 ***
                                (0.15)
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc -0.06 **
                                (0.02)
-----

```

```

AIC                            16318.64
BIC                            16404.74
Log Likelihood                 -8148.32
Num. obs.                      18532
Num. groups: Airport3         12
Var: Airport3 (Intercept)      0.01
Var: Airport3.1 ZLDEN_cmc      0.00
-----

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM1_SLdN80)
```

```
$Airport3
```

```

  (Intercept)  ZLDEN_cmc
1    0.012679214  0.065335699
1.1  0.019183464  0.006682530
1.2  0.027325163 -0.002845092
1.3 -0.045668246 -0.045957373
2    0.125481568  0.071195070
3   -0.034806656 -0.031827176
4   -0.150393783 -0.018178143
91   0.023796582  0.001358330
92   0.007201160  0.007818417
93   0.032838984 -0.046496660
94   0.008465929  0.009739514
95  -0.017132011 -0.017809222

```

with conditional variances for "Airport3"

```
>
```

```
> summary(AIM2_SLdN80)
```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ ZLDEN\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLog\_NAT\_n\_LS80\_cmc || Airport3) + ZLDEN\_cmc:ZLog\_NAT\_n\_LS  
80\_cmc

Data: dats

```

      AIC      BIC   logLik deviance df.resid
16317.3 16403.4 -8147.7 16295.3   18521

Scaled residuals:
   Min       1Q   Median       3Q      Max
-1.3044 -0.4993 -0.3879 -0.2681  6.4930

Random effects:
 Groups      Name                Variance Std.Dev.
 Airport3    (Intercept)             0.008135 0.09019
 Airport3.1  ZLog_NAT_n_LS80_cmc    0.007718 0.08785
Number of obs: 18532, groups:  Airport3, 12

Fixed effects:
                Estimate Std. Error z value Pr(>|z|)
(Intercept)      -1.73968    0.04513  -38.551 < 2e-16 ***
ZLDEN_cmc         0.52439    0.03676   14.264 < 2e-16 ***
ZLog_NAT_n_LS80_cmc 0.03683    0.04664    0.790 0.42965
ZFlights2206_gmc 2.96453    0.27494   10.782 < 2e-16 ***
ZNightflightrate_gmc -0.88262    0.09685   -9.113 < 2e-16 ***
ZTrend2206_gmc   -0.31394    0.03807   -8.247 < 2e-16 ***
ZNoiseStarts24_gmc -3.13218    0.28342  -11.051 < 2e-16 ***
HRC_c            0.82379    0.15252    5.401 6.62e-08 ***
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc -0.06026    0.02241   -2.689 0.00717 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) ZLDEN_c ZL_NAT ZF2206 ZNgght_ ZT2206 ZNS24_ HRC_c
ZLDEN_cmc  -0.030
ZL_NAT__LS8 -0.012 -0.561
ZFlght2206_ -0.169 0.029 0.000
ZNgghtflight_ 0.072 -0.032 0.010 -0.880
ZTrnd2206_g 0.070 -0.010 -0.040 -0.220 0.190
ZNSstrts24_ 0.264 -0.034 0.003 -0.973 0.800 0.237
HRC_c      -0.423 0.011 0.007 0.346 -0.027 -0.112 -0.514
ZLDEN_:ZL_N -0.242 -0.218 -0.025 -0.082 0.056 -0.015 0.093 -0.058
> performance::icc(AIM2_SLdN80)
# Intraclass Correlation Coefficient

      Adjusted ICC: 0.002
      Conditional ICC: 0.002
> performance::r2(AIM2_SLdN80)
# R2 for Mixed Models

      Conditional R2: 0.122
      Marginal R2: 0.120
> screenreg(AIM2_SLdN80)

=====
                                Model 1
-----
(Intercept)                    -1.74 ***
                                (0.05)
ZLDEN_cmc                       0.52 ***
                                (0.04)
ZLog_NAT_n_LS80_cmc            0.04
                                (0.05)

```

ZFlights2206_gmc	2.96 ***
	(0.27)
ZNightflightrate_gmc	-0.88 ***
	(0.10)
ZTrend2206_gmc	-0.31 ***
	(0.04)
ZNoiseStarts24_gmc	-3.13 ***
	(0.28)
HRC_c	0.82 ***
	(0.15)
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc	-0.06 **
	(0.02)

```
-----
AIC                16317.30
BIC                16403.40
Log Likelihood    -8147.65
Num. obs.         18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLog_NAT_n_LS80_cmc 0.01
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM2_SLdN80)
```

```
$Airport3
```

	(Intercept)	ZLog_NAT_n_LS80_cmc
1	0.019759500	0.025896709
1.1	0.016060570	-0.006135987
1.2	0.023975273	-0.032622369
1.3	-0.046560638	-0.161541322
2	0.131716599	0.038812269
3	-0.036975793	-0.010003638
4	-0.155649589	-0.024761321
91	0.025038439	0.002182003
92	0.010117756	0.039260756
93	0.031153289	0.016896215
94	0.008257435	0.099770297
95	-0.015159869	0.009638298

with conditional variances for "Airport3"

```
>
```

```
> anova(CIM_SLdN80, AIM1_SLdN80)
```

```
Data: dats
```

```
Models:
```

```
CIM_SLdN80: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
```

```
CIM_SLdN80: ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc
```

```
+
```

```
CIM_SLdN80: HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS80_cmc
```

```
AIM1_SLdN80: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
```

```
AIM1_SLdN80: ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc
```

```
+
```

```
AIM1_SLdN80: HRC_c + (1 + ZLDEN_cmc || Airport3) + ZLDEN_cmc:ZLog_NAT_n_
```

```
_LS80_cmc
```

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_SLdN80	10	16317	16396	-8148.7	16297			
AIM1_SLdN80	11	16319	16405	-8148.3	16297	0.7128	1	0.3985

```
> anova(CIM_SLdN80, AIM2_SLdN80)
```

```
Data: dats
```

```
Models:
```

```
CIM_SLdN80: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
```

```

CIM_SLdN80:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc
+
CIM_SLdN80:      HRC_c + (1 | Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS80_cmc
AIM2_SLdN80:    HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
AIM2_SLdN80:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc
+
AIM2_SLdN80:      HRC_c + (1 + ZLog_NAT_n_LS80_cmc || Airport3) + ZLDEN_cmc:
ZLog_NAT_n_LS80_cmc
              npar  AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLdN80      10 16317 16396 -8148.7   16297
AIM2_SLdN80     11 16317 16403 -8147.7   16295 2.0464  1    0.1526
>
> summary(FM_SLdN80)
Generalized linear mixed model fit by maximum likelihood (Laplace Approxima
tion) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLDEN_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLDEN_cmc || Airport3) + (1 + ZLog_NAT_n_LS80_cmc ||
  Airport3) + ZLDEN_cmc:ZLog_NAT_n_LS80_cmc + ZLDEN_cmc:ZFlights2206_gmc
+
  ZLDEN_cmc:ZNightflightrate_gmc + ZLDEN_cmc:ZTrend2206_gmc +
  ZLDEN_cmc:ZNoiseStarts24_gmc + ZLDEN_cmc:HRC_c + ZLog_NAT_n_LS80_cmc:ZF
lights2206_gmc +
  ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc + ZLog_NAT_n_LS80_cmc:ZTrend22
06_gmc +
  ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc + ZLog_NAT_n_LS80_cmc:HRC_c
Data:  data

              AIC      BIC  logLik deviance df.resid
16300.2  16480.2  -8127.1  16254.2    18509

Scaled residuals:
    Min       1Q   Median       3Q      Max
-0.9684 -0.5106 -0.3870 -0.2543  7.3029

Random effects:
 Groups   Name              Variance Std.Dev.
Airport3 (Intercept)      8.822e-03 9.392e-02
Airport3.1 ZLDEN_cmc      1.901e-09 4.360e-05
Airport3.2 (Intercept)    8.992e-05 9.482e-03
Airport3.3 ZLog_NAT_n_LS80_cmc 4.859e-09 6.971e-05
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z
|)
(Intercept)    -1.76803    0.04666  -37.888 < 2e-
16 ***
ZLDEN_cmc       0.65821    0.05494  11.980 < 2e-
16 ***
ZLog_NAT_n_LS80_cmc
62 .
ZFlights2206_gmc
16 ***
ZNightflightrate_gmc
16 ***
ZTrend2206_gmc
15 ***

```

ZNoiseStarts24_gmc 16 ***	-3.23068	0.29410	-10.985	< 2e-
HRC_c 08 ***	0.84208	0.15718	5.358	8.44e-
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc 12 .	-0.04233	0.02270	-1.865	0.0622
ZLDEN_cmc:ZFlights2206_gmc 06 ***	-1.70753	0.38206	-4.469	7.85e-
ZLDEN_cmc:ZNightflightrate_gmc 12 ***	0.49588	0.12840	3.862	0.0001
ZLDEN_cmc:ZTrend2206_gmc 18	-0.06182	0.03909	-1.582	0.1137
ZLDEN_cmc:ZNoiseStarts24_gmc 06 ***	1.85637	0.39047	4.754	1.99e-
ZLDEN_cmc:HRC_c 41 **	-0.47955	0.18577	-2.581	0.0098
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc 05 ***	1.45078	0.34657	4.186	2.84e-
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc 65 ***	-0.38652	0.11211	-3.448	0.0005
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc 36 **	0.09675	0.03296	2.935	0.0033
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc 06 ***	-1.58829	0.35555	-4.467	7.93e-
ZLog_NAT_n_LS80_cmc:HRC_c 36 **	0.45952	0.16865	2.725	0.0064

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as  $p = 19 > 12$ .  
Use `print(x, correlation=TRUE)` or  
`vcov(x)` if you need it

convergence code: 0  
boundary (singular) fit: see `?issingular`

> performance::icc(FM\_SLdN80)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
Conditional ICC: 0.002

> performance::r2(FM\_SLdN80)  
# R2 for Mixed Models

Conditional R2: 0.134  
Marginal R2: 0.131  
> screenreg(FM\_SLdN80)

```
=====
                                Model 1
-----
(Intercept)                    -1.77 ***
                                (0.05)
ZLDEN_cmc                       0.66 ***
                                (0.05)
ZLog_NAT_n_LS80_cmc            -0.10
                                (0.05)
ZFlights2206_gmc               3.06 ***
                                (0.29)
```

ZNightflightrate_gmc	-0.90 *** (0.10)
ZTrend2206_gmc	-0.32 *** (0.04)
ZNoiseStarts24_gmc	-3.23 *** (0.29)
HRC_c	0.84 *** (0.16)
ZLDEN_cmc:ZLog_NAT_n_LS80_cmc	-0.04 (0.02)
ZLDEN_cmc:ZFlights2206_gmc	-1.71 *** (0.38)
ZLDEN_cmc:ZNightflightrate_gmc	0.50 *** (0.13)
ZLDEN_cmc:ZTrend2206_gmc	-0.06 (0.04)
ZLDEN_cmc:ZNoiseStarts24_gmc	1.86 *** (0.39)
ZLDEN_cmc:HRC_c	-0.48 ** (0.19)
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc	1.45 *** (0.35)
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc	-0.39 *** (0.11)
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc	0.10 ** (0.03)
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc	-1.59 *** (0.36)
ZLog_NAT_n_LS80_cmc:HRC_c	0.46 ** (0.17)

AIC	16300.18
BIC	16480.20
Log Likelihood	-8127.09
Num. obs.	18532
Num. groups: Airport3	12
Var: Airport3 (Intercept)	0.01
Var: Airport3.1 ZLDEN_cmc	0.00
Var: Airport3.2 (Intercept)	0.00
Var: Airport3.3 ZLog_NAT_n_LS80_cmc	0.00

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(FM\_SLDn80)

\$Airport3

	(Intercept)	ZLDEN_cmc	(Intercept)	ZLog_NAT_n_LS80_cmc
1	0.023427764	3.066246e-08	2.387910e-04	8.765457e-09
1.1	0.024309399	3.770570e-09	2.477772e-04	5.807563e-08
1.2	0.033381186	-1.451188e-09	3.402427e-04	1.706699e-08
1.3	-0.075990671	-4.505388e-08	-7.745462e-04	-9.747506e-08
2	0.136844230	3.456087e-08	1.394805e-03	6.411003e-08
3	-0.040050603	-1.204151e-08	-4.082217e-04	-2.269849e-08
4	-0.154300598	-1.100432e-08	-1.572732e-03	-1.862538e-08
91	0.027857454	6.214001e-10	2.839412e-04	1.396264e-09
92	-0.003570446	-5.810888e-10	-3.639230e-05	3.167396e-09
93	0.036153512	-1.174069e-08	3.685000e-04	-2.782349e-08
94	0.007663452	-2.055483e-09	7.811087e-05	2.955293e-09
95	-0.009291613	1.404618e-08	-9.470614e-05	1.045324e-08

with conditional variances for "Airport3"





**4.39 Modell SLd (akustischer Prädiktor  $L_{den}$ )****4.39.1 MO\_SLd**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ (1 | Airport3)  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLd@theta[1] ^ 2 / (MO_SLd@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.07528805
```

```
> performance::icc(MO_SLd)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
Conditional ICC: 0.075
> performance::r2(MO_SLd)
# R2 for Mixed Models
```

```
Conditional R2: 0.075
Marginal R2: 0.000
> screenreg(MO_SLd)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SLd)
```

```
$Airport3
(Intercept)
1 -0.06300428
1.1 0.25571838
1.2 0.03926869
1.3 -0.25208466
2 -0.22400173
3 0.18283767
4 -0.82791041
91 0.17410584
92 0.56598494
93 0.45689415
94 -0.99572180
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```

**4.39.2 CIM\_Sld**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ ZLDEN\_cmc + ZFlights2206\_gmc + ZNightflightrate\_gmc +  
ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3)  
Data: data

AIC	BIC	logLik	deviance	df.resid
16321.3	16383.9	-8152.7	16305.3	18524

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.2144	-0.4989	-0.3884	-0.2735	5.3886

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.008901	0.09434

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.76998	0.04471	-39.591	< 2e-16 ***
ZLDEN_cmc	0.52718	0.02136	24.675	< 2e-16 ***
ZFlights2206_gmc	2.91729	0.27787	10.499	< 2e-16 ***
ZNightflightrate_gmc	-0.87395	0.09793	-8.925	< 2e-16 ***
ZTrend2206_gmc	-0.30579	0.03731	-8.197	2.46e-16 ***
ZNoiseStarts24_gmc	-3.08015	0.28644	-10.753	< 2e-16 ***
HRC_c	0.80800	0.15481	5.219	1.80e-07 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZF2206	ZNght_	ZT2206	ZNS24_
ZLDEN_cmc	-0.130					
ZFlight2206_	-0.191	0.004				
ZNightflight_	0.091	-0.020	-0.878			
ZTrnd2206_g	0.062	-0.033	-0.218	0.186		
ZNSStrts24_	0.294	-0.004	-0.973	0.798	0.243	
HRC_c	-0.445	-0.005	0.352	-0.031	-0.140	-0.520

> performance::icc(CIM\_Sld)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.003

Conditional ICC: 0.002

> performance::r2(CIM\_Sld)

# R2 for Mixed Models

Conditional R2: 0.117

Marginal R2: 0.114

> screenreg(CIM\_Sld)

```
=====
Model 1
-----
(Intercept)          -1.77 ***
                    (0.04)
ZLDEN_cmc             0.53 ***
                    (0.02)
ZFlights2206_gmc     2.92 ***
                    (0.28)
ZNightflightrate_gmc -0.87 ***
                    (0.10)
ZTrend2206_gmc       -0.31 ***
                    (0.04)
ZNoiseStarts24_gmc  -3.08 ***
                    (0.29)
HRC_c                 0.81 ***
                    (0.15)
-----
AIC                   16321.32
BIC                   16383.94
Log Likelihood        -8152.66
Num. obs.             18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_Sld)
$Airport3
  (Intercept)
1 0.026570757
1.1 0.010942517
```

```
1.2 0.033838009
1.3 -0.061163604
2 0.139235083
3 -0.040450099
4 -0.163533965
91 0.027805229
92 0.009562021
93 0.030400614
94 0.007160064
95 -0.013726526
```

```
with conditional variances for "Airport3"
>
```

**4.39.3 AIM1\_Sld**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )  
 Formula: HSDair ~ ZLDEN\_cmc + ZFlights2206\_gmc + ZNightflightrate\_gmc +  
 ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc || Airport3)  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16322.4	16392.8	-8152.2	16304.4	18523

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1815	-0.5009	-0.3890	-0.2709	5.4294

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.006962	0.08344
Airport3.1	ZLDEN_cmc	0.004344	0.06591

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.77303	0.04206	-42.152	< 2e-16 ***
ZLDEN_cmc	0.52971	0.03376	15.692	< 2e-16 ***
ZFlights2206_gmc	2.93510	0.26335	11.145	< 2e-16 ***
ZNightflightrate_gmc	-0.87616	0.09265	-9.457	< 2e-16 ***
ZTrend2206_gmc	-0.30813	0.03620	-8.511	< 2e-16 ***
ZNoiseStarts24_gmc	-3.10408	0.27152	-11.432	< 2e-16 ***
HRC_c	0.81756	0.14644	5.583	2.37e-08 ***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLDEN_	ZF2206	ZNght_	ZT2206	ZNS24_
ZLDEN_cmc	-0.123					
ZFlght2206_	-0.207	0.025				
ZNghtflght_	0.094	-0.019	-0.881			
ZTrnd2206_g	0.075	-0.057	-0.228	0.197		
ZNSStrts24_	0.310	-0.026	-0.973	0.801	0.248	
HRC_c	-0.460	0.012	0.345	-0.025	-0.119	-0.513

> performance::icc(AIM1\_Sld)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_Sld)

# R2 for Mixed Models

Conditional R2: 0.117

Marginal R2: 0.115

> screenreg(AIM1\_Sld)

```
=====
Model 1
-----
(Intercept)                -1.77 ***
                             (0.04)
ZLDEN_cmc                   0.53 ***
                             (0.03)
ZFlights2206_gmc           2.94 ***
                             (0.26)
ZNightflightrate_gmc       -0.88 ***
                             (0.09)
ZTrend2206_gmc             -0.31 ***
                             (0.04)
ZNoiseStarts24_gmc         -3.10 ***
                             (0.27)
HRC_c                       0.82 ***
                             (0.15)
-----
AIC                          16322.36
BIC                          16392.81
Log Likelihood               -8152.18
Num. obs.                    18532
Num. groups: Airport3       12
Var: Airport3 (Intercept)    0.01
Var: Airport3.1 ZLDEN_cmc   0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_Sld)
$Airport3
  (Intercept)    ZLDEN_cmc
```

1	0.014818318	0.074016088
1.1	0.012356570	0.005750969
1.2	0.030811699	-0.001285269
1.3	-0.046330819	-0.046926652
2	0.115551270	0.069586022
3	-0.031963870	-0.039758780
4	-0.138432745	-0.018586473
91	0.021873251	0.001463807
92	0.006026420	0.013330685
93	0.030760991	-0.043816686
94	0.007565216	0.004085079
95	-0.014750905	-0.018911244

with conditional variances for "Airport3"  
>

**4.39.4 Vergleichstest SLd****> anova(CIM\_SLd, AIM1\_SLd)**

Data: dats

Models:

```
CIM_SLd: HSDair ~ ZLDEN_cmc + ZFlights2206_gmc + ZNightflightrate_gmc +  
CIM_SLd:      ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3)  
AIM1_SLd: HSDair ~ ZLDEN_cmc + ZFlights2206_gmc + ZNightflightrate_gmc +  
AIM1_SLd:      ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 + ZLDEN_cmc ||  
AIM1_SLd:      Airport3)
```

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
CIM_SLd	8	16321	16384	-8152.7	16305			
AIM1_SLd	9	16322	16393	-8152.2	16304	0.9602	1	0.3271

**4.39.5 FM\_Sld**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLDEN\_cmc + ZFlights2206\_gmc + ZNightflightrate\_gmc +  
 ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 + ZLDEN\_cmc |  
 Airport3) + ZLDEN\_cmc:ZFlights2206\_gmc + ZLDEN\_cmc:ZNightflightrate\_gmc +  
 ZLDEN\_cmc:ZTrend2206\_gmc + ZLDEN\_cmc:ZNoiseStarts24\_gmc + ZLDEN\_cmc:HRC\_c  
 Data: dats

AIC BIC logLik deviance df.resid  
 16329.4 16439.0 -8150.7 16301.4 18518

Scaled residuals:  
 Min 1Q Median 3Q Max  
 -1.1352 -0.5033 -0.3889 -0.2685 5.6110

Random effects:  
 Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 8.409e-03 9.170e-02  
 Airport3.1 ZLDEN\_cmc 1.063e-10 1.031e-05  
 Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.77705	0.04423	-40.175	< 2e-16 ***
ZLDEN_cmc	0.55962	0.02894	19.336	< 2e-16 ***
ZFlights2206_gmc	2.98456	0.27921	10.689	< 2e-16 ***
ZNightflightrate_gmc	-0.88793	0.09835	-9.028	< 2e-16 ***
ZTrend2206_gmc	-0.31169	0.03907	-7.979	1.48e-15 ***
ZNoiseStarts24_gmc	-3.15707	0.28690	-11.004	< 2e-16 ***
HRC_c	0.83258	0.15421	5.399	6.70e-08 ***
ZLDEN_cmc:ZFlights2206_gmc	-0.28985	0.20485	-1.415	0.157
ZLDEN_cmc:ZNightflightrate_gmc	0.06711	0.07270	0.923	0.356
ZLDEN_cmc:ZTrend2206_gmc	0.01791	0.02893	0.619	0.536
ZLDEN_cmc:ZNoiseStarts24_gmc	0.34232	0.21096	1.623	0.105
ZLDEN_cmc:HRC_c	-0.13944	0.10997	-1.268	0.205

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:  
 (Intr) ZLDEN\_c ZF2206 ZNght\_ ZT2206 ZNS24\_ HRC\_c ZLDEN\_:ZF ZLDEN\_:ZN ZLDEN\_:ZT

	ZLDEN_cmc	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c	ZLDEN_:ZF	ZLDEN_:ZN	ZLDEN_:ZT
ZLDEN_:ZNS									
ZLDEN_cmc	-0.166								
ZFlght2206_	-0.202	0.073							
ZNghtflght_	0.097	-0.044	-0.881						
ZTrnd2206_g	0.068	-0.050	-0.234	0.205					
ZNsStrts24_	0.304	-0.083	-0.973	0.801	0.250				
HRC_c	-0.451	0.083	0.339	-0.021	-0.102	-0.507			
ZLDEN_:ZF22	0.063	-0.371	-0.183	0.171	0.081	0.173	-0.022		
ZLDEN_c:ZN_	-0.036	0.156	0.168	-0.185	-0.075	-0.152	-0.020	-0.930	
ZLDEN_:ZT22	-0.037	0.153	0.076	-0.073	-0.314	-0.065	-0.042	-0.207	0.159
ZLDEN_:ZNS2	-0.075	0.451	0.173	-0.155	-0.071	-0.170	0.044	-0.979	0.871
ZLDEN_:HRC_	0.085	-0.610	-0.024	-0.020	-0.036	0.047	-0.141	0.250	0.030

convergence code: 0  
 boundary (singular) fit: see ?issingular

> performance::icc(FM\_Sld)  
 # IntraClass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.002  
 > performance::r2(FM\_Sld)  
 # R2 for Mixed Models

Conditional R2: 0.120  
 Marginal R2: 0.118  
 > screenreg(FM\_Sld)

```
=====
-----
Model 1
-----
(Intercept)          -1.78 ***
                    (0.04)
ZLDEN_cmc             0.56 ***
                    (0.03)
ZFlights2206_gmc     2.98 ***
                    (0.28)
ZNightflightrate_gmc -0.89 ***
                    (0.10)
ZTrend2206_gmc       -0.31 ***
                    (0.04)
```

```
ZNoiseStarts24_gmc      -3.16 ***
                        (0.29)
HRC_c                   0.83 ***
                        (0.15)
ZLDEN_cmc:ZFlights2206_gmc -0.29
                        (0.20)
ZLDEN_cmc:ZNightflightrate_gmc 0.07
                        (0.07)
ZLDEN_cmc:ZTrend2206_gmc  0.02
                        (0.03)
ZLDEN_cmc:ZNoiseStarts24_gmc 0.34
                        (0.21)
ZLDEN_cmc:HRC_c         -0.14
                        (0.11)
```

```
-----
AIC                      16329.39
BIC                      16438.97
Log Likelihood           -8150.70
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLDEN_cmc 0.00
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(FM_Sld)
```

```
$Airport3
  (Intercept)      ZLDEN_cmc
1      0.023357556  2.065850e-09
1.1    0.011041027 -3.675082e-10
1.2    0.035568623 -9.164978e-11
1.3   -0.059791220 -2.152931e-09
2      0.133145423  1.993715e-09
3     -0.038494230 -7.322736e-10
4     -0.157030617 -7.278674e-10
91    0.026503126  3.453004e-11
92    0.008718569  7.468395e-10
93    0.030053863 -1.325834e-09
94    0.007237212 -1.931395e-10
95   -0.013972516  7.329353e-10
```

```
with conditional variances for "Airport3"
```

#### 4.40 Modell SLqN50 (akustische Prädiktoren $L_{Aeq,22-06h}(k = 10)$ und $\log(NAT_{22-06h,50})$ )

##### 4.40.1 MO\_SLqN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation ['glmerMod'])
```

```
Family: binomial (logit)
```

```
Formula: HSDair ~ (1 | Airport3)
```

```
Data: data
```

```
      AIC      BIC  logLik deviance df.resid
16986.6 17002.2 -8491.3 16982.6   18530
```

```
Scaled residuals:
```

```
      Min      1Q  Median      3Q      Max
-0.6437 -0.5062 -0.4317 -0.2945  3.6930
```

```
Random effects:
```

```
Groups   Name      Variance Std.Dev.
```

```
Airport3 (Intercept) 0.2679  0.5176
```

```
Number of obs: 18532, groups: Airport3, 12
```

```
Fixed effects:
```

```
      Estimate Std. Error z value Pr(>|z|)
```

```
(Intercept) -1.6172      0.1541 -10.49 <2e-16 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> icc <- MO_SLqN50@theta[1] ^ 2 / (MO_SLqN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```



```

> icc
[1] 0.075292
> performance::icc(M0_SLqN50)
# IntraClass Correlation Coefficient

Adjusted ICC: 0.075
Conditional ICC: 0.075
> performance::r2(M0_SLqN50)
# R2 for Mixed Models

Conditional R2: 0.075
Marginal R2: 0.000
> screenreg(M0_SLqN50)

=====
Model 1
-----
(Intercept)          -1.62 ***
                    (0.15)
-----
AIC                   16986.58
BIC                   17002.24
Log Likelihood        -8491.29
Num. obs.             18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_SLqN50)
$Airport3
(Intercept)
1 -0.06300806
1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

with conditional variances for "Airport3"
>

```

#### 4.40.2 CIM\_SLqN50

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_gmc + ZLog_NAT_n_LS50_gmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLpAeq2206_gmc:ZLog_NAT_n_LS50_gmc
Data: dats

AIC      BIC    logLik deviance df.resid
16252.8 16331.0 -8116.4 16232.8 18522

```

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.2207	-0.5122	-0.3845	-0.2573	6.8057

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.008235	0.09075

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.715683	0.045081	-38.057	< 2e-16 ***
ZLpAeq2206_cmc	0.582578	0.034449	16.911	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.003184	0.039914	0.080	0.936
ZFlights2206_gmc	2.973443	0.272495	10.912	< 2e-16 ***
ZNightflightrate_gmc	-0.861955	0.096139	-8.966	< 2e-16 ***
ZTrend2206_gmc	-0.289791	0.037008	-7.830	4.86e-15 ***
ZNoiseStarts24_gmc	-3.144583	0.281200	-11.183	< 2e-16 ***
HRC_c	0.885718	0.152921	5.792	6.95e-09 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc	-0.148288	0.028088	-5.279	1.30e-07 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA2206_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	-0.010							
ZL_NAT__LS5	-0.047	-0.736						
ZFlght2206_	-0.184	0.022	-0.018					
ZNightflght_	0.091	-0.006	0.000	-0.877				
ZTrnd2206_g	0.081	0.022	-0.031	-0.212	0.189			
ZNsstrts24_	0.283	-0.021	0.015	-0.973	0.796	0.234		
HRC_c	-0.415	0.050	-0.041	0.348	-0.022	-0.117	-0.517	
ZLA2206_:ZL	-0.211	-0.320	0.152	-0.037	-0.023	-0.108	0.045	-0.117

> performance::icc(CIM\_SLqN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(CIM\_SLqN50)

# R2 for Mixed Models

Conditional R2: 0.130

Marginal R2: 0.128

> screenreg(CIM\_SLqN50)

```
=====
                                Model 1
-----
(Intercept)                    -1.72 ***
                                (0.05)
ZLpAeq2206_cmc                  0.58 ***
                                (0.03)
ZLog_NAT_n_LS50_cmc             0.00
                                (0.04)
ZFlights2206_gmc                2.97 ***
                                (0.27)
ZNightflightrate_gmc           -0.86 ***
                                (0.10)
ZTrend2206_gmc                 -0.29 ***
```

```

                                (0.04)
ZNoiseStarts24_gmc             -3.14 ***
                                (0.28)
HRC_c                           0.89 ***
                                (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc -0.15 ***
                                (0.03)
-----
AIC                               16252.78
BIC                               16331.05
Log Likelihood                   -8116.39
Num. obs.                        18532
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```
> ranef(CIM_SLqN50)
```

```

$Airport3
  (Intercept)
1    0.0105447360
1.1  0.0342460864
1.2  0.0140103044
1.3 -0.0479981485
2    0.1335093458
3   -0.0377945953
4   -0.1560368143
91   0.0252811076
92   0.0007440632
93   0.0370669725
94   0.0087369113
95  -0.0162339302

```

```
with conditional variances for "Airport3"
```

```
>
```

#### 4.40.3 AIM1\_SLqN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
```

```
Family: binomial ( logit )
```

```
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
Data: dats
```

```

      AIC      BIC  logLik deviance df.resid
16251.1 16337.2 -8114.6 16229.1   18521

```

```
Scaled residuals:
```

```

      Min       1Q   Median       3Q      Max
-1.1084 -0.5122 -0.3841 -0.2561  7.1035

```

```
Random effects:
```

```

Groups      Name          Variance Std.Dev.
Airport3    (Intercept)    0.00513  0.07162
Airport3.1  ZLpAeq2206_cmc  0.01273  0.11283
Number of obs: 18532, groups: Airport3, 12

```

```
Fixed effects:
```

```
Estimate Std. Error z value Pr(>|z|)
```

```

(Intercept)                -1.71651    0.04116 -41.704 < 2e-16 ***
ZLpAeq2206_cmc              0.56003    0.05212  10.745 < 2e-16 ***
ZLog_NAT_n_LS50_cmc        0.01527    0.04360   0.350  0.726
ZFlights2206_gmc           2.96434    0.24885  11.912 < 2e-16 ***
ZNightflightrate_gmc      -0.86037    0.08757  -9.825 < 2e-16 ***
ZTrend2206_gmc             -0.29954    0.03558  -8.419 < 2e-16 ***
ZNoiseStarts24_gmc        -3.14135    0.25659 -12.243 < 2e-16 ***
HRC_c                       0.89662    0.13896   6.452 1.10e-10 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc -0.14721    0.02900  -5.076 3.85e-07 ***

```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

(Intr) ZLpA2206_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLpAq2206_c -0.031
ZL_NAT__LS5 -0.090 -0.461
ZFlght2206_ -0.204 0.036 -0.020
ZNghtflght_ 0.091 -0.008 -0.001 -0.882
ZTrnd2206_g 0.090 -0.010 -0.050 -0.221 0.203
ZNsStrts24_ 0.302 -0.036 0.018 -0.974 0.803 0.231
HRC_c       -0.437 0.044 -0.033 0.332 -0.006 -0.068 -0.500
ZLA2206_:ZL -0.262 -0.198 0.206 -0.046 -0.014 -0.087 0.051 -0.115

```

convergence code: 0

Model failed to converge with max|grad| = 0.00237185 (tol = 0.002, component 1)

```

> performance::icc(AIM1_SLqN50)
# Intraclass Correlation Coefficient

```

Adjusted ICC: 0.002

Conditional ICC: 0.001

```

> performance::r2(AIM1_SLqN50)

```

# R2 for Mixed Models

Conditional R2: 0.127

Marginal R2: 0.125

```

> screenreg(AIM1_SLqN50)

```

```

=====
Model 1
-----
(Intercept)                -1.72 ***
                             (0.04)
ZLpAeq2206_cmc              0.56 ***
                             (0.05)
ZLog_NAT_n_LS50_cmc        0.02
                             (0.04)
ZFlights2206_gmc           2.96 ***
                             (0.25)
ZNightflightrate_gmc      -0.86 ***
                             (0.09)
ZTrend2206_gmc             -0.30 ***
                             (0.04)
ZNoiseStarts24_gmc        -3.14 ***
                             (0.26)
HRC_c                       0.90 ***
                             (0.14)
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc -0.15 ***
                             (0.03)
-----

```

```

AIC                16251.11
BIC                16337.21
Log Likelihood     -8114.56
Num. obs.         18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
Var: Airport3.1 ZLpAeq2206_cmc  0.01

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(AIM1_SLqN50)
$Airport3
  (Intercept) ZLpAeq2206_cmc
1 -0.001439225  0.117466177
1.1 0.024843231  0.031592901
1.2 0.010528559 -0.076550539
1.3 -0.020243387 -0.191537965
2  0.092182086  0.117035774
3 -0.024256073  0.002919015
4 -0.113017606 -0.021973661
91 0.015872547  0.003824411
92 0.004254105 -0.003424492
93 0.028600997  0.035251359
94 0.007757301  0.049340828
95 -0.017111648 -0.064394542

```

```
with conditional variances for "Airport3"
```

```
>
```

#### 4.40.4 AIM2\_SLqN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
```

```
Family: binomial ( logit )
```

```
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_n_LS50_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
```

```
Data: dats
```

```

AIC      BIC    logLik deviance df.resid
16251.0 16337.1 -8114.5 16229.0  18521

```

```
Scaled residuals:
```

```

  Min      1Q  Median      3Q      Max
-1.2286 -0.5119 -0.3852 -0.2540  7.8585

```

```
Random effects:
```

```

Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                0.007829 0.08848
Airport3.1  ZLog_NAT_n_LS50_cmc        0.033257 0.18237

```

```
Number of obs: 18532, groups: Airport3, 12
```

```
Fixed effects:
```

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.715679    0.045050 -38.084 < 2e-16 ***
ZLpAeq2206_cmc  0.574475    0.034928  16.447 < 2e-16 ***
ZLog_NAT_n_LS50_cmc  0.008296    0.078230   0.106  0.916
ZFlights2206_gmc  2.988653    0.271241  11.018 < 2e-16 ***
ZNightflightrate_gmc -0.872833    0.095687  -9.122 < 2e-16 ***
ZTrend2206_gmc -0.300979    0.038216  -7.876 3.39e-15 ***
ZNoiseStarts24_gmc -3.162016    0.279761 -11.303 < 2e-16 ***

```

```
HRC_c                0.881941    0.151814    5.809 6.27e-09 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc -0.156313    0.029036   -5.383 7.31e-08 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

```
(Intr) ZLpA2206_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLpAq2206_c -0.006
ZL_NAT__LS5 -0.067 -0.396
ZFlight2206_ -0.185 0.020 0.018
ZNghtflight_ 0.091 0.000 -0.023 -0.878
ZTrnd2206_g 0.084 0.027 -0.075 -0.230 0.206
ZNSstrts24_ 0.286 -0.020 -0.018 -0.972 0.796 0.246
HRC_c        -0.418 0.054 -0.019 0.340 -0.016 -0.097 -0.510
ZLA2206_:ZL -0.221 -0.307 0.087 -0.056 0.001 -0.066 0.060 -0.110
> performance::icc(AIM2_SLqN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.002
Conditional ICC: 0.002
> performance::r2(AIM2_SLqN50)
# R2 for Mixed Models
```

```
Conditional R2: 0.130
Marginal R2: 0.128
> screenreg(AIM2_SLqN50)
```

```
=====
Model 1
-----
(Intercept)                -1.72 ***
                             (0.05)
ZLpAeq2206_cmc              0.57 ***
                             (0.03)
ZLog_NAT_n_LS50_cmc        0.01
                             (0.08)
ZFlights2206_gmc           2.99 ***
                             (0.27)
ZNightflightrate_gmc      -0.87 ***
                             (0.10)
ZTrend2206_gmc             -0.30 ***
                             (0.04)
ZNoiseStarts24_gmc        -3.16 ***
                             (0.28)
HRC_c                       0.88 ***
                             (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc -0.16 ***
                             (0.03)
-----
AIC                          16250.99
BIC                          16337.09
Log Likelihood               -8114.50
Num. obs.                    18532
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.01
Var: Airport3.1 ZLog_NAT_n_LS50_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_SLqN50)
```

```

$Airport3
  (Intercept) ZLog_NAT_n_LS50_cmc
1 -0.007589749      0.212959143
1.1 0.035992940      0.017001405
1.2 0.018462749     -0.172515279
1.3 -0.024591320    -0.165570202
2  0.121767306      0.176810048
3 -0.032397855      0.043351746
4 -0.154914965      0.079424070
91 0.024029015      0.003512772
92 0.006960469     -0.132429233
93 0.040591353     -0.225010075
94 0.011600346      0.100205056
95 -0.025855828      0.051444972

with conditional variances for "Airport3"
>
> anova(CIM_SLqN50, AIM1_SLqN50)
Data: dats
Models:
CIM_SLqN50: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
CIM_SLqN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN50:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
AIM1_SLqN50: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
AIM1_SLqN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SLqN50:   HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
      npar  AIC  BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN50    10 16253 16331 -8116.4    16233
AIM1_SLqN50   11 16251 16337 -8114.6    16229 3.6659  1  0.05554 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> anova(CIM_SLqN50, AIM2_SLqN50)
Data: dats
Models:
CIM_SLqN50: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
CIM_SLqN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN50:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
AIM2_SLqN50: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
AIM2_SLqN50:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLqN50:   HRC_c + (1 + ZLog_NAT_n_LS50_cmc || Airport3) +
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
      npar  AIC  BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN50    10 16253 16331 -8116.4    16233
AIM2_SLqN50   11 16251 16337 -8114.5    16229 3.7844  1  0.05173 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.40.5 FM\_SLqN50

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + (1 + ZLog_NAT_n_LS50_cmc ||
  Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc + ZLpAeq2206_cmc:ZFlights2206_gmc +
  ZLpAeq2206_cmc:ZNightflightrate_gmc + ZLpAeq2206_cmc:ZTrend2206_gmc +
  ZLpAeq2206_cmc:ZNoiseStarts24_gmc + ZLpAeq2206_cmc:HRC_c +
  ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc +

```

```
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc +
ZLog_NAT_n_LS50_cmc:HRC_c
```

```
Data: dats
```

```
      AIC      BIC    logLik deviance df.resid
16259.4 16439.4 -8106.7 16213.4   18509
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.3153 -0.5115 -0.3853 -0.2499  9.4216
```

```
Random effects:
```

```
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                5.019e-03 0.0708480
Airport3.1  ZLpAeq2206_cmc             3.978e-08 0.0001994
Airport3.2  (Intercept)                2.756e-03 0.0524984
Airport3.3  ZLog_NAT_n_LS50_cmc       3.108e-02 0.1763040
Number of obs: 18532, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.728665	0.045544	-37.956	< 2e-16	***
ZLpAeq2206_cmc	0.617817	0.042047	14.693	< 2e-16	***
ZLog_NAT_n_LS50_cmc	0.007531	0.100876	0.075	0.94049	
ZFlights2206_gmc	2.987818	0.275992	10.826	< 2e-16	***
ZNightflightrate_gmc	-0.862924	0.097577	-8.844	< 2e-16	***
ZTrend2206_gmc	-0.308977	0.039115	-7.899	2.81e-15	***
ZNoiseStarts24_gmc	-3.170545	0.283587	-11.180	< 2e-16	***
HRC_c	0.917854	0.152796	6.007	1.89e-09	***
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc	-0.147334	0.029998	-4.912	9.04e-07	***
ZLpAeq2206_cmc:ZFlights2206_gmc	0.145639	0.264519	0.551	0.58192	
ZLpAeq2206_cmc:ZNightflightrate_gmc	-0.142385	0.093367	-1.525	0.12726	
ZLpAeq2206_cmc:ZTrend2206_gmc	0.014118	0.054178	0.261	0.79440	
ZLpAeq2206_cmc:ZNoiseStarts24_gmc	0.032305	0.269737	0.120	0.90467	
ZLpAeq2206_cmc:HRC_c	-0.465598	0.149021	-3.124	0.00178	**
ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc	-0.851175	0.696747	-1.222	0.22184	
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc	0.412803	0.229043	1.802	0.07150	.
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc	0.024293	0.082653	0.294	0.76882	
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc	0.635459	0.703761	0.903	0.36655	
ZLog_NAT_n_LS50_cmc:HRC_c	0.373242	0.355698	1.049	0.29403	

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation matrix not shown by default, as p = 19 > 12.
```

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

```
convergence code: 0
```

```
Model failed to converge with max|grad| = 0.0204008 (tol = 0.002, component 1)
```

```
> performance::icc(FM_SLqN50)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.002
```

```
Conditional ICC: 0.001
```

```
> performance::r2(FM_SLqN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.134
```



```

Marginal R2: 0.132
> screenreg(FM_SLqN50)

=====
-----
Model 1
-----
(Intercept)                -1.73 ***
                             (0.05)
ZLpAeq2206_cmc              0.62 ***
                             (0.04)
ZLog_NAT_n_LS50_cmc        0.01
                             (0.10)
ZFlights2206_gmc           2.99 ***
                             (0.28)
ZNightflightrate_gmc      -0.86 ***
                             (0.10)
ZTrend2206_gmc             -0.31 ***
                             (0.04)
ZNoiseStarts24_gmc        -3.17 ***
                             (0.28)
HRC_c                       0.92 ***
                             (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS50_cmc
                             -0.15 ***
                             (0.03)
ZLpAeq2206_cmc:ZFlights2206_gmc
                             0.15
                             (0.26)
ZLpAeq2206_cmc:ZNightflightrate_gmc
                             -0.14
                             (0.09)
ZLpAeq2206_cmc:ZTrend2206_gmc
                             0.01
                             (0.05)
ZLpAeq2206_cmc:ZNoiseStarts24_gmc
                             0.03
                             (0.27)
ZLpAeq2206_cmc:HRC_c       -0.47 **
                             (0.15)
ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc
                             -0.85
                             (0.70)
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc
                             0.41
                             (0.23)
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc
                             0.02
                             (0.08)
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc
                             0.64
                             (0.70)
ZLog_NAT_n_LS50_cmc:HRC_c   0.37
                             (0.36)
-----
AIC                          16259.38
BIC                          16439.40
Log Likelihood                -8106.69
Num. obs.                     18532
Num. groups: Airport3        12
Var: Airport3 (Intercept)     0.01
Var: Airport3.1 ZLpAeq2206_cmc 0.00
Var: Airport3.2 (Intercept)   0.00
Var: Airport3.3 ZLog_NAT_n_LS50_cmc 0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLqN50)
$Airport3
(Intercept) ZLpAeq2206_cmc (Intercept) ZLog_NAT_n_LS50_cmc

```

---

1	-0.002490353	2.965507e-07	-0.001367409	0.224849924
1.1	0.022289193	4.862158e-07	0.012238608	0.076005994
1.2	0.011611852	-2.010144e-07	0.006375866	-0.184269415
1.3	-0.017455862	-8.013608e-07	-0.009584710	-0.230751400
2	0.079054177	6.891398e-07	0.043407273	0.130207405
3	-0.021434225	-2.193084e-07	-0.011769160	-0.061086831
4	-0.099289575	-2.588468e-07	-0.054518178	0.070813452
91	0.015625690	1.159190e-08	0.008579794	0.003129653
92	0.006881832	-2.344212e-07	0.003778694	-0.036551173
93	0.022947189	-6.622179e-10	0.012599902	-0.111906495
94	0.006933975	1.035305e-08	0.003807325	-0.027242904
95	-0.015755119	2.081080e-07	-0.008650861	0.137007291

with conditional variances for "Airport3"

**4.41 Modell SLqN60 (akustische Prädiktoren  $L_{Aeq,22-06h}(k = 10)$  und  $\log(NAT_{22-06h,60})$ )****4.41.1 MO\_SLqN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5176

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1541	-10.49	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLqN60@theta[1] ^ 2 / (MO_SLqN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.075292
```

```
> performance::icc(MO_SLqN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SLqN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SLqN60)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.62 ***
                                (0.15)
-----
AIC                             16986.58
BIC                             17002.24
Log Likelihood                  -8491.29
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_SLqN60)
$Airport3
  (Intercept)
1 -0.06300806
```

```

1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

>

#### 4.41.2 CIM\_SLqN60

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc
Data: dats

```

```

      AIC      BIC   logLik deviance df.resid
16250.3 16328.6 -8115.2 16230.3   18522

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-1.1502 -0.5119 -0.3876 -0.2514  7.4735

```

Random effects:

```

Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.00922  0.09602
Number of obs: 18532, groups: Airport3, 12

```

Fixed effects:

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.71318    0.04695 -36.492 < 2e-16 ***
ZLpAeq2206_cmc  0.53888    0.04700  11.466 < 2e-16 ***
ZLog_NAT_n_LS60_cmc 0.05949    0.05013   1.187  0.235
ZFlights2206_gmc 2.96901    0.28009  10.600 < 2e-16 ***
ZNightflightrate_gmc -0.87056    0.09884  -8.807 < 2e-16 ***
ZTrend2206_gmc -0.29505    0.03778  -7.809 5.76e-15 ***
ZNoiseStarts24_gmc -3.14000    0.28899 -10.865 < 2e-16 ***
HRC_c          0.85567    0.15675   5.459 4.80e-08 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.12067    0.02516  -4.796 1.62e-06 ***
---

```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

              (Intr) ZLpA2206_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLpAq2206_c  0.066
ZL_NAT__LS6 -0.105 -0.865
ZFlght2206_ -0.178  0.014  -0.008
ZNghtflght_  0.089 -0.006  -0.002 -0.877
ZTrnd2206_g  0.080  0.031  -0.039 -0.211  0.184
ZNsStrts24_  0.277 -0.013   0.006 -0.972  0.795  0.235
HRC_c        -0.410  0.036  -0.030  0.351 -0.027 -0.130 -0.520

```

```
ZLA2206_:ZL -0.248 -0.419    0.298 -0.031 -0.008 -0.094  0.039 -0.083
> performance::icc(CIM_SLqN60)
# IntraClass Correlation Coefficient
```

```
Adjusted ICC: 0.003
Conditional ICC: 0.002
> performance::r2(CIM_SLqN60)
# R2 for Mixed Models
```

```
Conditional R2: 0.133
Marginal R2: 0.130
> screenreg(CIM_SLqN60)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.71 ***
                                (0.05)
ZLpAeq2206_cmc                  0.54 ***
                                (0.05)
ZLog_NAT_n_LS60_cmc             0.06
                                (0.05)
ZFlights2206_gmc                 2.97 ***
                                (0.28)
ZNightflightrate_gmc            -0.87 ***
                                (0.10)
ZTrend2206_gmc                  -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc              -3.14 ***
                                (0.29)
HRC_c                            0.86 ***
                                (0.16)
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.12 ***
                                (0.03)
-----
AIC                               16250.32
BIC                               16328.59
Log Likelihood                   -8115.16
Num. obs.                        18532
Num. groups: Airport3            12
Var: Airport3 (Intercept)        0.01
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_SLqN60)
$Airport3
```

```
(Intercept)
1    0.017395524
1.1  0.034598409
1.2  0.015411658
1.3 -0.056652875
2    0.146531539
3   -0.042573767
4   -0.166993602
91   0.027859740
92   0.007006347
93   0.031280466
94   0.008430503
95  -0.015470546
```

with conditional variances for "Airport3"  
>

#### 4.41.3 AIM1\_SLqN60

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)  
Formula: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLpAeq2206\_cmc || Airport3) + ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS60\_cmc  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16248.4	16334.5	-8113.2	16226.4	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0628	-0.5107	-0.3871	-0.2488	7.7972

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.00574	0.07576
Airport3.1	ZLpAeq2206_cmc	0.01393	0.11804

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.71688	0.04287	-40.050	< 2e-16 ***
ZLpAeq2206_cmc	0.51418	0.06311	8.147	3.74e-16 ***
ZLog_NAT_n_LS60_cmc	0.07810	0.05604	1.394	0.163
ZFlights2206_gmc	2.95594	0.25473	11.604	< 2e-16 ***
ZNightflightrate_gmc	-0.86742	0.08968	-9.673	< 2e-16 ***
ZTrend2206_gmc	-0.30462	0.03613	-8.432	< 2e-16 ***
ZNoiseStarts24_gmc	-3.13222	0.26243	-11.936	< 2e-16 ***
HRC_c	0.86890	0.14148	6.142	8.17e-10 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc	-0.11672	0.02621	-4.453	8.48e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA2206_	ZL_NAT_	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	0.055							
ZL_NAT__LS6	-0.164	-0.655						
ZFlight2206_	-0.193	0.034	-0.018					
ZNghtflght_	0.086	-0.007	-0.002	-0.882				
ZTrnd2206_g	0.093	0.006	-0.060	-0.222	0.200			
ZNSstrts24_	0.289	-0.035	0.017	-0.973	0.803	0.234		
HRC_c	-0.429	0.040	-0.028	0.333	-0.010	-0.081	-0.501	
ZLA2206_:ZL	-0.314	-0.323	0.352	-0.040	-0.002	-0.079	0.044	-0.078

> performance::icc(AIM1\_SLqN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_SLqN60)

# R2 for Mixed Models

Conditional R2: 0.131

Marginal R2: 0.129

```

> screenreg(AIM1_SLqN60)

=====
                                Model 1
-----
(Intercept)                    -1.72 ***
                                (0.04)
ZLpAeq2206_cmc                  0.51 ***
                                (0.06)
ZLog_NAT_n_LS60_cmc            0.08
                                (0.06)
ZFlights2206_gmc                2.96 ***
                                (0.25)
ZNightflightrate_gmc           -0.87 ***
                                (0.09)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc             -3.13 ***
                                (0.26)
HRC_c                           0.87 ***
                                (0.14)
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.12 ***
                                (0.03)
-----
AIC                             16248.39
BIC                             16334.49
Log Likelihood                  -8113.19
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.01
Var: Airport3.1 ZLpAeq2206_cmc   0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SLqN60)
$Airport3
  (Intercept) ZLpAeq2206_cmc
1    0.001964662  0.1232168012
1.1  0.026060503  0.0160955768
1.2  0.011933975 -0.0848081324
1.3 -0.025636341 -0.2073160357
2    0.101863028  0.1312860904
3   -0.027539660  0.0002782825
4   -0.121771953 -0.0198088545
91   0.017564413  0.0042689896
92   0.008569785  0.0142647857
93   0.025398745  0.0401069069
94   0.007885761  0.0359649170
95  -0.017310315 -0.0538683049

```

with conditional variances for "Airport3"

>

#### 4.41.4 AIM2\_SLqN60

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_n_LS60_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc

```

```

Data: dats

      AIC      BIC   logLik deviance df.resid
16244.7 16330.8 -8111.3 16222.7   18521

Scaled residuals:
      Min       1Q   Median       3Q      Max
-1.1098 -0.5121 -0.3908 -0.2410  7.9095

Random effects:
 Groups      Name                Variance Std.Dev.
Airport3    (Intercept)              0.005049 0.07105
Airport3.1  ZLog_NAT_n_LS60_cmc     0.038720 0.19677
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.72764    0.04230 -40.840 < 2e-16 ***
ZLpAeq2206_cmc  0.50519    0.04925  10.257 < 2e-16 ***
ZLog_NAT_n_LS60_cmc 0.11055    0.08653   1.278  0.201
ZFlights2206_gmc  2.99030    0.24901  12.009 < 2e-16 ***
ZNightflightrate_gmc -0.88083    0.08781 -10.031 < 2e-16 ***
ZTrend2206_gmc  -0.30590    0.03589  -8.523 < 2e-16 ***
ZNoiseStarts24_gmc -3.16906    0.25675 -12.343 < 2e-16 ***
HRC_c          0.87786    0.13886   6.322 2.58e-10 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.11018    0.02601  -4.236 2.28e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) ZLpA2206_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLpAq2206_c  0.120
ZL_NAT__LS6 -0.156 -0.566
ZFlght2206_ -0.204  0.005   0.027
ZNghtflght_  0.090  0.016  -0.027 -0.884
ZTrnd2206_g  0.089  0.036  -0.068 -0.235  0.214
ZNsStrts24_  0.303 -0.004  -0.030 -0.973  0.804  0.242
HRC_c        -0.443  0.028   0.012  0.327 -0.005 -0.063 -0.497
ZLA2206_:ZL -0.317 -0.445   0.243 -0.040 -0.003 -0.070  0.042 -0.075
> performance::icc(AIM2_SLqN60)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.002
Conditional ICC: 0.001
> performance::r2(AIM2_SLqN60)
# R2 for Mixed Models

Conditional R2: 0.136
Marginal R2: 0.135
> screenreg(AIM2_SLqN60)

```

```

=====
Model 1
-----
(Intercept)          -1.73 ***
                    (0.04)
ZLpAeq2206_cmc       0.51 ***
                    (0.05)
ZLog_NAT_n_LS60_cmc  0.11

```



```

(0.09)
ZFlights2206_gmc          2.99 ***
                          (0.25)
ZNightflightrate_gmc     -0.88 ***
                          (0.09)
ZTrend2206_gmc           -0.31 ***
                          (0.04)
ZNoiseStarts24_gmc       -3.17 ***
                          (0.26)
HRC_c                     0.88 ***
                          (0.14)
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.11 ***
                          (0.03)

```

```

-----
AIC                        16244.66
BIC                        16330.76
Log Likelihood             -8111.33
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)   0.01
Var: Airport3.1 ZLog_NAT_n_LS60_cmc 0.04
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM2_SLqN60)
```

```

$Airport3
  (Intercept) ZLog_NAT_n_LS60_cmc
1 -0.009846890  0.2726811352
1.1 0.029395614 -0.0180666252
1.2 0.016816060 -0.1992733696
1.3 -0.020100899 -0.2308915279
2  0.087449347  0.3277732208
3 -0.022298060 -0.0137264016
4 -0.109659720 -0.0121646527
91 0.015674433  0.0013998959
92 0.001936427  0.0609917519
93 0.032143258 -0.1277500508
94 0.009283089  0.0002872648
95 -0.019398761 -0.0768609510

```

with conditional variances for "Airport3"

```
>
```

```
> anova(CIM_SLqN60, AIM1_SLqN60)
```

Data: dats

Models:

CIM\_SLqN60: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +

CIM\_SLqN60: ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +

CIM\_SLqN60: HRC\_c + (1 | Airport3) + ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS60\_cmc

AIM1\_SLqN60: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +

AIM1\_SLqN60: ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +

AIM1\_SLqN60: HRC\_c + (1 + ZLpAeq2206\_cmc || Airport3) + ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS60\_cmc

```

      npar  AIC  BIC logLik deviance Chisq Df Pr(>Chisq)

```

```
CIM_SLqN60  10 16250 16329 -8115.2  16230
```

```
AIM1_SLqN60  11 16248 16334 -8113.2  16226 3.9267  1  0.04752 *
```

```
---
```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> anova(CIM_SLqN60, AIM2_SLqN60)
```

Data: dats

Models:

CIM\_SLqN60: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +

```

CIM_SLqN60:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN60:      HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc
AIM2_SLqN60:    HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
AIM2_SLqN60:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLqN60:      HRC_c + (1 + ZLog_NAT_n_LS60_cmc || Airport3) +
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc
              npar  AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN60    10 16250 16329 -8115.2   16230
AIM2_SLqN60   11 16245 16331 -8111.3   16223 7.6609 1  0.005643 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.41.5 FM\_SLqN60

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) [`glmerMod`]

Family: binomial (logit)

```

Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
          ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
          HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + (1 + ZLog_NAT_n_LS60_cmc ||
Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc + ZLpAeq2206_cmc:ZFlights2206_gmc +
          ZLpAeq2206_cmc:ZNightflightrate_gmc + ZLpAeq2206_cmc:ZTrend2206_gmc +
          ZLpAeq2206_cmc:ZNoiseStarts24_gmc + ZLpAeq2206_cmc:HRC_c +
          ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc +
          ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc +
ZLog_NAT_n_LS60_cmc:HRC_c
Data:  dats

```

AIC	BIC	logLik	deviance	df.resid
16262	16442	-8108	16216	18509

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1723	-0.5095	-0.3936	-0.2375	6.9868

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.382e-03	6.620e-02
Airport3.1	ZLpAeq2206_cmc	2.120e-09	4.604e-05
Airport3.2	(Intercept)	7.956e-04	2.821e-02
Airport3.3	ZLog_NAT_n_LS60_cmc	3.287e-02	1.813e-01

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.73214	0.04272	-40.543	< 2e-16 ***
ZLpAeq2206_cmc	0.49767	0.06394	7.783	7.09e-15 ***
ZLog_NAT_n_LS60_cmc	0.16931	0.10595	1.598	0.110
ZFlights2206_gmc	2.98624	0.25376	11.768	< 2e-16 ***
ZNightflightrate_gmc	-0.87533	0.08964	-9.765	< 2e-16 ***
ZTrend2206_gmc	-0.31032	0.03668	-8.461	< 2e-16 ***
ZNoiseStarts24_gmc	-3.16938	0.26089	-12.148	< 2e-16 ***
HRC_c	0.89682	0.14030	6.392	1.64e-10 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc	-0.11041	0.02664	-4.145	3.40e-05 ***
ZLpAeq2206_cmc:ZFlights2206_gmc	0.43267	0.36554	1.184	0.237
ZLpAeq2206_cmc:ZNightflightrate_gmc	-0.17224	0.12186	-1.413	0.158
ZLpAeq2206_cmc:ZTrend2206_gmc	0.06271	0.05210	1.204	0.229
ZLpAeq2206_cmc:ZNoiseStarts24_gmc	-0.38295	0.37069	-1.033	0.302
ZLpAeq2206_cmc:HRC_c	-0.05233	0.16939	-0.309	0.757

```

ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc    -0.80549    0.63719   -1.264    0.206
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc 0.27930    0.21480    1.300    0.194
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc      -0.02064    0.07443   -0.277    0.782
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc   0.83311    0.64962    1.282    0.200
ZLog_NAT_n_LS60_cmc:HRC_c                -0.30243    0.32066   -0.943    0.346

```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation matrix not shown by default, as p = 19 > 12.
```

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

```
convergence code: 0
```

```
boundary (singular) fit: see ?issingular
```

```
> performance::icc(FM_SLqN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.001
```

```
Conditional ICC: 0.001
```

```
> performance::r2(FM_SLqN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.136
```

```
Marginal R2: 0.135
```

```
> screenreg(FM_SLqN60)
```

```

=====
Model 1
-----
(Intercept)                -1.73 ***
                           (0.04)
ZLpAeq2206_cmc              0.50 ***
                           (0.06)
ZLog_NAT_n_LS60_cmc         0.17
                           (0.11)
ZFlights2206_gmc            2.99 ***
                           (0.25)
ZNightflightrate_gmc       -0.88 ***
                           (0.09)
ZTrend2206_gmc              -0.31 ***
                           (0.04)
ZNoiseStarts24_gmc         -3.17 ***
                           (0.26)
HRC_c                       0.90 ***
                           (0.14)
ZLpAeq2206_cmc:ZLog_NAT_n_LS60_cmc -0.11 ***
                           (0.03)
ZLpAeq2206_cmc:ZFlights2206_gmc  0.43
                           (0.37)
ZLpAeq2206_cmc:ZNightflightrate_gmc -0.17
                           (0.12)
ZLpAeq2206_cmc:ZTrend2206_gmc  0.06
                           (0.05)
ZLpAeq2206_cmc:ZNoiseStarts24_gmc -0.38
                           (0.37)
ZLpAeq2206_cmc:HRC_c        -0.05
                           (0.17)
ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc -0.81

```

```

(0.64)
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc      0.28
(0.21)
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc          -0.02
(0.07)
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc      0.83
(0.65)
ZLog_NAT_n_LS60_cmc:HRC_c                   -0.30
(0.32)
-----
AIC                                           16261.99
BIC                                           16442.01
Log Likelihood                               -8107.99
Num. obs.                                    18532
Num. groups: Airport3                        12
Var: Airport3 (Intercept)                    0.00
Var: Airport3.1 ZLpAeq2206_cmc              0.00
Var: Airport3.2 (Intercept)                  0.00
Var: Airport3.3 ZLog_NAT_n_LS60_cmc         0.03
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLqN60)
$Airport3
  (Intercept) ZLpAeq2206_cmc  (Intercept) ZLog_NAT_n_LS60_cmc
1 -0.007145761  9.426681e-09 -0.0012973547  0.2484118073
1.1 0.024968244  2.033860e-08  0.0045331310  0.0414177292
1.2 0.014022748 -8.321941e-09  0.0025459121 -0.1717871844
1.3 -0.018143096 -3.034044e-08 -0.0032939853 -0.2041292115
2 0.075919182  2.359836e-08  0.0137835723  0.2550827768
3 -0.019609626 -7.307778e-09 -0.0035602425 -0.0913578216
4 -0.094804640 -7.993917e-09 -0.0172123378 -0.0796624483
91 0.013701069  6.769186e-10  0.0024875094  0.0009959051
92 0.003218396 -1.317958e-08  0.0005843186  0.0379976443
93 0.025992153  4.099858e-09  0.0047190276 -0.1311642950
94 0.007691346  8.500638e-10  0.0013964090 -0.0242206938
95 -0.016147108  8.404910e-09 -0.0029316020  0.1041104837

```

with conditional variances for "Airport3"

**4.42 Modell SLqN70 (akustische Prädiktoren  $L_{Aeq,22-06h}(k = 10)$  und  $\log(NAT_{22-06h,70})$ )****4.42.1 M0\_SLqN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5176

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1541	-10.49	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- M0_SLqN70@theta[1] ^ 2 / (M0_SLqN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.075292
```

```
> performance::icc(M0_SLqN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(M0_SLqN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(M0_SLqN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.62 ***
                                (0.15)
-----
AIC                             16986.58
BIC                             17002.24
Log Likelihood                  -8491.29
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(M0_SLqN70)
$Airport3
  (Intercept)
1 -0.06300806
```

```

1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

>

#### 4.42.2 CIM\_SLqN70

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
Data: dats

```

AIC	BIC	logLik	deviance	df.resid
16254.6	16332.8	-8117.3	16234.6	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1599	-0.5104	-0.3865	-0.2532	6.2327

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.01041	0.102

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.70461	0.04906	-34.743	< 2e-16 ***
ZLpAeq2206_cmc	0.58105	0.05628	10.324	< 2e-16 ***
ZLog_NAT_n_LS70_cmc	0.01881	0.05447	0.345	0.73
ZFlights2206_gmc	2.99243	0.29037	10.306	< 2e-16 ***
ZNightflightrate_gmc	-0.88339	0.10244	-8.624	< 2e-16 ***
ZTrend2206_gmc	-0.30269	0.03866	-7.829	4.93e-15 ***
ZNoiseStarts24_gmc	-3.16301	0.29961	-10.557	< 2e-16 ***
HRC_c	0.83493	0.16187	5.158	2.49e-07 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc	-0.11972	0.02542	-4.710	2.48e-06 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA2206_	ZL_NAT_	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	0.111							
ZL_NAT__LS7	-0.130	-0.901						
ZFlght2206_	-0.167	0.024	-0.016					
ZNghtflght_	0.081	-0.027	0.020	-0.876				
ZTrnd2206_g	0.067	-0.011	0.003	-0.211	0.180			
ZNsStrts24_	0.265	-0.024	0.015	-0.972	0.795	0.237		
HRC_c	-0.412	-0.003	0.009	0.355	-0.033	-0.145	-0.524	

```
ZLA2206_:ZL -0.278 -0.499    0.367 -0.046  0.022 -0.041  0.053 -0.041
convergence code: 0
Model failed to converge with max|grad| = 0.00277432 (tol = 0.002, component 1)
```

```
> performance::icc(CIM_SLqN70)
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.003
Conditional ICC: 0.003
```

```
> performance::r2(CIM_SLqN70)
# R2 for Mixed Models
```

```
Conditional R2: 0.132
Marginal R2: 0.129
```

```
> screenreg(CIM_SLqN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.70 ***
                                (0.05)
ZLpAeq2206_cmc                  0.58 ***
                                (0.06)
ZLog_NAT_n_LS70_cmc             0.02
                                (0.05)
ZFlights2206_gmc                2.99 ***
                                (0.29)
ZNightflightrate_gmc           -0.88 ***
                                (0.10)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.16 ***
                                (0.30)
HRC_c                            0.83 ***
                                (0.16)
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc -0.12 ***
                                (0.03)
-----
AIC                               16254.57
BIC                               16332.85
Log Likelihood                   -8117.29
Num. obs.                         18532
Num. groups: Airport3             12
Var: Airport3 (Intercept)         0.01
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_SLqN70)
```

```
$Airport3
  (Intercept)
1    0.024444192
1.1  0.032666719
1.2  0.015289870
1.3 -0.061701168
2    0.159317014
3   -0.046610181
4   -0.181619565
91   0.031017470
92   0.007358593
93   0.033967121
```

```
94 0.008415304
95 -0.014834843
```

```
with conditional variances for "Airport3"
>
```

#### 4.42.3 AIM1\_SLqN70

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
```

```
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
Data: dats
```

```
      AIC      BIC  logLik deviance df.resid
16252.9 16339.0 -8115.4 16230.9   18521
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-1.0634 -0.5084 -0.3856 -0.2535  6.2970
```

```
Random effects:
```

```
Groups      Name          Variance Std.Dev.
Airport3    (Intercept)    0.007072 0.08409
Airport3.1  ZLpAeq2206_cmc 0.011835 0.10879
Number of obs: 18532, groups: Airport3, 12
```

```
Fixed effects:
```

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.703723	0.045042	-37.826	< 2e-16 ***
ZLpAeq2206_cmc	0.582890	0.068118	8.557	< 2e-16 ***
ZLog_NAT_n_LS70_cmc	0.001009	0.056479	0.018	0.986
ZFlights2206_gmc	2.986710	0.266807	11.194	< 2e-16 ***
ZNightflightrate_gmc	-0.880326	0.093962	-9.369	< 2e-16 ***
ZTrend2206_gmc	-0.308674	0.037031	-8.335	< 2e-16 ***
ZNoiseStarts24_gmc	-3.165545	0.274758	-11.521	< 2e-16 ***
HRC_c	0.853832	0.147664	5.782	7.37e-09 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc	-0.122673	0.025824	-4.750	2.03e-06 ***

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation of Fixed Effects:
```

	(Intr)	ZLpA2206_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	0.082							
ZL_NAT__LS7	-0.153	-0.741						
ZFlght2206_	-0.175	0.038	-0.023					
ZNghtflght_	0.075	-0.020	0.014	-0.881				
ZTrnd2206_g	0.075	-0.028	-0.004	-0.222	0.195			
ZNsStrts24_	0.271	-0.041	0.025	-0.973	0.801	0.239		
HRC_c	-0.426	0.019	-0.005	0.338	-0.019	-0.104	-0.507	
ZLA2206_:ZL	-0.323	-0.397	0.377	-0.057	0.028	-0.031	0.064	-0.044

```
> performance::icc(AIM1_SLqN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.002
```

```
Conditional ICC: 0.002
```

```
> performance::r2(AIM1_SLqN70)
```

```
# R2 for Mixed Models
```



```

Conditional R2: 0.128
Marginal R2: 0.126
> screenreg(AIM1_SLqN70)

```

```

=====
                                Model 1
-----
(Intercept)                    -1.70 ***
                                (0.05)
ZLpAeq2206_cmc                  0.58 ***
                                (0.07)
ZLog_NAT_n_LS70_cmc            0.00
                                (0.06)
ZFlights2206_gmc                2.99 ***
                                (0.27)
ZNightflightrate_gmc           -0.88 ***
                                (0.09)
ZTrend2206_gmc                 -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc             -3.17 ***
                                (0.27)
HRC_c                           0.85 ***
                                (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc -0.12 ***
                                (0.03)
-----
AIC                             16252.89
BIC                             16338.99
Log Likelihood                  -8115.44
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.01
Var: Airport3.1 ZLpAeq2206_cmc 0.01
=====

```

```

*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(AIM1_SLqN70)

```

```

$Airport3

```

```

  (Intercept) ZLpAeq2206_cmc
1    0.008649130    0.110444481
1.1  0.025117572    0.036566398
1.2  0.012567093   -0.068943052
1.3 -0.031349066   -0.178813942
2    0.119297019    0.125740227
3   -0.032593179   -0.008206988
4   -0.142165918   -0.014231985
91   0.021233982    0.003489524
92   0.009034019    0.011888872
93   0.029862675    0.024305223
94   0.008376795    0.019523420
95  -0.017711516   -0.062514143

```

```

with conditional variances for "Airport3"

```

```

>

```

#### 4.42.4 AIM2\_SLqN70

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )

```

```

Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_n_LS70_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
Data: dats

```

```

AIC      BIC    logLik deviance df.resid
16246.5  16332.6  -8112.3  16224.5   18521

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-1.0974 -0.5128 -0.3861 -0.2518  6.5082

```

Random effects:

```

Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                 0.003826 0.06185
Airport3.1  ZLog_NAT_n_LS70_cmc        0.022191 0.14897
Number of obs: 18532, groups: Airport3, 12

```

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.71102	0.04070	-42.037	< 2e-16	***
ZLpAeq2206_cmc	0.57966	0.05954	9.735	< 2e-16	***
ZLog_NAT_n_LS70_cmc	0.01928	0.07951	0.242	0.808	
ZFlights2206_gmc	3.01465	0.23829	12.651	< 2e-16	***
ZNightflightrate_gmc	-0.88734	0.08385	-10.582	< 2e-16	***
ZTrend2206_gmc	-0.31240	0.03456	-9.039	< 2e-16	***
ZNoiseStarts24_gmc	-3.19077	0.24579	-12.982	< 2e-16	***
HRC_c	0.86076	0.13205	6.519	7.1e-11	***
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc	-0.11681	0.02604	-4.485	7.3e-06	***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

      (Intr) ZLpA2206_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLpAq2206_c  0.169
ZL_NAT__LS7 -0.184 -0.703
ZFlght2206_ -0.199  0.037  -0.005
ZNgghtflght_ 0.073 -0.017   0.003 -0.887
ZTrnd2206_g  0.085  0.017  -0.063 -0.229  0.211
ZNsStrts24_  0.291 -0.040   0.007 -0.974  0.808  0.233
HRC_c        -0.455  0.012   0.012  0.320  0.003 -0.050 -0.489
ZLA2206_:ZL -0.366 -0.522   0.330 -0.073  0.031 -0.047  0.081 -0.055

```

convergence code: 0

Model failed to converge with max|grad| = 0.00327765 (tol = 0.002, component 1)

```

> performance::icc(AIM2_SLqN70)
# Intraclass Correlation Coefficient

```

Adjusted ICC: 0.001

Conditional ICC: 0.001

```

> performance::r2(AIM2_SLqN70)

```

# R2 for Mixed Models

Conditional R2: 0.132

Marginal R2: 0.131

```

> screenreg(AIM2_SLqN70)

```

=====  
Model 1

```
-----
(Intercept)                -1.71 ***
                           (0.04)
ZLpAeq2206_cmc              0.58 ***
                           (0.06)
ZLog_NAT_n_LS70_cmc        0.02
                           (0.08)
ZFlights2206_gmc           3.01 ***
                           (0.24)
ZNightflightrate_gmc       -0.89 ***
                           (0.08)
ZTrend2206_gmc             -0.31 ***
                           (0.03)
ZNoiseStarts24_gmc         -3.19 ***
                           (0.25)
HRC_c                       0.86 ***
                           (0.13)
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc -0.12 ***
                           (0.03)
-----
```

```
AIC                16246.51
BIC                16332.61
Log Likelihood    -8112.26
Num. obs.         18532
Num. groups: Airport3 12
Var: Airport3 (Intercept) 0.00
Var: Airport3.1 ZLog_NAT_n_LS70_cmc 0.02
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM2_SLqN70)
```

```
$Airport3
```

```
  (Intercept) ZLog_NAT_n_LS70_cmc
1  7.810435e-05  0.181803954
1.1 2.305197e-02  0.004617475
1.2 8.137016e-03 -0.062987450
1.3 -2.131213e-02 -0.217457686
2  7.539965e-02  0.221285073
3 -1.984632e-02 -0.062562121
4 -8.712145e-02 -0.081112802
91 1.174481e-02  0.004903439
92 3.831473e-03  0.033593218
93 2.001442e-02  0.031384257
94 6.083737e-03  0.042945385
95 -1.196914e-02 -0.103651553
```

with conditional variances for "Airport3"

```
>
```

```
> anova(CIM_SLqN70, AIM1_SLqN70)
```

```
Data: dats
```

```
Models:
```

```
CIM_SLqN70: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
```

```
CIM_SLqN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
CIM_SLqN70:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
```

```
AIM1_SLqN70: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
```

```
AIM1_SLqN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
AIM1_SLqN70:   HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
```

```
npair  AIC  BIC  logLik  deviance  Chisq  Df  Pr(>Chisq)
```

```
CIM_SLqN70  10 16255 16333 -8117.3  16235
```

```
AIM1_SLqN70  11 16253 16339 -8115.4  16231 3.685  1  0.0549 .
```

```

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> anova(CIM_SLqN70, AIM2_SLqN70)
Data: dats
Models:
CIM_SLqN70: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
CIM_SLqN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN70:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
AIM2_SLqN70: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
AIM2_SLqN70:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLqN70:   HRC_c + (1 + ZLog_NAT_n_LS70_cmc || Airport3) +
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc
      npar  AIC  BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN70   10 16255 16333 -8117.3    16235
AIM2_SLqN70  11 16246 16333 -8112.3    16224 10.062  1  0.001514 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.42.5 FM\_SLqN70

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial ( logit )

```

Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + (1 + ZLog_NAT_n_LS70_cmc ||
  Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc + ZLpAeq2206_cmc:ZFlights2206_gmc +
  ZLpAeq2206_cmc:ZNightflightrate_gmc + ZLpAeq2206_cmc:ZTrend2206_gmc +
  ZLpAeq2206_cmc:ZNoiseStarts24_gmc + ZLpAeq2206_cmc:HRC_c +
  ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc +
  ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc +
ZLog_NAT_n_LS70_cmc:HRC_c
Data: dats

```

	AIC	BIC	logLik	deviance	df.resid
	16256.7	16436.7	-8105.3	16210.7	18509

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-1.1214	-0.5113	-0.3905	-0.2499	7.3830

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	3.086e-03	0.0555518
Airport3.1	ZLpAeq2206_cmc	1.286e-08	0.0001134
Airport3.2	(Intercept)	2.829e-04	0.0168187
Airport3.3	ZLog_NAT_n_LS70_cmc	1.899e-02	0.1378045

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.716928	0.040557	-42.334	< 2e-16 ***
ZLpAeq2206_cmc	0.442082	0.085671	5.160	2.47e-07 ***
ZLog_NAT_n_LS70_cmc	0.165407	0.102112	1.620	0.10526
ZFlights2206_gmc	3.025206	0.239670	12.622	< 2e-16 ***
ZNightflightrate_gmc	-0.889105	0.084153	-10.565	< 2e-16 ***
ZTrend2206_gmc	-0.320402	0.036261	-8.836	< 2e-16 ***
ZNoiseStarts24_gmc	-3.203803	0.246550	-12.995	< 2e-16 ***
HRC_c	0.874695	0.132552	6.599	4.14e-11 ***

ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc	-0.115084	0.026646	-4.319	1.57e-05	***
ZLpAeq2206_cmc:ZFlights2206_gmc	1.406202	0.532073	2.643	0.00822	**
ZLpAeq2206_cmc:ZNightflightrate_gmc	-0.333205	0.173222	-1.924	0.05441	.
ZLpAeq2206_cmc:ZTrend2206_gmc	-0.002952	0.067370	-0.044	0.96505	
ZLpAeq2206_cmc:ZNoiseStarts24_gmc	-1.371949	0.539569	-2.543	0.01100	*
ZLpAeq2206_cmc:HRC_c	0.398560	0.246249	1.619	0.10555	
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc	-1.415738	0.627555	-2.256	0.02407	*
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc	0.297416	0.213409	1.394	0.16342	
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc	0.079851	0.100603	0.794	0.42736	
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc	1.471003	0.635821	2.314	0.02069	*
ZLog_NAT_n_LS70_cmc:HRC_c	-0.609134	0.314154	-1.939	0.05251	.

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as  $p = 19 > 12$ .Use `print(x, correlation=TRUE)` or  
`vcov(x)` if you need it

convergence code: 0

Model failed to converge with  $\max|\text{grad}| = 0.00986087$  (tol = 0.002, component 1)> performance::icc(FM\_SLqN70)  
# Intraclass Correlation Coefficient

Adjusted ICC: 0.001

Conditional ICC: 0.001

&gt; performance::r2(FM\_SLqN70)

# R2 for Mixed Models

Conditional R2: 0.134

Marginal R2: 0.133

&gt; screenreg(FM\_SLqN70)

```
=====
                                Model 1
-----
```

(Intercept)	-1.72 ***
	(0.04)
ZLpAeq2206_cmc	0.44 ***
	(0.09)
ZLog_NAT_n_LS70_cmc	0.17
	(0.10)
ZFlights2206_gmc	3.03 ***
	(0.24)
ZNightflightrate_gmc	-0.89 ***
	(0.08)
ZTrend2206_gmc	-0.32 ***
	(0.04)
ZNoiseStarts24_gmc	-3.20 ***
	(0.25)
HRC_c	0.87 ***
	(0.13)
ZLpAeq2206_cmc:ZLog_NAT_n_LS70_cmc	-0.12 ***
	(0.03)
ZLpAeq2206_cmc:ZFlights2206_gmc	1.41 **
	(0.53)
ZLpAeq2206_cmc:ZNightflightrate_gmc	-0.33
	(0.17)
ZLpAeq2206_cmc:ZTrend2206_gmc	-0.00

	(0.07)
ZLpAeq2206_cmc:ZNoiseStarts24_gmc	-1.37 *
	(0.54)
ZLpAeq2206_cmc:HRC_c	0.40
	(0.25)
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc	-1.42 *
	(0.63)
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc	0.30
	(0.21)
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc	0.08
	(0.10)
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc	1.47 *
	(0.64)
ZLog_NAT_n_LS70_cmc:HRC_c	-0.61
	(0.31)

```
-----
```

AIC	16256.65
BIC	16436.68
Log Likelihood	-8105.33
Num. obs.	18532
Num. groups: Airport3	12
Var: Airport3 (Intercept)	0.00
Var: Airport3.1 ZLpAeq2206_cmc	0.00
Var: Airport3.2 (Intercept)	0.00
Var: Airport3.3 ZLog_NAT_n_LS70_cmc	0.02

```
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(FM\_SLqN70)

\$Airport3

	(Intercept)	ZLpAeq2206_cmc	(Intercept)	ZLog_NAT_n_LS70_cmc
1	-0.0006145259	6.177021e-08	-0.0000563287	0.133561440
1.1	0.0171979263	6.320494e-08	0.0015763972	0.035445115
1.2	0.0075545192	-6.256581e-08	0.0006924627	-0.043850453
1.3	-0.0152380557	-1.035005e-07	-0.0013967514	-0.170048826
2	0.0617933720	7.443793e-08	0.0056641071	0.226003401
3	-0.0159966337	-2.545014e-08	-0.0014662842	-0.068882484
4	-0.0735335925	-6.192511e-09	-0.0067402397	-0.140767707
91	0.0096005061	4.124460e-09	0.0008800021	0.004454776
92	0.0036888103	-4.962891e-08	0.0003381239	-0.005998252
93	0.0175993118	3.347279e-09	0.0016131890	-0.018773087
94	0.0050517268	-2.585497e-09	0.0004630516	-0.002696415
95	-0.0107912701	4.552579e-08	-0.0009891499	0.046192180

with conditional variances for "Airport3"

**4.43 Modell SLqN80 (akustische Prädiktoren  $L_{Aeq,22-06h}(k = 10)$  und  $\log(NAT_{22-06h,80})$ )****4.43.1 MO\_SLqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ (1 | Airport3)  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SLqN80@theta[1] ^ 2 / (MO_SLqN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.07528805
```

```
> performance::icc(MO_SLqN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SLqN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SLqN80)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SLqN80)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.06300428
```

```
1.1 0.25571838
```

```
1.2 0.03926869
```

```
1.3 -0.25208466
```

```
2 -0.22400173
```

```
3 0.18283767
```

```
4 -0.82791041
```

```
91 0.17410584
```

```
92 0.56598494
```

```
93 0.45689415
```

```
94 -0.99572180
```

```
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```

**4.43.2 CIM\_SLqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial ( logit )  
 Formula: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3) +  
 ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS80\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16238.1	16316.4	-8109.1	16218.1	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0881	-0.5114	-0.3841	-0.2532	5.9255

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.01144	0.1069

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.70384	0.04950	-34.419	< 2e-16	***
ZLpAeq2206_cmc	0.69472	0.04051	17.148	< 2e-16	***
ZLog_NAT_n_LS80_cmc	-0.07797	0.03678	-2.120	0.034	*
ZFlights2206_gmc	3.07345	0.29875	10.288	< 2e-16	***
ZNightflightrate_gmc	-0.91509	0.10539	-8.683	< 2e-16	***
ZTrend2206_gmc	-0.29523	0.03947	-7.480	7.43e-14	***
ZNoiseStarts24_gmc	-3.26762	0.30857	-10.589	< 2e-16	***
HRC_c	0.87800	0.16662	5.270	1.37e-07	***
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc	-0.14576	0.02315	-6.296	3.06e-10	***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLpA2206_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	-0.015						
ZL_NAT_LS8	0.012	-0.768					
ZFlght2206_	-0.166	0.040	-0.022				
ZNghtflght_	0.080	-0.050	0.033	-0.875			
ZTrnd2206_g	0.067	0.001	-0.001	-0.205	0.174		
ZNSStrts24_	0.264	-0.046	0.023	-0.972	0.794	0.232	
HRC_c	-0.411	0.021	0.001	0.360	-0.039	-0.149	-0.529
ZLA2206_:ZL	-0.199	-0.339	0.019	-0.072	0.050	-0.060	0.089

> performance::icc(CIM\_SLqN80)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.003  
 > performance::r2(CIM\_SLqN80)  
 # R2 for Mixed Models

Conditional R2: 0.133  
 Marginal R2: 0.130  
 > screenreg(CIM\_SLqN80)

```

=====
                                Model 1
-----
(Intercept)                    -1.70 ***
                                (0.05)
ZLpAeq2206_cmc                  0.69 ***
                                (0.04)
ZLog_NAT_n_LS80_cmc            -0.08 *
                                (0.04)
ZFlights2206_gmc               3.07 ***
                                (0.30)
ZNightflightrate_gmc          -0.92 ***
                                (0.11)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.27 ***
                                (0.31)
HRC_c                          0.88 ***
                                (0.17)
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc -0.15 ***
                                (0.02)
-----
AIC                             16238.12
BIC                             16316.40
Log Likelihood                  -8109.06
Num. obs.                       18532
    
```



---

```
Num. groups: Airport3          12
Var: Airport3 (Intercept)     0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_SLqN80)
$Airport3
  (Intercept)
1      0.022714100
1.1    0.031327409
1.2    0.020772643
1.3   -0.060855337
2      0.167781134
3     -0.048932362
4     -0.196937008
91     0.034086242
92     0.010350163
93     0.037409987
94     0.009416929
95    -0.018818209

with conditional variances for "Airport3"
>
```

**4.43.3 AIM1\_SLqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLpAeq2206\_cmc || Airport3) + ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS80\_cmc  
 Data: data

AIC BIC logLik deviance df.resid  
 16235.7 16321.8 -8106.9 16213.7 18521

Scaled residuals:

Min 1Q Median 3Q Max  
 -1.0247 -0.5111 -0.3834 -0.2518 6.1618

Random effects:

Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 0.007549 0.08688  
 Airport3.1 ZLpAeq2206\_cmc 0.013273 0.11521

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.70502	0.04457	-38.257	< 2e-16	***
ZLpAeq2206_cmc	0.69703	0.05853	11.910	< 2e-16	***
ZLog_NAT_n_LS80_cmc	-0.08480	0.03730	-2.273	0.023	*
ZFlights2206_gmc	3.07603	0.27165	11.323	< 2e-16	***
ZNightflightrate_gmc	-0.91123	0.09564	-9.527	< 2e-16	***
ZTrend2206_gmc	-0.30449	0.03749	-8.122	4.58e-16	***
ZNoiseStarts24_gmc	-3.27636	0.28005	-11.699	< 2e-16	***
HRC_c	0.89753	0.15029	5.972	2.35e-09	***
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc	-0.14724	0.02353	-6.258	3.90e-10	***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLpA2206_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	-0.038							
ZL_NAT__LS8	0.011	-0.561						
ZFlght2206_	-0.175	0.048	-0.023					
ZNghtflght_	0.072	-0.034	0.024	-0.881				
ZTrnd2206_g	0.076	-0.036	0.006	-0.217	0.189			
ZNsStrts24_	0.271	-0.054	0.024	-0.973	0.801	0.234		
HRC_c	-0.428	0.035	-0.004	0.344	-0.025	-0.108	-0.512	
ZLA2206_:ZL	-0.234	-0.243	0.029	-0.087	0.063	-0.038	0.102	-0.081

> performance::icc(AIM1\_SLqN80)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.002  
 Conditional ICC: 0.002  
 > performance::r2(AIM1\_SLqN80)  
 # R2 for Mixed Models

Conditional R2: 0.133  
 Marginal R2: 0.131  
 > screenreg(AIM1\_SLqN80)

```
=====
-----
Model 1
-----
(Intercept)                -1.71 ***
                           (0.04)
ZLpAeq2206_cmc              0.70 ***
                           (0.06)
ZLog_NAT_n_LS80_cmc        -0.08 *
                           (0.04)
ZFlights2206_gmc           3.08 ***
                           (0.27)
ZNightflightrate_gmc       -0.91 ***
                           (0.10)
ZTrend2206_gmc             -0.30 ***
                           (0.04)
ZNoiseStarts24_gmc         -3.28 ***
                           (0.28)
HRC_c                       0.90 ***
                           (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc -0.15 ***
                           (0.02)
-----
AIC                          16235.73
BIC                          16321.83
Log Likelihood                -8106.86
```

---

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLpAeq2206_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SLqN80)
$Airport3
  (Intercept) ZLpAeq2206_cmc
1      0.005970097      0.101433049
1.1    0.023750191      0.017179175
1.2    0.016820950     -0.077166342
1.3   -0.028571976     -0.195870985
2      0.122913953      0.139381878
3     -0.033401088     -0.036794335
4     -0.150943093     -0.021363442
91    0.022806639      0.003926707
92    0.011628969      0.021907648
93    0.032072653      0.043041369
94    0.009173064      0.049611694
95   -0.021035040     -0.045977125

with conditional variances for "Airport3"
>
```

**4.43.4 AIM2\_SLqN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLpAeq2206\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
 HRC\_c + (1 + ZLog\_NAT\_n\_LS80\_cmc | Airport3) + ZLpAeq2206\_cmc:ZLog\_NAT\_n\_LS80\_cmc  
 Data: dats

AIC BIC logLik deviance df.resid  
 16237.1 16323.2 -8107.5 16215.1 18521

Scaled residuals:

Min 1Q Median 3Q Max  
 -1.1191 -0.5111 -0.3848 -0.2529 6.5671

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.009652	0.09824
Airport3.1	ZLog_NAT_n_LS80_cmc	0.008542	0.09242

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.70326	0.04728	-36.027	< 2e-16 ***
ZLpAeq2206_cmc	0.69745	0.04185	16.664	< 2e-16 ***
ZLog_NAT_n_LS80_cmc	-0.07352	0.04948	-1.486	0.137
ZFlights2206_gmc	3.07937	0.28761	10.707	< 2e-16 ***
ZNightflightrate_gmc	-0.91497	0.10150	-9.015	< 2e-16 ***
ZTrend2206_gmc	-0.30600	0.03928	-7.790	6.72e-15 ***
ZNoiseStarts24_gmc	-3.26679	0.29664	-11.013	< 2e-16 ***
HRC_c	0.87224	0.15965	5.463	4.67e-08 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc	-0.14780	0.02331	-6.342	2.27e-10 ***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLpA2206_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLpAq2206_c	-0.014						
ZL_NAT__LS8	-0.013	-0.584					
ZFlght2206_	-0.167	0.043	-0.009				
ZNghtflght_	0.074	-0.043	0.016	-0.878			
ZTrnd2206_g	0.071	0.001	-0.037	-0.215	0.184		
ZNSstrts24_	0.263	-0.050	0.011	-0.972	0.798	0.234	
HRC_c	-0.417	0.022	0.006	0.349	-0.030	-0.122	-0.518
ZLA2206_:ZL	-0.213	-0.332	0.025	-0.083	0.059	-0.047	0.099

> performance::icc(AIM2\_SLqN80)  
 # Intraclass Correlation Coefficient

Adjusted ICC: 0.003  
 Conditional ICC: 0.003  
 > performance::r2(AIM2\_SLqN80)  
 # R2 for Mixed Models

Conditional R2: 0.136  
 Marginal R2: 0.133  
 > screenreg(AIM2\_SLqN80)

```
=====
-----
Model 1
-----
(Intercept)                -1.70 ***
                           (0.05)
ZLpAeq2206_cmc              0.70 ***
                           (0.04)
ZLog_NAT_n_LS80_cmc        -0.07
                           (0.05)
ZFlights2206_gmc           3.08 ***
                           (0.29)
ZNightflightrate_gmc       -0.91 ***
                           (0.10)
ZTrend2206_gmc             -0.31 ***
                           (0.04)
ZNoiseStarts24_gmc         -3.27 ***
                           (0.30)
HRC_c                       0.87 ***
                           (0.16)
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc -0.15 ***
                           (0.02)
-----
AIC                          16237.08
BIC                          16323.18
Log Likelihood               -8107.54
```

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLog_NAT_n_LS80_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM2_SLqN80)
$Airport3
  (Intercept) ZLog_NAT_n_LS80_cmc
1      0.016770623      0.028379737
1.1    0.028954670     -0.018966816
1.2    0.016526147     -0.038966738
1.3   -0.046105502     -0.167192504
2       0.149134020      0.064322815
3     -0.042217125     -0.032342720
4     -0.176159125     -0.021715691
91    0.029059415      0.002551082
92    0.011781038      0.020772879
93    0.034561706      0.035358536
94    0.009852775      0.097106250
95   -0.018688898      0.027877308

with conditional variances for "Airport3"
>
```

**4.43.5 Vergleichstests SLqN80****4.43.5.1 > anova(CIM\_SLqN80, AIM1\_SLqN80)**

```
Data: dats
Models:
CIM_SLqN80: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
CIM_SLqN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN80:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc
AIM1_SLqN80: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
AIM1_SLqN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SLqN80:   HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc
      npar  AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN80   10 16238 16316 -8109.1    16218
AIM1_SLqN80  11 16236 16322 -8106.9    16214 4.3947  1    0.03605 *
```

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.43.5.2 > anova(CIM\_SLqN80, AIM2\_SLqN80)**

```
Data: dats
Models:
CIM_SLqN80: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
CIM_SLqN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SLqN80:   HRC_c + (1 | Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc
AIM2_SLqN80: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
AIM2_SLqN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SLqN80:   HRC_c + (1 + ZLog_NAT_n_LS80_cmc || Airport3) +
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc
      npar  AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SLqN80   10 16238 16316 -8109.1    16218
AIM2_SLqN80  11 16237 16323 -8107.5    16215 3.0419  1    0.08114 .
```

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**4.43.6 FM\_SLqN80**

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLpAeq2206_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLpAeq2206_cmc || Airport3) + (1 + ZLog_NAT_n_LS80_cmc ||
  Airport3) + ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc + ZLpAeq2206_cmc:ZFlights2206_gmc +
  ZLpAeq2206_cmc:ZNightflightrate_gmc + ZLpAeq2206_cmc:ZTrend2206_gmc +
  ZLpAeq2206_cmc:ZNoiseStarts24_gmc + ZLpAeq2206_cmc:HRC_c +
  ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc +
  ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc +
  ZLog_NAT_n_LS80_cmc:HRC_c
Data:      dat
```

```
      AIC      BIC    logLik deviance df.resid
16236.8 16416.8 -8095.4 16190.8   18509
```

```
Scaled residuals:
      Min       1Q   Median       3Q      Max
-1.0504 -0.5095 -0.3844 -0.2481  7.1165
```

```
Random effects:
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                 1.441e-03 0.0379598
Airport3.1  ZLpAeq2206_cmc              7.225e-03 0.0850029
Airport3.2  (Intercept)                 6.464e-03 0.0803972
Airport3.3  ZLog_NAT_n_LS80_cmc        1.268e-08 0.0001126
Number of obs: 18532, groups: Airport3, 12
```

```
Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.722925    0.045576 -37.803 < 2e-16 ***
ZLpAeq2206_cmc  0.804712    0.069033  11.657 < 2e-16 ***
ZLog_NAT_n_LS80_cmc -0.197977    0.054188  -3.653 0.000259 ***
ZFlights2206_gmc  3.078495    0.279891  10.999 < 2e-16 ***
ZNightflightrate_gmc -0.908033    0.098759  -9.194 < 2e-16 ***
ZTrend2206_gmc -0.319208    0.039968  -7.987 1.39e-15 ***
ZNoiseStarts24_gmc -3.270732    0.287313 -11.384 < 2e-16 ***
HRC_c          0.889566    0.153407  5.799 6.68e-09 ***
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc -0.127248    0.024508 -5.192 2.08e-07 ***
ZLpAeq2206_cmc:ZFlights2206_gmc -0.589902    0.435994 -1.353 0.176055
ZLpAeq2206_cmc:ZNightflightrate_gmc  0.095973    0.147825  0.649 0.516186
ZLpAeq2206_cmc:ZTrend2206_gmc -0.007716    0.044964 -0.172 0.863746
ZLpAeq2206_cmc:ZNoiseStarts24_gmc  0.818969    0.447611  1.830 0.067303 .
ZLpAeq2206_cmc:HRC_c -0.645055    0.221301 -2.915 0.003559 **
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc  0.606409    0.350552  1.730 0.083653 .
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc -0.124343    0.115051 -1.081 0.279802
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc  0.064275    0.037383  1.719 0.085544 .
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc -0.807763    0.359445 -2.247 0.024624 *
ZLog_NAT_n_LS80_cmc:HRC_c  0.487108    0.169591  2.872 0.004076 **
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Correlation matrix not shown by default, as p = 19 > 12.
```

```
Use print(x, correlation=TRUE) or
vcov(x) if you need it
```

```
convergence code: 0
unable to evaluate scaled gradient
Model failed to converge: degenerate Hessian with 1 negative eigenvalues
```

```
> performance::icc(FM_SLqN80)
# Intraclass Correlation Coefficient
```

```
      Adjusted ICC: 0.000
      Conditional ICC: 0.000
> performance::r2(FM_SLqN80)
# R2 for Mixed Models
```

```
      Conditional R2: 0.134
      Marginal R2: 0.134
> screenreg(FM_SLqN80)
```

```
=====
Model 1
-----
(Intercept)          -1.72 ***
                    (0.05)
ZLpAeq2206_cmc        0.80 ***
                    (0.07)
ZLog_NAT_n_LS80_cmc -0.20 ***
                    (0.05)
```

```

ZFlights2206_gmc                3.08 ***
                                (0.28)
ZNightflightrate_gmc            -0.91 ***
                                (0.10)
ZTrend2206_gmc                  -0.32 ***
                                (0.04)
ZNoiseStarts24_gmc              -3.27 ***
                                (0.29)
HRC_c                            0.89 ***
                                (0.15)
ZLpAeq2206_cmc:ZLog_NAT_n_LS80_cmc -0.13 ***
                                (0.02)
ZLpAeq2206_cmc:ZFlights2206_gmc -0.59
                                (0.44)
ZLpAeq2206_cmc:ZNightflightrate_gmc 0.10
                                (0.15)
ZLpAeq2206_cmc:ZTrend2206_gmc     -0.01
                                (0.04)
ZLpAeq2206_cmc:ZNoiseStarts24_gmc  0.82
                                (0.45)
ZLpAeq2206_cmc:HRC_c             -0.65 **
                                (0.22)
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc 0.61
                                (0.35)
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc -0.12
                                (0.12)
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc  0.06
                                (0.04)
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc -0.81 *
                                (0.36)
ZLog_NAT_n_LS80_cmc:HRC_c         0.49 **
                                (0.17)
-----
AIC                               16236.77
BIC                               16416.80
Log Likelihood                    -8095.39
Num. obs.                          18532
Num. groups: Airport3              12
Var: Airport3 (Intercept)           0.00
Var: Airport3.1 ZLpAeq2206_cmc      0.01
Var: Airport3.2 (Intercept)         0.01
Var: Airport3.3 ZLog_NAT_n_LS80_cmc 0.00
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SLqN80)
$Airport3
  (Intercept) ZLpAeq2206_cmc (Intercept) ZLog_NAT_n_LS80_cmc
1      0.002274672      0.063678340  0.010203613      2.696949e-08
1.1    0.004136061      0.052699823  0.018553339      9.472737e-08
1.2    0.003205066     -0.035460129  0.014377126      1.246016e-08
1.3   -0.006990928     -0.117391537 -0.031359562     -1.695465e-07
2      0.023314841      0.095655999  0.104584573      1.141826e-07
3     -0.006424412     -0.032015765 -0.028818314     -3.514284e-08
4     -0.028075649     -0.027908779 -0.125940375     -4.539213e-08
91     0.004437897      0.002146627  0.019907302      3.865920e-09
92     0.001188788     -0.028491558  0.005332606     -5.710019e-08
93     0.006373200     -0.010217892  0.028588589      1.848273e-08
94     0.001580381     -0.001907532  0.007089194      7.977897e-09
95    -0.003197926      0.038617599 -0.014345102      2.927582e-08

```

with conditional variances for "Airport3"



**4.44 Modell SMN50 (akustische Prädiktoren  $L_{AS,max,log,22-06h,50}$  und  $\log(NAT_{22-06h,50})$ )****4.44.1 MO\_SMN50**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5176

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1541	-10.49	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SMN50@theta[1] ^ 2 / (MO_SMN50@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.075292
```

```
> performance::icc(MO_SMN50)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SMN50)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SMN50)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.62 ***
                                (0.15)
-----
AIC                             16986.58
BIC                             17002.24
Log Likelihood                  -8491.29
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_SMN50)
$Airport3
  (Intercept)
1 -0.06300806
```

```

1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

>

#### 4.44.2 CIM\_SMN50

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLAm_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLAm_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
Data: dats

```

```

      AIC      BIC   logLik deviance df.resid
16280.5 16358.8 -8130.3 16260.5   18522

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-1.2244 -0.5052 -0.3833 -0.2631  5.8566

```

Random effects:

```

Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.01035  0.1018
Number of obs: 18532, groups: Airport3, 12

```

Fixed effects:

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.75951    0.04696 -37.466 < 2e-16 ***
ZLAm_n_LS50_cmc  0.37670    0.02388  15.774 < 2e-16 ***
ZLog_NAT_n_LS50_cmc 0.36691    0.02765  13.268 < 2e-16 ***
ZFlights2206_gmc  2.92177    0.28994  10.077 < 2e-16 ***
ZNightflightrate_gmc -0.85481    0.10239  -8.348 < 2e-16 ***
ZTrend2206_gmc  -0.30169    0.03868  -7.799 6.24e-15 ***
ZNoiseStarts24_gmc -3.09579    0.29895 -10.356 < 2e-16 ***
HRC_c          0.84608    0.16208  5.220 1.79e-07 ***
ZLAm_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.09959    0.02995  -3.325 0.000883 ***
---

```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

      (Intr) ZLAm__LS50_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLAm__LS50_ -0.049
ZL_NAT__LS5 -0.066 -0.267
ZFlght2206_ -0.183  0.010   -0.003
ZNghtflght_  0.090  0.007   -0.006 -0.876
ZTrnd2206_g  0.065  0.018   -0.027 -0.212  0.182
ZNSstrts24_  0.285 -0.013    0.000 -0.972  0.794  0.237
HRC_c        -0.431  0.045   -0.013  0.353 -0.030 -0.140 -0.522

```

```
ZLA__LS50_: -0.056 -0.394      -0.074 -0.022 -0.025 -0.081  0.034 -0.094
> performance::icc(CIM_SMN50)
# IntraClass Correlation Coefficient

Adjusted ICC: 0.003
Conditional ICC: 0.003
> performance::r2(CIM_SMN50)
# R2 for Mixed Models

Conditional R2: 0.125
Marginal R2: 0.122
> screenreg(CIM_SMN50)
```

```
=====
Model 1
-----
(Intercept)                -1.76 ***
                           (0.05)
ZLamax_n_LS50_cmc          0.38 ***
                           (0.02)
ZLog_NAT_n_LS50_cmc        0.37 ***
                           (0.03)
ZFlights2206_gmc           2.92 ***
                           (0.29)
ZNightflightrate_gmc       -0.85 ***
                           (0.10)
ZTrend2206_gmc             -0.30 ***
                           (0.04)
ZNoiseStarts24_gmc         -3.10 ***
                           (0.30)
HRC_c                      0.85 ***
                           (0.16)
ZLamax_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.10 ***
                           (0.03)
-----
AIC                        16280.54
BIC                        16358.81
Log Likelihood             -8130.27
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(CIM_SMN50)
$Airport3
```

```
(Intercept)
1 0.037778654
1.1 0.016165099
1.2 0.022776595
1.3 -0.070518375
2 0.156190687
3 -0.045889963
4 -0.178602092
91 0.032161262
92 0.001069297
93 0.038488878
94 0.006851850
95 -0.008921112
```

with conditional variances for "Airport3"  
>

#### 4.44.3 AIM1\_SMN50

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)  
Formula: HSDair ~ ZLAm<sub>max</sub>\_n\_LS50\_cmc + ZLog\_NAT\_n\_LS50\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAm<sub>max</sub>\_n\_LS50\_cmc || Airport3) + ZLAm<sub>max</sub>\_n\_LS50\_cmc:ZLog\_NAT\_n\_LS50\_cmc  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16277.3	16363.4	-8127.7	16255.3	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1964	-0.5044	-0.3815	-0.2585	5.8707

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.006616	0.08134
Airport3.1	ZLAm <sub>max</sub> _n_LS50_cmc	0.010528	0.10261

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.76539	0.04171	-42.330	< 2e-16 ***
ZLAm <sub>max</sub> _n_LS50_cmc	0.36632	0.04206	8.709	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.37363	0.02825	13.227	< 2e-16 ***
ZFlights2206_gmc	2.92048	0.26192	11.150	< 2e-16 ***
ZNightflightrate_gmc	-0.85209	0.09240	-9.221	< 2e-16 ***
ZTrend2206_gmc	-0.30572	0.03614	-8.460	< 2e-16 ***
ZNoiseStarts24_gmc	-3.10094	0.26946	-11.508	< 2e-16 ***
HRC_c	0.86597	0.14541	5.955	2.6e-09 ***
ZLAm <sub>max</sub> _n_LS50_cmc:ZLog_NAT_n_LS50_cmc	-0.08997	0.03084	-2.918	0.00353 **

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm__LS50_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLAm__LS50_	-0.049							
ZL_NAT__LS5	-0.092	-0.131						
ZFlight2206_	-0.199	0.021	-0.002					
ZNghtflight_	0.086	-0.002	-0.004	-0.882				
ZTrnd2206_g	0.078	-0.028	-0.030	-0.222	0.196			
ZNSstrts24_	0.299	-0.023	-0.002	-0.973	0.803	0.239		
HRC_c	-0.453	0.031	-0.006	0.336	-0.013	-0.101	-0.504	
ZLA__LS50_:	-0.083	-0.211	-0.022	-0.024	-0.025	-0.073	0.035	-0.094

> performance::icc(AIM1\_SMN50)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_SMN50)

# R2 for Mixed Models

Conditional R2: 0.124

Marginal R2: 0.122

```
> screenreg(AIM1_SMN50)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.77 ***
                                (0.04)
ZLAmx_n_LS50_cmc                0.37 ***
                                (0.04)
ZLog_NAT_n_LS50_cmc            0.37 ***
                                (0.03)
ZFlights2206_gmc               2.92 ***
                                (0.26)
ZNightflightrate_gmc          -0.85 ***
                                (0.09)
ZTrend2206_gmc                 -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.10 ***
                                (0.27)
HRC_c                           0.87 ***
                                (0.15)
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.09 **
                                (0.03)
-----
AIC                             16277.32
BIC                             16363.42
Log Likelihood                  -8127.66
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.01
Var: Airport3.1 ZLAmx_n_LS50_cmc 0.01
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(AIM1_SMN50)
```

```
$Airport3
  (Intercept) ZLAmx_n_LS50_cmc
1  0.022891760  0.102071877
1.1 0.014422924 -0.002159938
1.2 0.017407079 -0.013479250
1.3 -0.046271838 -0.171980843
2  0.115403508  0.120940970
3  -0.032594020 -0.024536670
4  -0.130358293 -0.026658163
91  0.020875557  0.003166665
92  0.005925985 -0.007717079
93  0.025395836  0.087043068
94  0.006119243 -0.003535772
95 -0.009450939 -0.062916706
```

```
with conditional variances for "Airport3"
```

```
>
```

#### 4.44.4 AIM2\_SMN50

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
```

```
Family: binomial ( logit )
```

```
Formula: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
```

```
ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
HRC_c + (1 + ZLog_NAT_n_LS50_cmc || Airport3) + ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
```

```

Data:  dats

      AIC      BIC   logLik deviance df.resid
16277.0 16363.1 -8127.5 16255.0   18521

Scaled residuals:
      Min       1Q   Median       3Q      Max
-1.2259 -0.5038 -0.3852 -0.2601  6.2064

Random effects:
 Groups      Name                Variance Std.Dev.
 Airport3    (Intercept)           0.009537 0.09766
 Airport3.1  ZLog_NAT_n_LS50_cmc 0.045719 0.21382
Number of obs: 18532, groups:  Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.76406    0.04627  -38.126 < 2e-16 ***
ZLAmx_n_LS50_cmc  0.37106    0.02417  15.353 < 2e-16 ***
ZLog_NAT_n_LS50_cmc 0.38086    0.08073   4.718 2.39e-06 ***
ZFlights2206_gmc  2.94118    0.28532  10.308 < 2e-16 ***
ZNightflightrate_gmc -0.86908    0.10070  -8.631 < 2e-16 ***
ZTrend2206_gmc   -0.31050    0.03953  -7.855 4.00e-15 ***
ZNoiseStarts24_gmc -3.11820    0.29400 -10.606 < 2e-16 ***
HRC_c           0.83862    0.15929   5.265 1.40e-07 ***
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.10424    0.03058  -3.408 0.000653 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) ZLAm__LS50_  ZL_NAT  ZF2206  ZNght_  ZT2206  ZNS24_  HRC_c
ZLAm__LS50_ -0.045
ZL_NAT__LS5 -0.063 -0.105
ZFlght2206_ -0.187  0.015      0.024
ZNghtflght_  0.092  0.006     -0.022 -0.876
ZTrnd2206_g  0.071  0.018     -0.057 -0.228  0.199
ZNsStrts24_  0.291 -0.017     -0.025 -0.972  0.794  0.247
HRC_c        -0.435  0.047      0.000  0.345 -0.023 -0.116 -0.515
ZLA__LS50_: -0.065 -0.389     -0.018 -0.044 -0.002 -0.051  0.052 -0.084
> performance::icc(AIM2_SMN50)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.003
Conditional ICC: 0.003
> performance::r2(AIM2_SMN50)
# R2 for Mixed Models

Conditional R2: 0.127
Marginal R2: 0.124
> screenreg(AIM2_SMN50)

```

```

=====
Model 1
-----
(Intercept)          -1.76 ***
                    (0.05)
ZLAmx_n_LS50_cmc      0.37 ***
                    (0.02)
ZLog_NAT_n_LS50_cmc  0.38 ***

```

```

                                (0.08)
ZFlights2206_gmc                2.94 ***
                                (0.29)
ZNightflightrate_gmc           -0.87 ***
                                (0.10)
ZTrend2206_gmc                 -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc             -3.12 ***
                                (0.29)
HRC_c                           0.84 ***
                                (0.16)
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.10 ***
                                (0.03)

```

```

-----
AIC                             16276.99
BIC                             16363.09
Log Likelihood                  -8127.50
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)        0.01
Var: Airport3.1 ZLog_NAT_n_LS50_cmc 0.05
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM2_SMN50)
```

```
$Airport3
```

```

  (Intercept) ZLog_NAT_n_LS50_cmc
1    0.013218176      0.255244996
1.1  0.022875418     -0.004367020
1.2  0.030020870     -0.192639597
1.3 -0.046168614     -0.154246260
2     0.142574001      0.265397194
3    -0.039438954      0.034817604
4    -0.175260680      0.079979232
91   0.029691276      0.004727405
92   0.007712223     -0.174497648
93   0.042190809     -0.297690550
94   0.010880785      0.049726443
95  -0.020778744      0.115969521

```

with conditional variances for "Airport3"

```
>
```

```
> anova(CIM_SMN50, AIM1_SMN50)
```

```
Data: dats
```

```
Models:
```

```
CIM_SMN50: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
```

```
CIM_SMN50:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
CIM_SMN50:      HRC_c + (1 | Airport3) + ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
```

```
AIM1_SMN50: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
```

```
AIM1_SMN50:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
AIM1_SMN50:      HRC_c + (1 + ZLAmx_n_LS50_cmc || Airport3) +
```

```
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
```

```
      npar  AIC  BIC logLik deviance Chisq Df Pr(>Chisq)
```

```
CIM_SMN50    10 16280 16359 -8130.3   16260
```

```
AIM1_SMN50   11 16277 16363 -8127.7   16255 5.2165 1    0.02237 *
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> anova(CIM_SMN50, AIM2_SMN50)
```

```
Data: dats
```

```
Models:
```

```

CIM_SMN50: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
CIM_SMN50:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN50:      HRC_c + (1 | Airport3) + ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
AIM2_SMN50: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
AIM2_SMN50:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SMN50:      HRC_c + (1 + ZLog_NAT_n_LS50_cmc || Airport3) +
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc
      npar  AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SMN50   10 16280 16359 -8130.3   16260
AIM2_SMN50  11 16277 16363 -8127.5   16255 5.5479  1    0.0185 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.44.5 FM\_SMN50

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) [`'glmerMod'`]  
Family: binomial (logit)

```

Formula: HSDair ~ ZLAmx_n_LS50_cmc + ZLog_NAT_n_LS50_cmc + ZFlights2206_gmc +
      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
      HRC_c + (1 + ZLAmx_n_LS50_cmc || Airport3) + (1 + ZLog_NAT_n_LS50_cmc ||
      Airport3) + ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc + ZLAmx_n_LS50_cmc:ZFlights2206_gmc +
      ZLAmx_n_LS50_cmc:ZNightflightrate_gmc + ZLAmx_n_LS50_cmc:ZTrend2206_gmc +
      ZLAmx_n_LS50_cmc:ZNoiseStarts24_gmc + ZLAmx_n_LS50_cmc:HRC_c +
      ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc +
      ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc +
ZLog_NAT_n_LS50_cmc:HRC_c
Data:  dats

```

AIC	BIC	logLik	deviance	df.resid
16286.0	16466.1	-8120.0	16240.0	18509

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.2972	-0.5034	-0.3847	-0.2517	6.4489

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	7.401e-03	0.0860297
Airport3.1	ZLAmx_n_LS50_cmc	6.329e-08	0.0002516
Airport3.2	(Intercept)	1.738e-03	0.0416877
Airport3.3	ZLog_NAT_n_LS50_cmc	3.977e-02	0.1994253

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.774618	0.045978	-38.597	< 2e-16 ***
ZLAmx_n_LS50_cmc	0.401422	0.029231	13.733	< 2e-16 ***
ZLog_NAT_n_LS50_cmc	0.407563	0.100308	4.063	4.84e-05 ***
ZFlights2206_gmc	2.964905	0.286710	10.341	< 2e-16 ***
ZNightflightrate_gmc	-0.866974	0.101273	-8.561	< 2e-16 ***
ZTrend2206_gmc	-0.313235	0.039965	-7.838	4.59e-15 ***
ZNoiseStarts24_gmc	-3.149239	0.294569	-10.691	< 2e-16 ***
HRC_c	0.882165	0.158642	5.561	2.69e-08 ***
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc	-0.094731	0.031657	-2.992	0.00277 **
ZLAmx_n_LS50_cmc:ZFlights2206_gmc	-0.040805	0.177788	-0.230	0.81847
ZLAmx_n_LS50_cmc:ZNightflightrate_gmc	-0.049151	0.060938	-0.807	0.41991
ZLAmx_n_LS50_cmc:ZTrend2206_gmc	0.006255	0.035304	0.177	0.85937
ZLAmx_n_LS50_cmc:ZNoiseStarts24_gmc	0.140505	0.182354	0.771	0.44100



```

ZLAmx_n_LS50_cmc:HRC_c          -0.315670  0.099904  -3.160  0.00158 **
ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc -0.908805  0.680511  -1.335  0.18172
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc 0.382058  0.223994  1.706  0.08807 .
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc      0.006098  0.065906  0.093  0.92629
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc  0.795003  0.688008  1.156  0.24788
ZLog_NAT_n_LS50_cmc:HRC_c            0.083831  0.343792  0.244  0.80735

```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as  $p = 19 > 12$ .

Use `print(x, correlation=TRUE)` or  
`vcov(x)` if you need it

convergence code: 0

Model failed to converge with  $\max|\text{grad}| = 0.00890929$  (tol = 0.002, component 1)

```

> performance::icc(FM_SMN50)
# Intraclass Correlation Coefficient

```

Adjusted ICC: 0.002

Conditional ICC: 0.002

```

> performance::r2(FM_SMN50)

```

# R2 for Mixed Models

Conditional R2: 0.130

Marginal R2: 0.128

```

> screenreg(FM_SMN50)

```

```

=====
Model 1
-----
(Intercept)          -1.77 ***
                    (0.05)
ZLAmx_n_LS50_cmc      0.40 ***
                    (0.03)
ZLog_NAT_n_LS50_cmc  0.41 ***
                    (0.10)
ZFlights2206_gmc     2.96 ***
                    (0.29)
ZNightflightrate_gmc -0.87 ***
                    (0.10)
ZTrend2206_gmc       -0.31 ***
                    (0.04)
ZNoiseStarts24_gmc   -3.15 ***
                    (0.29)
HRC_c                 0.88 ***
                    (0.16)
ZLAmx_n_LS50_cmc:ZLog_NAT_n_LS50_cmc -0.09 **
                    (0.03)
ZLAmx_n_LS50_cmc:ZFlights2206_gmc    -0.04
                    (0.18)
ZLAmx_n_LS50_cmc:ZNightflightrate_gmc -0.05
                    (0.06)
ZLAmx_n_LS50_cmc:ZTrend2206_gmc      0.01
                    (0.04)
ZLAmx_n_LS50_cmc:ZNoiseStarts24_gmc  0.14
                    (0.18)
ZLAmx_n_LS50_cmc:HRC_c                -0.32 **
                    (0.10)

```

ZLog_NAT_n_LS50_cmc:ZFlights2206_gmc	-0.91 (0.68)
ZLog_NAT_n_LS50_cmc:ZNightflightrate_gmc	0.38 (0.22)
ZLog_NAT_n_LS50_cmc:ZTrend2206_gmc	0.01 (0.07)
ZLog_NAT_n_LS50_cmc:ZNoiseStarts24_gmc	0.80 (0.69)
ZLog_NAT_n_LS50_cmc:HRC_c	0.08 (0.34)

---

AIC	16286.02
BIC	16466.05
Log Likelihood	-8120.01
Num. obs.	18532
Num. groups: Airport3	12
Var: Airport3 (Intercept)	0.01
Var: Airport3.1 ZLamax_n_LS50_cmc	0.00
Var: Airport3.2 (Intercept)	0.00
Var: Airport3.3 ZLog_NAT_n_LS50_cmc	0.04

=====  
\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(FM\_SMN50)

\$Airport3

	(Intercept)	ZLamax_n_LS50_cmc	(Intercept)	ZLog_NAT_n_LS50_cmc
1	0.013194846	7.405010e-07	0.003098293	0.279406999
1.1	0.016030593	5.162668e-07	0.003764158	0.066254607
1.2	0.023368734	-6.232051e-08	0.005487233	-0.216759312
1.3	-0.037263473	-1.663838e-06	-0.008749869	-0.262717154
2	0.112855017	1.305217e-06	0.026499585	0.162863909
3	-0.031622577	-3.744957e-07	-0.007425325	-0.074897915
4	-0.137444396	-6.225908e-07	-0.032273439	0.067653143
91	0.023459058	1.820830e-08	0.005508442	0.003888025
92	0.008697542	-7.424233e-07	0.002042277	-0.028927347
93	0.029665799	3.914516e-07	0.006965852	-0.138446011
94	0.007919713	2.309185e-08	0.001859635	-0.034644939
95	-0.015499044	4.505180e-07	-0.003639344	0.160689563

with conditional variances for "Airport3"

**4.45 Modell SMN60 (akustische Prädiktoren  $L_{AS,max,log,22-06h,60}$  und  $\log(NAT_{22-06h,60})$ )****4.45.1 MO\_SMN60**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5176

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1541	-10.49	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SMN60@theta[1] ^ 2 / (MO_SMN60@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.075292
```

```
> performance::icc(MO_SMN60)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SMN60)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SMN60)
```

```
=====
                        Model 1
-----
(Intercept)                -1.62 ***
                          (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_SMN60)
$Airport3
  (Intercept)
1 -0.06300806
```

```

1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

>

#### 4.45.2 CIM\_SMN60

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLAm_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc + HRC_c + (1 | Airport3) +
  ZLAm_n_LS60_cmc:ZLog_NAT_n_LS60_cmc
Data: dats

```

```

      AIC      BIC   logLik deviance df.resid
16282.8 16361.0 -8131.4 16262.8   18522

```

Scaled residuals:

```

      Min       1Q   Median       3Q      Max
-1.1045 -0.5030 -0.3884 -0.2572  6.3317

```

Random effects:

```

Groups   Name              Variance Std.Dev.
Airport3 (Intercept) 0.01012  0.1006
Number of obs: 18532, groups: Airport3, 12

```

Fixed effects:

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.76223    0.04675 -37.697 < 2e-16 ***
ZLAm_n_LS60_cmc  0.22249    0.02211  10.060 < 2e-16 ***
ZLog_NAT_n_LS60_cmc 0.46221    0.02711  17.048 < 2e-16 ***
ZFlights2206_gmc  2.92021    0.28788  10.144 < 2e-16 ***
ZNightflightrate_gmc -0.86135    0.10153  -8.484 < 2e-16 ***
ZTrend2206_gmc  -0.30601    0.03834  -7.982 1.44e-15 ***
ZNoiseStarts24_gmc -3.08655    0.29661 -10.406 < 2e-16 ***
HRC_c          0.80789    0.16008   5.047 4.49e-07 ***
ZLAm_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.04990    0.02142  -2.330 0.0198 *
---

```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

      (Intr) ZLAm__LS60_ ZL_NAT ZF2206 ZNght_ ZT2206 ZNS24_ HRC_c
ZLAm__LS60_ -0.021
ZL_NAT__LS6 -0.082 -0.348
ZFlght2206_ -0.183 -0.005      0.009
ZNghtflght_ 0.090 0.006      -0.012 -0.877
ZTrnd2206_g 0.065 -0.001      -0.025 -0.214 0.182
ZNSstrts24_ 0.286 0.008      -0.012 -0.972 0.796 0.241
HRC_c       -0.436 0.002      -0.006 0.354 -0.034 -0.148 -0.522

```

```
ZLA__LS60_: -0.102 -0.210      -0.156 -0.010 -0.011 -0.036  0.007  0.004
> performance::icc(CIM_SMN60)
# IntraClass Correlation Coefficient

Adjusted ICC: 0.003
Conditional ICC: 0.003
> performance::r2(CIM_SMN60)
# R2 for Mixed Models

Conditional R2: 0.129
Marginal R2: 0.126
> screenreg(CIM_SMN60)
```

```
=====
Model 1
-----
(Intercept)                -1.76 ***
                           (0.05)
ZLAmx_n_LS60_cmc           0.22 ***
                           (0.02)
ZLog_NAT_n_LS60_cmc       0.46 ***
                           (0.03)
ZFlights2206_gmc          2.92 ***
                           (0.29)
ZNightflightrate_gmc     -0.86 ***
                           (0.10)
ZTrend2206_gmc            -0.31 ***
                           (0.04)
ZNoiseStarts24_gmc       -3.09 ***
                           (0.30)
HRC_c                      0.81 ***
                           (0.16)
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.05 *
                           (0.02)
-----
AIC                        16282.76
BIC                        16361.03
Log Likelihood             -8131.38
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_SMN60)
$Airport3
(Intercept)
1 0.045883417
1.1 0.001228662
1.2 0.027473256
1.3 -0.068329732
2 0.153068791
3 -0.045149547
4 -0.176241109
91 0.031362925
92 0.007510393
93 0.032842494
94 0.005425521
95 -0.007625894
```

with conditional variances for "Airport3"  
>

#### 4.45.3 AIM1\_SMN60

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)  
Formula: HSDair ~ ZLAm<sub>max</sub>\_n\_LS60\_cmc + ZLog\_NAT\_n\_LS60\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAm<sub>max</sub>\_n\_LS60\_cmc || Airport3) + ZLAm<sub>max</sub>\_n\_LS60\_cmc:ZLog\_NAT\_n\_LS60\_cmc  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16280.3	16366.4	-8129.1	16258.3	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0832	-0.5041	-0.3856	-0.2538	6.3406

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.007493	0.08656
Airport3.1	ZLAm <sub>max</sub> _n_LS60_cmc	0.007566	0.08698

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.76928	0.04313	-41.026	< 2e-16 ***
ZLAm <sub>max</sub> _n_LS60_cmc	0.21873	0.03689	5.929	3.05e-09 ***
ZLog_NAT_n_LS60_cmc	0.47521	0.02836	16.758	< 2e-16 ***
ZFlights2206_gmc	2.92523	0.26885	10.881	< 2e-16 ***
ZNightflightrate_gmc	-0.86246	0.09470	-9.107	< 2e-16 ***
ZTrend2206_gmc	-0.30989	0.03657	-8.474	< 2e-16 ***
ZNoiseStarts24_gmc	-3.09320	0.27659	-11.183	< 2e-16 ***
HRC_c	0.82068	0.14858	5.524	3.32e-08 ***
ZLAm <sub>max</sub> _n_LS60_cmc:ZLog_NAT_n_LS60_cmc	-0.04291	0.02233	-1.922	0.0546 .

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm__LS60_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLAm__LS60_	-0.028							
ZL_NAT__LS6	-0.109	-0.200						
ZFlight2206_	-0.194	0.011	0.009					
ZNghtflght_	0.089	0.000	-0.012	-0.881				
ZTrnd2206_g	0.077	-0.022	-0.038	-0.222	0.191			
ZNSstrts24_	0.295	-0.011	-0.011	-0.973	0.803	0.242		
HRC_c	-0.449	0.014	-0.005	0.344	-0.025	-0.123	-0.510	
ZLA__LS60_:	-0.124	-0.132	-0.066	-0.009	-0.015	-0.048	0.008	-0.004

> performance::icc(AIM1\_SMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_SMN60)

# R2 for Mixed Models

Conditional R2: 0.131

Marginal R2: 0.129

```
> screenreg(AIM1_SMN60)

=====
                                Model 1
-----
(Intercept)                    -1.77 ***
                                (0.04)
ZLAmx_n_LS60_cmc                0.22 ***
                                (0.04)
ZLog_NAT_n_LS60_cmc            0.48 ***
                                (0.03)
ZFlights2206_gmc               2.93 ***
                                (0.27)
ZNightflightrate_gmc          -0.86 ***
                                (0.09)
ZTrend2206_gmc                 -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.09 ***
                                (0.28)
HRC_c                           0.82 ***
                                (0.15)
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.04
                                (0.02)
-----
AIC                             16280.27
BIC                             16366.37
Log Likelihood                  -8129.13
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.01
Var: Airport3.1 ZLAmx_n_LS60_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SMN60)
$Airport3
  (Intercept) ZLAmx_n_LS60_cmc
1    0.033450525    0.072411938
1.1  0.004745426   -0.053279103
1.2  0.022085562    0.010139652
1.3 -0.052035325   -0.140908688
2    0.125757385    0.098003739
3   -0.036294418   -0.010816463
4   -0.142544954   -0.024731155
91   0.023595787    0.003411217
92   0.011228817   -0.024955306
93   0.022970479    0.076745227
94   0.005430803    0.010237660
95  -0.008245643   -0.013680052
```

```
with conditional variances for "Airport3"
>
```

#### 4.45.4 AIM2\_SMN60

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_n_LS60_cmc || Airport3) + ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc
```

```

Data: dats

      AIC      BIC   logLik deviance df.resid
16273.3 16359.4 -8125.6 16251.3   18521

Scaled residuals:
      Min       1Q   Median       3Q      Max
-1.1288 -0.5051 -0.3922 -0.2397  6.9864

Random effects:
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)              0.004488 0.06699
Airport3.1  ZLog_NAT_n_LS60_cmc      0.044591 0.21117
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -1.77853    0.03923  -45.342 < 2e-16 ***
ZLAm_n_LS60_cmc  0.20582    0.02365   8.705 < 2e-16 ***
ZLog_NAT_n_LS60_cmc  0.52103    0.07583   6.871 6.37e-12 ***
ZFlights2206_gmc  2.94877    0.24494  12.039 < 2e-16 ***
ZNightflightrate_gmc -0.87866    0.08602 -10.215 < 2e-16 ***
ZTrend2206_gmc  -0.31565    0.03516  -8.978 < 2e-16 ***
ZNoiseStarts24_gmc -3.12052    0.25220 -12.373 < 2e-16 ***
HRC_c         0.82983    0.13587   6.108 1.01e-09 ***
ZLAm_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.04301    0.02423  -1.775  0.076 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
              (Intr) ZLAm__LS60_  ZL_NAT  ZF2206  ZNght_  ZT2206  ZNS24_  HRC_c
ZLAm__LS60_  0.022
ZL_NAT__LS6  -0.089 -0.121
ZFlght2206_ -0.229 -0.008      0.037
ZNghtflght_  0.101  0.021     -0.023 -0.886
ZTrnd2206_g  0.078 -0.009     -0.051 -0.237  0.214
ZNsStrts24_  0.332  0.016     -0.038 -0.974  0.808  0.244
HRC_c        -0.493 -0.017      0.029  0.330 -0.011 -0.063 -0.497
ZLA__LS60_: -0.170 -0.316     -0.068 -0.014 -0.014  0.005 -0.002  0.038
convergence code: 0
Model failed to converge with max|grad| = 0.00257104 (tol = 0.002, component 1)

> performance::icc(AIM2_SMN60)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.001
Conditional ICC: 0.001
> performance::r2(AIM2_SMN60)
# R2 for Mixed Models

Conditional R2: 0.139
Marginal R2: 0.138
> screenreg(AIM2_SMN60)

```

```

=====
-----
Model 1
-----
(Intercept)                -1.78 ***
                          (0.04)

```



```

ZLAmx_n_LS60_cmc          0.21 ***
                          (0.02)
ZLog_NAT_n_LS60_cmc      0.52 ***
                          (0.08)
ZFlights2206_gmc         2.95 ***
                          (0.24)
ZNightflightrate_gmc     -0.88 ***
                          (0.09)
ZTrend2206_gmc           -0.32 ***
                          (0.04)
ZNoiseStarts24_gmc       -3.12 ***
                          (0.25)
HRC_c                     0.83 ***
                          (0.14)
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.04
                          (0.02)

```

```

-----
AIC                        16273.27
BIC                        16359.37
Log Likelihood             -8125.64
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.00
Var: Airport3.1 ZLog_NAT_n_LS60_cmc 0.04

```

```

=====
*** p < 0.001; ** p < 0.01; * p < 0.05

```

```

> ranef(AIM2_SMN60)

```

```

$Airport3
  (Intercept) ZLog_NAT_n_LS60_cmc
1    0.003117622    0.316751383
1.1  0.013649461   -0.084860524
1.2  0.021599762   -0.205040349
1.3 -0.026104317   -0.240984501
2    0.081828976    0.374451588
3   -0.021154272    0.003137770
4   -0.100145092   -0.040313144
91   0.014380245    0.001419175
92   0.002518867    0.020661323
93   0.027456803   -0.105973809
94   0.007175406   -0.026592284
95  -0.013567918   -0.030354187

```

```

with conditional variances for "Airport3"

```

```

>

```

```

> anova(CIM_SMN60, AIM1_SMN60)

```

```

Data: dats

```

```

Models:

```

```

CIM_SMN60: HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
CIM_SMN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN60:   HRC_c + (1 | Airport3) + ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc
AIM1_SMN60: HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
AIM1_SMN60:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SMN60:   HRC_c + (1 + ZLAmx_n_LS60_cmc || Airport3) +
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc

```

```

      npar  AIC   BIC logLik deviance Chisq Df Pr(>Chisq)
CIM_SMN60   10 16283 16361 -8131.4   16263
AIM1_SMN60  11 16280 16366 -8129.1   16258 4.4929  1    0.03403 *

```

```

---

```

```

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

> anova(CIM_SMN60, AIM2_SMN60)
Data:  dats
Models:
CIM_SMN60:  HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
CIM_SMN60:    ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN60:    HRC_c + (1 | Airport3) + ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc
AIM2_SMN60:  HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
AIM2_SMN60:    ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SMN60:    HRC_c + (1 + ZLog_NAT_n_LS60_cmc || Airport3) +
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc
      npar  AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
CIM_SMN60   10 16283 16361 -8131.4   16263
AIM2_SMN60  11 16273 16359 -8125.6   16251 11.488  1 0.0007007 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.45.5 FM\_SMN60

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

```

Family: binomial ( logit )
Formula: HSDair ~ ZLAmx_n_LS60_cmc + ZLog_NAT_n_LS60_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLAmx_n_LS60_cmc || Airport3) + (1 + ZLog_NAT_n_LS60_cmc ||
  Airport3) + ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc + ZLAmx_n_LS60_cmc:ZFlights2206_gmc +
  ZLAmx_n_LS60_cmc:ZNightflightrate_gmc + ZLAmx_n_LS60_cmc:ZTrend2206_gmc +
  ZLAmx_n_LS60_cmc:ZNoiseStarts24_gmc + ZLAmx_n_LS60_cmc:HRC_c +
  ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc +
  ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc +
ZLog_NAT_n_LS60_cmc:HRC_c
Data:  dats

```

AIC	BIC	logLik	deviance	df.resid
16292	16472	-8123	16246	18509

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.3060	-0.5034	-0.3941	-0.2376	7.1780

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	4.208e-03	0.0648701
Airport3.1	ZLAmx_n_LS60_cmc	4.273e-08	0.0002067
Airport3.2	(Intercept)	4.964e-04	0.0222807
Airport3.3	ZLog_NAT_n_LS60_cmc	3.464e-02	0.1861208

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.78387	0.03969	-44.943	< 2e-16 ***
ZLAmx_n_LS60_cmc	0.19705	0.03361	5.863	4.55e-09 ***
ZLog_NAT_n_LS60_cmc	0.56384	0.08660	6.511	7.46e-11 ***
ZFlights2206_gmc	2.94545	0.25113	11.729	< 2e-16 ***
ZNightflightrate_gmc	-0.87364	0.08821	-9.904	< 2e-16 ***
ZTrend2206_gmc	-0.31741	0.03611	-8.789	< 2e-16 ***
ZNoiseStarts24_gmc	-3.12026	0.25776	-12.105	< 2e-16 ***
HRC_c	0.85015	0.13799	6.161	7.24e-10 ***
ZLAmx_n_LS60_cmc:ZLog_NAT_n_LS60_cmc	-0.03520	0.02632	-1.338	0.181
ZLAmx_n_LS60_cmc:ZFlights2206_gmc	0.08279	0.18666	0.444	0.657

ZLAm <sub>max</sub> _n_LS60_cmc:ZNightflightrate_gmc	-0.05213	0.06009	-0.868	0.386
ZLAm <sub>max</sub> _n_LS60_cmc:ZTrend2206_gmc	0.01593	0.02476	0.644	0.520
ZLAm <sub>max</sub> _n_LS60_cmc:ZNoiseStarts24_gmc	-0.07826	0.19030	-0.411	0.681
ZLAm <sub>max</sub> _n_LS60_cmc:HRC_c	-0.06233	0.08829	-0.706	0.480
ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc	-0.41633	0.53370	-0.780	0.435
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc	0.15148	0.18191	0.833	0.405
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc	0.02171	0.05595	0.388	0.698
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc	0.47065	0.54985	0.856	0.392
ZLog_NAT_n_LS60_cmc:HRC_c	-0.27250	0.28678	-0.950	0.342

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as  $p = 19 > 12$ .Use `print(x, correlation=TRUE)` or  
`vcov(x)` if you need it

convergence code: 0

Model failed to converge with  $\max|\text{grad}| = 0.0133012$  (tol = 0.002, component 1)

&gt; performance::icc(FM\_SMN60)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.001

Conditional ICC: 0.001

&gt; performance::r2(FM\_SMN60)

# R2 for Mixed Models

Conditional R2: 0.137

Marginal R2: 0.136

&gt; screenreg(FM\_SMN60)

```
=====
                                Model 1
-----
(Intercept)                    -1.78 ***
                                (0.04)
ZLAmmax_n_LS60_cmc              0.20 ***
                                (0.03)
ZLog_NAT_n_LS60_cmc            0.56 ***
                                (0.09)
ZFlights2206_gmc                2.95 ***
                                (0.25)
ZNightflightrate_gmc           -0.87 ***
                                (0.09)
ZTrend2206_gmc                 -0.32 ***
                                (0.04)
ZNoiseStarts24_gmc            -3.12 ***
                                (0.26)
HRC_c                           0.85 ***
                                (0.14)
ZLAmmax_n_LS60_cmc:ZLog_NAT_n_LS60_cmc -0.04
                                (0.03)
ZLAmmax_n_LS60_cmc:ZFlights2206_gmc  0.08
                                (0.19)
ZLAmmax_n_LS60_cmc:ZNightflightrate_gmc -0.05
                                (0.06)
ZLAmmax_n_LS60_cmc:ZTrend2206_gmc    0.02
                                (0.02)
ZLAmmax_n_LS60_cmc:ZNoiseStarts24_gmc -0.08
```

	(0.19)
ZLAm <sub>max</sub> _n_LS60_cmc:HRC_c	-0.06
	(0.09)
ZLog_NAT_n_LS60_cmc:ZFlights2206_gmc	-0.42
	(0.53)
ZLog_NAT_n_LS60_cmc:ZNightflightrate_gmc	0.15
	(0.18)
ZLog_NAT_n_LS60_cmc:ZTrend2206_gmc	0.02
	(0.06)
ZLog_NAT_n_LS60_cmc:ZNoiseStarts24_gmc	0.47
	(0.55)
ZLog_NAT_n_LS60_cmc:HRC_c	-0.27
	(0.29)

```
-----
AIC                16291.97
BIC                16472.00
Log Likelihood    -8122.99
Num. obs.         18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.00
Var: Airport3.1 ZLAmmax_n_LS60_cmc  0.00
Var: Airport3.2 (Intercept)  0.00
Var: Airport3.3 ZLog_NAT_n_LS60_cmc  0.03
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

> ranef(FM\_SMN60)

\$Airport3

	(Intercept)	ZLAm <sub>max</sub> _n_LS60_cmc	(Intercept)	ZLog_NAT_n_LS60_cmc
1	0.006464407	5.039226e-07	0.0007625973	0.2953977657
1.1	0.009490005	-1.235844e-07	0.0011195230	-0.0194510067
1.2	0.019695751	1.821999e-07	0.0023234810	-0.1669625527
1.3	-0.025159551	-8.707350e-07	-0.0029680381	-0.2093855596
2	0.076151160	4.720972e-07	0.0089834492	0.2563934126
3	-0.020023137	-1.000855e-07	-0.0023621023	-0.0881198470
4	-0.093134502	-2.847964e-07	-0.0109869511	-0.0919634846
91	0.013583020	1.953187e-08	0.0016023704	0.0009756776
92	0.003393532	-7.462124e-07	0.0004003303	0.0014742125
93	0.024176853	6.408956e-07	0.0028521106	-0.0866905257
94	0.006030128	2.213432e-08	0.0007113660	-0.0280177243
95	-0.011321668	3.056077e-07	-0.0013356019	0.1215792315

with conditional variances for "Airport3"

**4.46 Modell SMN70 (akustische Prädiktoren  $L_{AS,max,log,22-06h,70}$  und  $\log(NAT_{22-06h,70})$ )****4.46.1 MO\_SMN70**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HSDair ~ (1 | Airport3)

Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5176

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1541	-10.49	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SMN70@theta[1] ^ 2 / (MO_SMN70@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.075292
```

```
> performance::icc(MO_SMN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SMN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SMN70)
```

```
=====
                                Model 1
-----
(Intercept)                    -1.62 ***
                                (0.15)
-----
AIC                             16986.58
BIC                             17002.24
Log Likelihood                  -8491.29
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.27
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(MO_SMN70)
$Airport3
  (Intercept)
1 -0.06300806
```

```

1.1 0.25571466
1.2 0.03926515
1.3 -0.25208869
2 -0.22400563
3 0.18283402
4 -0.82791642
91 0.17410838
92 0.56598270
93 0.45689126
94 -0.99572862
95 0.73618866

```

with conditional variances for "Airport3"

>

#### 4.46.2 CIM\_SMN70

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)

Formula: HSDair ~ ZLAm<sub>n</sub>\_LS70<sub>cmc</sub> + ZLog<sub>NAT</sub>\_n\_LS70<sub>cmc</sub> + ZFlights2206<sub>gmc</sub> +  
ZNightflightrate<sub>gmc</sub> + ZTrend2206<sub>gmc</sub> + ZNoiseStarts24<sub>gmc</sub> +  
HRC<sub>c</sub> + (1 | Airport3) + ZLAm<sub>n</sub>\_LS70<sub>cmc</sub>:ZLog<sub>NAT</sub>\_n\_LS70<sub>cmc</sub>

Data: dats

AIC	BIC	logLik	deviance	df.resid
16349.6	16427.9	-8164.8	16329.6	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.9542	-0.5062	-0.3882	-0.2642	5.8406

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.009395	0.09693

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.75904	0.04595	-38.282	< 2e-16 ***
ZLAm <sub>n</sub> _LS70 <sub>cmc</sub>	0.06924	0.02228	3.108	0.00188 **
ZLog <sub>NAT</sub> _n_LS70 <sub>cmc</sub>	0.51673	0.02650	19.503	< 2e-16 ***
ZFlights2206 <sub>gmc</sub>	2.93483	0.28248	10.389	< 2e-16 ***
ZNightflightrate <sub>gmc</sub>	-0.85899	0.09953	-8.631	< 2e-16 ***
ZTrend2206 <sub>gmc</sub>	-0.29726	0.03762	-7.902	2.75e-15 ***
ZNoiseStarts24 <sub>gmc</sub>	-3.10275	0.29088	-10.667	< 2e-16 ***
HRC <sub>c</sub>	0.83284	0.15690	5.308	1.11e-07 ***
ZLAm <sub>n</sub> _LS70 <sub>cmc</sub> :ZLog <sub>NAT</sub> _n_LS70 <sub>cmc</sub>	-0.03329	0.02051	-1.623	0.10460

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm__LS70_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLAm__LS70_	0.037							
ZL_NAT__LS7_	-0.091	-0.392						
ZFlght2206_	-0.178	-0.002	0.016					
ZNghtflght_	0.079	0.001	-0.014	-0.879				
ZTrnd2206_g	0.063	-0.002	-0.006	-0.214	0.181			
ZNsStrts24_	0.281	0.006	-0.017	-0.973	0.798	0.240		
HRC_c	-0.442	-0.016	0.009	0.351	-0.032	-0.146	-0.519	

```
ZLA__LS70_: -0.153 -0.264      -0.169 -0.044  0.043 -0.026  0.036  0.030
> performance::icc(CIM_SMN70)
# IntraClass Correlation Coefficient

Adjusted ICC: 0.003
Conditional ICC: 0.003
> performance::r2(CIM_SMN70)
# R2 for Mixed Models

Conditional R2: 0.120
Marginal R2: 0.118
> screenreg(CIM_SMN70)
```

```
=====
Model 1
-----
(Intercept)                -1.76 ***
                           (0.05)
ZLamax_n_LS70_cmc          0.07 **
                           (0.02)
ZLog_NAT_n_LS70_cmc        0.52 ***
                           (0.03)
ZFlights2206_gmc           2.93 ***
                           (0.28)
ZNightflightrate_gmc      -0.86 ***
                           (0.10)
ZTrend2206_gmc             -0.30 ***
                           (0.04)
ZNoiseStarts24_gmc        -3.10 ***
                           (0.29)
HRC_c                      0.83 ***
                           (0.16)
ZLamax_n_LS70_cmc:ZLog_NAT_n_LS70_cmc -0.03
                           (0.02)
-----
AIC                        16349.64
BIC                        16427.92
Log Likelihood             -8164.82
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
=====
```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(CIM_SMN70)
$Airport3
(Intercept)
1 0.042094148
1.1 -0.004158360
1.2 0.029848955
1.3 -0.060671469
2 0.143366678
3 -0.041400535
4 -0.169926375
91 0.029326715
92 0.004641343
93 0.037135986
94 0.005576410
95 -0.008852792
```

with conditional variances for "Airport3"  
>

#### 4.46.3 AIM1\_SMN70

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
Family: binomial (logit)  
Formula: HSDair ~ ZLAm<sub>max</sub>\_n\_LS70\_cmc + ZLog\_NAT\_n\_LS70\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAm<sub>max</sub>\_n\_LS70\_cmc || Airport3) + ZLAm<sub>max</sub>\_n\_LS70\_cmc:ZLog\_NAT\_n\_LS70\_cmc  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16339.6	16425.7	-8158.8	16317.6	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1407	-0.5050	-0.3888	-0.2611	6.0906

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.008221	0.09067
Airport3.1	ZLAm <sub>max</sub> _n_LS70_cmc	0.022379	0.14960

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.772134	0.044584	-39.748	< 2e-16 ***
ZLAm <sub>max</sub> _n_LS70_cmc	-0.004041	0.057423	-0.070	0.944
ZLog_NAT_n_LS70_cmc	0.557002	0.029389	18.952	< 2e-16 ***
ZFlights2206_gmc	2.895178	0.275144	10.522	< 2e-16 ***
ZNightflightrate_gmc	-0.851753	0.096876	-8.792	< 2e-16 ***
ZTrend2206_gmc	-0.304636	0.037142	-8.202	2.36e-16 ***
ZNoiseStarts24_gmc	-3.056428	0.283086	-10.797	< 2e-16 ***
HRC_c	0.824012	0.152289	5.411	6.27e-08 ***
ZLAm <sub>max</sub> _n_LS70_cmc:ZLog_NAT_n_LS70_cmc	-0.006493	0.023208	-0.280	0.780

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)	ZLAm__LS70_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLAm__LS70_	0.038							
ZL_NAT__LS7	-0.133	-0.268						
ZFlight2206_	-0.176	0.017	0.000					
ZNghtflight_	0.075	-0.009	-0.002	-0.881				
ZTrnd2206_g	0.074	0.001	-0.028	-0.219	0.187			
ZNsStrts24_	0.277	-0.018	0.001	-0.973	0.802	0.242		
HRC_c	-0.443	0.007	0.002	0.346	-0.028	-0.132	-0.513	
ZLA__LS70_:	-0.192	-0.215	0.039	-0.049	0.044	-0.044	0.043	0.020

> performance::icc(AIM1\_SMN70)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_SMN70)

# R2 for Mixed Models

Conditional R2: 0.122

Marginal R2: 0.120



```

> screenreg(AIM1_SMN70)

=====
                                Model 1
-----
(Intercept)                    -1.77 ***
                                (0.04)
ZLAmx_n_LS70_cmc                -0.00
                                (0.06)
ZLog_NAT_n_LS70_cmc             0.56 ***
                                (0.03)
ZFlights2206_gmc                2.90 ***
                                (0.28)
ZNightflightrate_gmc           -0.85 ***
                                (0.10)
ZTrend2206_gmc                 -0.30 ***
                                (0.04)
ZNoiseStarts24_gmc             -3.06 ***
                                (0.28)
HRC_c                           0.82 ***
                                (0.15)
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc -0.01
                                (0.02)
-----
AIC                             16339.61
BIC                             16425.71
Log Likelihood                  -8158.81
Num. obs.                       18532
Num. groups: Airport3           12
Var: Airport3 (Intercept)       0.01
Var: Airport3.1 ZLAmx_n_LS70_cmc 0.02
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SMN70)
$Airport3
  (Intercept) ZLAmx_n_LS70_cmc
1    0.036964411    0.076458867
1.1 -0.004274115   -0.066668057
1.2  0.028435494   -0.103809807
1.3 -0.050392937   -0.331499870
2    0.131113622    0.036857706
3   -0.037323260    0.096266030
4   -0.155186261   -0.028861237
91   0.026052891    0.006176114
92   0.010303342    0.002310697
93   0.030533753    0.102400241
94   0.006340368    0.099641690
95  -0.009846628    0.124124896

```

with conditional variances for "Airport3"

>

#### 4.46.4 AIM2\_SMN70

```

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial ( logit )
Formula: HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
  ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
  HRC_c + (1 + ZLog_NAT_n_LS70_cmc || Airport3) + ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc

```

```

Data: dats

      AIC      BIC   logLik deviance df.resid
16332.7 16418.8 -8155.3 16310.7   18521

Scaled residuals:
      Min       1Q   Median       3Q      Max
-0.8988 -0.5132 -0.3898 -0.2519  6.7137

Random effects:
Groups      Name                Variance Std.Dev.
Airport3    (Intercept)                2.183e-09 4.673e-05
Airport3.1  ZLog_NAT_n_LS70_cmc         4.040e-02 2.010e-01
Number of obs: 18532, groups: Airport3, 12

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.76572    0.02750  -64.213 < 2e-16 ***
ZLAm_n_LS70_cmc  0.05796    0.02301   2.519  0.0118 *
ZLog_NAT_n_LS70_cmc  0.55314    0.07173   7.712 1.24e-14 ***
ZFlights2206_gmc  2.93246    0.18958  15.468 < 2e-16 ***
ZNightflightrate_gmc -0.87902    0.06882 -12.773 < 2e-16 ***
ZTrend2206_gmc   -0.31879    0.03108 -10.258 < 2e-16 ***
ZNoiseStarts24_gmc -3.09327    0.19358 -15.980 < 2e-16 ***
HRC_c           0.81777    0.10138   8.066 7.24e-16 ***
ZLAm_n_LS70_cmc:ZLog_NAT_n_LS70_cmc -0.03345    0.02131  -1.569  0.1166
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
              (Intr) ZLAm__LS70_  ZL_NAT  ZF2206  ZNght_  ZT2206  ZNS24_  HRC_c
ZLAm__LS70_  0.118
ZL_NAT__LS7  -0.114 -0.174
ZFlght2206_ -0.271  0.001      0.041
ZNghtflght_  0.108 -0.007      -0.024 -0.915
ZTrnd2206_g  0.193  0.011      -0.081 -0.295  0.251
ZNSstrts24_  0.350  0.010      -0.040 -0.977  0.850  0.291
HRC_c        -0.538 -0.052      0.030  0.197  0.085 -0.009 -0.370
ZLA__LS70_: -0.297 -0.296      -0.053 -0.063  0.077 -0.008  0.042  0.081
convergence code: 0
boundary (singular) fit: see ?issingular

> performance::icc(AIM2_SMN70)
# Intraclass Correlation Coefficient

Adjusted ICC: 0.000
Conditional ICC: 0.000
> performance::r2(AIM2_SMN70)
# R2 for Mixed Models

Conditional R2: 0.127
Marginal R2: 0.127
> screenreg(AIM2_SMN70)

```

```

=====
-----
Model 1
-----
(Intercept)                -1.77 ***
                          (0.03)

```

```

ZLAmx_n_LS70_cmc          0.06 *
                          (0.02)
ZLog_NAT_n_LS70_cmc      0.55 ***
                          (0.07)
ZFlights2206_gmc         2.93 ***
                          (0.19)
ZNightflightrate_gmc    -0.88 ***
                          (0.07)
ZTrend2206_gmc          -0.32 ***
                          (0.03)
ZNoiseStarts24_gmc      -3.09 ***
                          (0.19)
HRC_c                    0.82 ***
                          (0.10)
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc -0.03
                          (0.02)

```

```

-----
AIC                        16332.66
BIC                        16418.76
Log Likelihood             -8155.33
Num. obs.                  18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.00
Var: Airport3.1 ZLog_NAT_n_LS70_cmc 0.04
=====

```

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05

```
> ranef(AIM2_SMN70)
```

```
$Airport3
```

```

(Intercept) ZLog_NAT_n_LS70_cmc
1    9.468918e-10    0.336411722
1.1  1.674619e-08   -0.075576713
1.2  1.122241e-08   -0.121315806
1.3 -2.213811e-08   -0.289367813
2    6.001567e-08    0.235145511
3   -1.530229e-08    0.061775392
4   -6.653994e-08   -0.188902487
91   7.043846e-09    0.009541801
92   1.595667e-09    0.015594462
93   1.589476e-08    0.001285163
94   4.884373e-09    0.124380848
95  -8.649021e-09   -0.113763427

```

with conditional variances for "Airport3"

```
>
```

```
> anova(CIM_SMN70, AIM1_SMN70)
```

```
Data: dats
```

```
Models:
```

```
CIM_SMN70: HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
```

```
CIM_SMN70:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
CIM_SMN70:      HRC_c + (1 | Airport3) + ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc
```

```
AIM1_SMN70: HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
```

```
AIM1_SMN70:      ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
```

```
AIM1_SMN70:      HRC_c + (1 + ZLAmx_n_LS70_cmc || Airport3) +
```

```
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc
```

```
      npar  AIC   BIC logLik deviance Chisq Df Pr(>Chisq)
```

```
CIM_SMN70    10 16350 16428 -8164.8   16330
```

```
AIM1_SMN70   11 16340 16426 -8158.8   16318 12.03  1 0.0005234 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```

> anova(CIM_SMN70, AIM2_SMN70)
Data:  dats
Models:
CIM_SMN70:  HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
CIM_SMN70:    ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN70:    HRC_c + (1 | Airport3) + ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc
AIM2_SMN70:  HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
AIM2_SMN70:    ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SMN70:    HRC_c + (1 + ZLog_NAT_n_LS70_cmc || Airport3) +
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc
      npar  AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
CIM_SMN70   10 16350 16428 -8164.8   16330
AIM2_SMN70  11 16333 16419 -8155.3   16311 18.982  1  1.319e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```

#### 4.46.5 FM\_SMN70

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

```

Formula:  HSDair ~ ZLAmx_n_LS70_cmc + ZLog_NAT_n_LS70_cmc + ZFlights2206_gmc +
          ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
          HRC_c + (1 + ZLAmx_n_LS70_cmc || Airport3) + (1 + ZLog_NAT_n_LS70_cmc ||
          Airport3) + ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc + ZLAmx_n_LS70_cmc:ZFlights2206_gmc +
          ZLAmx_n_LS70_cmc:ZNightflightrate_gmc + ZLAmx_n_LS70_cmc:ZTrend2206_gmc +
          ZLAmx_n_LS70_cmc:ZNoiseStarts24_gmc + ZLAmx_n_LS70_cmc:HRC_c +
          ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc + ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc +
          ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc + ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc +
          ZLog_NAT_n_LS70_cmc:HRC_c
Data:  dats

```

AIC	BIC	logLik	deviance	df.resid
16330	16510	-8142	16284	18509

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.3049	-0.5090	-0.3916	-0.2458	7.4405

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	2.133e-08	1.460e-04
Airport3.1	ZLAmx_n_LS70_cmc	1.023e-09	3.198e-05
Airport3.2	(Intercept)	1.175e-09	3.428e-05
Airport3.3	ZLog_NAT_n_LS70_cmc	3.661e-02	1.913e-01

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.788716	0.028522	-62.714	< 2e-16 ***
ZLAmx_n_LS70_cmc	-0.123407	0.046437	-2.658	0.007872 **
ZLog_NAT_n_LS70_cmc	0.674946	0.086176	7.832	4.79e-15 ***
ZFlights2206_gmc	2.952542	0.194622	15.171	< 2e-16 ***
ZNightflightrate_gmc	-0.882477	0.070421	-12.531	< 2e-16 ***
ZTrend2206_gmc	-0.325416	0.032594	-9.984	< 2e-16 ***
ZNoiseStarts24_gmc	-3.117706	0.197988	-15.747	< 2e-16 ***
HRC_c	0.834712	0.103380	8.074	6.79e-16 ***
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc	0.002957	0.024471	0.121	0.903825
ZLAmx_n_LS70_cmc:ZFlights2206_gmc	0.809170	0.248080	3.262	0.001107 **

```

ZLAmx_n_LS70_cmc:ZNightflightrate_gmc -0.198617 0.074620 -2.662 0.007775 **
ZLAmx_n_LS70_cmc:ZTrend2206_gmc 0.026043 0.020664 1.260 0.207547
ZLAmx_n_LS70_cmc:ZNoiseStarts24_gmc -0.934433 0.251221 -3.720 0.000200 ***
ZLAmx_n_LS70_cmc:HRC_c 0.345771 0.100252 3.449 0.000563 ***
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc -0.525153 0.508193 -1.033 0.301429
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc 0.171431 0.177150 0.968 0.333186
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc 0.068584 0.061804 1.110 0.267126
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc 0.675853 0.521669 1.296 0.195127
ZLog_NAT_n_LS70_cmc:HRC_c -0.345703 0.275576 -1.254 0.209669

```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

boundary (singular) fit: see ?issingular

```
> performance::icc(FM_SMN70)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.000
```

```
Conditional ICC: 0.000
```

```
> performance::r2(FM_SMN70)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.138
```

```
Marginal R2: 0.138
```

```
> screenreg(FM_SMN70)
```

```

=====
Model 1
-----
(Intercept) -1.79 ***
(0.03)
ZLAmx_n_LS70_cmc -0.12 **
(0.05)
ZLog_NAT_n_LS70_cmc 0.67 ***
(0.09)
ZFlights2206_gmc 2.95 ***
(0.19)
ZNightflightrate_gmc -0.88 ***
(0.07)
ZTrend2206_gmc -0.33 ***
(0.03)
ZNoiseStarts24_gmc -3.12 ***
(0.20)
HRC_c 0.83 ***
(0.10)
ZLAmx_n_LS70_cmc:ZLog_NAT_n_LS70_cmc 0.00
(0.02)
ZLAmx_n_LS70_cmc:ZFlights2206_gmc 0.81 **
(0.25)
ZLAmx_n_LS70_cmc:ZNightflightrate_gmc -0.20 **
(0.07)
ZLAmx_n_LS70_cmc:ZTrend2206_gmc 0.03
(0.02)
ZLAmx_n_LS70_cmc:ZNoiseStarts24_gmc -0.93 ***

```

```

(0.25)
ZLamax_n_LS70_cmc:HRC_c          0.35 ***
(0.10)
ZLog_NAT_n_LS70_cmc:ZFlights2206_gmc -0.53
(0.51)
ZLog_NAT_n_LS70_cmc:ZNightflightrate_gmc 0.17
(0.18)
ZLog_NAT_n_LS70_cmc:ZTrend2206_gmc      0.07
(0.06)
ZLog_NAT_n_LS70_cmc:ZNoiseStarts24_gmc  0.68
(0.52)
ZLog_NAT_n_LS70_cmc:HRC_c          -0.35
(0.28)
-----
AIC                                16330.02
BIC                                16510.04
Log Likelihood                     -8142.01
Num. obs.                          18532
Num. groups: Airport3              12
Var: Airport3 (Intercept)           0.00
Var: Airport3.1 ZLamax_n_LS70_cmc  0.00
Var: Airport3.2 (Intercept)         0.00
Var: Airport3.3 ZLog_NAT_n_LS70_cmc 0.04
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SMN70)
$Airport3
  (Intercept) ZLamax_n_LS70_cmc (Intercept) ZLog_NAT_n_LS70_cmc
1  1.875419e-08 -9.292729e-10  1.033087e-09  0.297186675
1.1 1.356453e-07  1.182272e-08  7.472111e-09 -0.090986394
1.2 1.276123e-07 -2.374027e-09  7.029608e-09 -0.061624956
1.3 -2.217180e-07 -1.497434e-08 -1.221349e-08 -0.228868171
2   5.552335e-07  6.884310e-10  3.058541e-08  0.299401449
3  -1.408942e-07  8.227889e-10 -7.761251e-09 -0.089144036
4  -6.287224e-07  4.037129e-09 -3.463359e-08 -0.195552905
91  7.033962e-08  3.127653e-10  3.874705e-09  0.009343406
92  8.067021e-10 -2.352526e-08  4.443773e-11 -0.033346144
93  1.683775e-07  1.807247e-08  9.275189e-09  0.005860064
94  4.457210e-08  1.292329e-09  2.455284e-09 -0.017739802
95 -7.609370e-08  5.499757e-09 -4.191673e-09  0.101789552

```

with conditional variances for "Airport3"

**4.47 Modell SMN80 (akustische Prädiktoren  $L_{AS,max,log,22-06h,80}$  und  $\log(NAT_{22-06h,80})$ )****4.47.1 MO\_SMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
Formula: HSDair ~ (1 | Airport3)  
Data: dats

AIC	BIC	logLik	deviance	df.resid
16986.6	17002.2	-8491.3	16982.6	18530

Scaled residuals:

Min	1Q	Median	3Q	Max
-0.6437	-0.5062	-0.4317	-0.2945	3.6930

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.2679	0.5175

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.6172	0.1539	-10.51	<2e-16 ***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> icc <- MO_SMN80@theta[1] ^ 2 / (MO_SMN80@theta[1] ^ 2 + (3.14159 ^ 2 / 3))
```

```
> icc
```

```
[1] 0.07528805
```

```
> performance::icc(MO_SMN80)
```

```
# Intraclass Correlation Coefficient
```

```
Adjusted ICC: 0.075
```

```
Conditional ICC: 0.075
```

```
> performance::r2(MO_SMN80)
```

```
# R2 for Mixed Models
```

```
Conditional R2: 0.075
```

```
Marginal R2: 0.000
```

```
> screenreg(MO_SMN80)
```

```
=====
Model 1
-----
(Intercept)                -1.62 ***
                           (0.15)
-----
AIC                        16986.58
BIC                        17002.24
Log Likelihood             -8491.29
Num. obs.                  18532
Num. groups: Airport3     12
Var: Airport3 (Intercept)  0.27
=====
```

```
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(MO_SMN80)
```

```
$Airport3
```

```
(Intercept)
```

```
1 -0.06300428
```

```
1.1 0.25571838
```

```
1.2 0.03926869
```

```
1.3 -0.25208466
```

```
2 -0.22400173
```

```
3 0.18283767
```

```
4 -0.82791041
```

```
91 0.17410584
```

```
92 0.56598494
```

```
93 0.45689415
```

```
94 -0.99572180
```

```
95 0.73619152
```

```
with conditional variances for "Airport3"
```

```
>
```

**4.47.2 CIM\_SMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']  
 Family: binomial ( logit )  
 Formula: HSDair ~ ZLAm<sub>n</sub>\_LS80\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
 ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc + HRC\_c + (1 | Airport3) +  
 ZLAm<sub>n</sub>\_LS80\_cmc:ZLog\_NAT\_n\_LS80\_cmc  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16537.1	16615.3	-8258.5	16517.1	18522

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.0824	-0.4896	-0.3993	-0.3090	6.4601

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.008363	0.09145

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.77464	0.04501	-39.428	< 2e-16	***
ZLAm <sub>n</sub> _LS80_cmc	-0.10225	0.03513	-2.910	0.00361	**
ZLog_NAT_n_LS80_cmc	0.48151	0.02831	17.011	< 2e-16	***
ZFlights2206_gmc	2.74152	0.27632	9.922	< 2e-16	***
ZNightflightrate_gmc	-0.79651	0.09695	-8.215	< 2e-16	***
ZTrend2206_gmc	-0.31436	0.03693	-8.512	< 2e-16	***
ZNoiseStarts24_gmc	-2.85277	0.28667	-9.951	< 2e-16	***
HRC_c	0.70979	0.15413	4.605	4.12e-06	***
ZLAm <sub>n</sub> _LS80_cmc:ZLog_NAT_n_LS80_cmc	0.08006	0.02560	3.127	0.00177	**

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLAm__LS80_	ZL_NAT	ZF2206	ZNght_	ZT2206	ZNS24_	HRC_c
ZLAm__LS80_	0.192						
ZL_NAT__LS80_	-0.181	-0.651					
ZFligh2206_	-0.149	0.111	-0.063				
ZNightflight_	0.053	-0.094	0.058	-0.881			
ZTrnd2206_g	0.079	0.044	-0.057	-0.206	0.176		
ZNSStrts24_	0.236	-0.137	0.081	-0.973	0.802	0.225	
HRC_c	-0.389	0.118	-0.076	0.365	-0.049	-0.122	-0.532
ZLA__LS80_:	-0.241	-0.763	0.423	-0.152	0.123	-0.070	0.190

&gt; performance::icc(CIM\_SMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.003

Conditional ICC: 0.002

&gt; performance::r2(CIM\_SMN80)

# R2 for Mixed Models

Conditional R2: 0.096

Marginal R2: 0.094

&gt; screenreg(CIM\_SMN80)

```
=====
                                Model 1
-----
(Intercept)                    -1.77 ***
                                (0.05)
ZLAmn_LS80_cmc                  -0.10 **
                                (0.04)
ZLog_NAT_n_LS80_cmc             0.48 ***
                                (0.03)
ZFlights2206_gmc                2.74 ***
                                (0.28)
ZNightflightrate_gmc           -0.80 ***
                                (0.10)
ZTrend2206_gmc                 -0.31 ***
                                (0.04)
ZNoiseStarts24_gmc            -2.85 ***
                                (0.29)
HRC_c                           0.71 ***
                                (0.15)
ZLAmn_LS80_cmc:ZLog_NAT_n_LS80_cmc 0.08 **
                                (0.03)
-----
AIC                             16537.06
BIC                             16615.33
Log Likelihood                  -8258.53
Num. obs.                       18532
=====
```



```
Num. groups: Airport3                12
Var: Airport3 (Intercept)            0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(CIM_SMN80)
$Airport3
  (Intercept)
1      0.045045063
1.1    0.011169621
1.2    0.018444199
1.3   -0.072850256
2      0.138450716
3     -0.042361830
4     -0.145596628
91     0.026301996
92     0.011889311
93     0.014198162
94     0.003640786
95    -0.002046017

with conditional variances for "Airport3"
>
```

**4.47.3 AIM1\_SMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial (logit)  
 Formula: HSDair ~ ZLAm<sub>n</sub>LS80<sub>cmc</sub> + ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub> + ZFlights2206<sub>gmc</sub> +  
 ZNightflightrate<sub>gmc</sub> + ZTrend2206<sub>gmc</sub> + ZNoiseStarts24<sub>gmc</sub> +  
 HRC<sub>c</sub> + (1 + ZLAm<sub>n</sub>LS80<sub>cmc</sub> || Airport3) + ZLAm<sub>n</sub>LS80<sub>cmc</sub>:ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub>  
 Data: dats

AIC	BIC	logLik	deviance	df.resid
16506.7	16592.8	-8242.4	16484.7	18521

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.3185	-0.4868	-0.3937	-0.3083	6.4188

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.007944	0.08913
Airport3.1	ZLAm <sub>n</sub> LS80 <sub>cmc</sub>	0.085570	0.29252

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.79928	0.04505	-39.942	< 2e-16 ***
ZLAm <sub>n</sub> LS80 <sub>cmc</sub>	-0.28392	0.10293	-2.758	0.00581 **
ZLog <sub>NAT</sub> <sub>n</sub> LS80 <sub>cmc</sub>	0.56617	0.03358	16.858	< 2e-16 ***
ZFlights2206 <sub>gmc</sub>	2.63131	0.27389	9.607	< 2e-16 ***
ZNightflightrate <sub>gmc</sub>	-0.77382	0.09605	-8.056	7.86e-16 ***
ZTrend2206 <sub>gmc</sub>	-0.31679	0.03678	-8.612	< 2e-16 ***
ZNoiseStarts24 <sub>gmc</sub>	-2.71683	0.28456	-9.547	< 2e-16 ***
HRC <sub>c</sub>	0.65582	0.15271	4.295	1.75e-05 ***
ZLAm <sub>n</sub> LS80 <sub>cmc</sub> :ZLog <sub>NAT</sub> <sub>n</sub> LS80 <sub>cmc</sub>	0.12430	0.02833	4.388	1.14e-05 ***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr)	ZLAm <sub>LS80</sub>	ZL <sub>NAT</sub>	ZF2206	ZNght	ZT2206	ZNS24	HRC <sub>c</sub>
ZLAm <sub>LS80</sub>	0.088						
ZL <sub>NAT</sub>	-0.202	-0.329					
ZFght2206	-0.137	0.051	-0.077				
ZNghtflight	0.042	-0.043	0.070	-0.882			
ZTrnd2206 <sub>g</sub>	0.077	0.015	-0.067	-0.209	0.180		
ZNsStrts24	0.221	-0.064	0.099	-0.973	0.803	0.227	
HRC <sub>c</sub>	-0.381	0.057	-0.089	0.365	-0.048	-0.120	-0.532
ZL <sub>LS80</sub>	-0.281	-0.287	0.426	-0.171	0.140	-0.046	0.209

> performance::icc(AIM1\_SMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.002

Conditional ICC: 0.002

> performance::r2(AIM1\_SMN80)

# R2 for Mixed Models

Conditional R2: 0.097

Marginal R2: 0.095

> screenreg(AIM1\_SMN80)

```
=====
-----
Model 1
-----
(Intercept)                -1.80 ***
                           (0.05)
ZLAmnLS80cmc              -0.28 **
                           (0.10)
ZLogNATnLS80cmc            0.57 ***
                           (0.03)
ZFlights2206gmc           2.63 ***
                           (0.27)
ZNightflightrategmc      -0.77 ***
                           (0.10)
ZTrend2206gmc            -0.32 ***
                           (0.04)
ZNoiseStarts24gmc       -2.72 ***
                           (0.28)
HRCc                      0.66 ***
                           (0.15)
ZLAmnLS80cmc:ZLogNATnLS80cmc 0.12 ***
                           (0.03)
-----
AIC                          16506.74
BIC                          16592.84
Log Likelihood                -8242.37
-----
```

---

```
Num. obs.                18532
Num. groups: Airport3    12
Var: Airport3 (Intercept) 0.01
Var: Airport3.1 ZLAmx_n_LS80_cmc 0.09
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(AIM1_SMN80)
$Airport3
  (Intercept) ZLAmx_n_LS80_cmc
1      0.033664826      0.374235325
1.1    0.020572993     -0.115308585
1.2    0.016250037     -0.199141271
1.3   -0.059926773     -0.676734938
2      0.135466944      0.024818587
3     -0.041505076      0.240099012
4     -0.141829536      0.200407987
91    0.025423430      0.003477228
92    0.026491669     -0.079294849
93    0.002407334      0.111175056
94    0.005506582     -0.009951091
95   -0.008164441      0.158130242

with conditional variances for "Airport3"
>
```

**4.47.4 AIM2\_SMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )  
 Formula: HSDair ~ ZLAm<sub>n</sub>LS80<sub>cmc</sub> + ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub> + ZFlights2206<sub>gmc</sub> +  
 ZNightflightrate<sub>gmc</sub> + ZTrend2206<sub>gmc</sub> + ZNoiseStarts24<sub>gmc</sub> +  
 HRC<sub>c</sub> + (1 + ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub> | Airport3) + ZLAm<sub>n</sub>LS80<sub>cmc</sub>:ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub>  
 Data: dats

AIC BIC logLik deviance df.resid  
 16505.4 16591.5 -8241.7 16483.4 18521

Scaled residuals:  
 Min 1Q Median 3Q Max  
 -1.0826 -0.4890 -0.3970 -0.2922 6.9111

Random effects:  
 Groups Name Variance Std.Dev.  
 Airport3 (Intercept) 0.00536 0.07321  
 Airport3.1 ZLog<sub>NAT</sub><sub>n</sub>LS80<sub>cmc</sub> 0.04298 0.20733  
 Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.79126	0.04099	-43.703	< 2e-16	***
ZLAm <sub>n</sub> LS80 <sub>cmc</sub>	-0.15287	0.04031	-3.792	0.000149	***
ZLog <sub>NAT</sub> <sub>n</sub> LS80 <sub>cmc</sub>	0.51759	0.07349	7.043	1.88e-12	***
ZFlights2206 <sub>gmc</sub>	2.67281	0.25936	10.306	< 2e-16	***
ZNightflightrate <sub>gmc</sub>	-0.79619	0.09067	-8.781	< 2e-16	***
ZTrend2206 <sub>gmc</sub>	-0.33009	0.03698	-8.927	< 2e-16	***
ZNoiseStarts24 <sub>gmc</sub>	-2.76807	0.26905	-10.288	< 2e-16	***
HRC <sub>c</sub>	0.68304	0.14199	4.811	1.51e-06	***
ZLAm <sub>n</sub> LS80 <sub>cmc</sub> :ZLog <sub>NAT</sub> <sub>n</sub> LS80 <sub>cmc</sub>	0.10379	0.02771	3.746	0.000180	***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:  
 (Intr) ZLAm<sub>LS80</sub> ZL<sub>NAT</sub> ZF2206 ZNght\_ ZT2206 ZNS24\_ HRC<sub>c</sub>  
 ZLAm<sub>LS80</sub> 0.242  
 ZL<sub>NAT</sub> -0.123 -0.319  
 ZF<sub>ight</sub>2206\_ -0.138 0.173 -0.038  
 ZNght<sub>flight</sub>\_ 0.031 -0.146 0.035 -0.891  
 ZTrnd2206<sub>g</sub> 0.090 0.037 -0.066 -0.237 0.215  
 ZNsStrts24\_ 0.216 -0.207 0.049 -0.974 0.816 0.238  
 HRC<sub>c</sub> -0.389 0.155 -0.040 0.348 -0.039 -0.052 -0.513  
 ZLAm<sub>LS80</sub>\_: -0.291 -0.794 0.225 -0.213 0.180 -0.041 0.255 -0.192  
 convergence code: 0  
 Model failed to converge with max|grad| = 0.00894788 (tol = 0.002, component 1)

> performance::icc(AIM2\_SMN80)  
 # IntraClass Correlation Coefficient

Adjusted ICC: 0.002  
 Conditional ICC: 0.001  
 > performance::r2(AIM2\_SMN80)  
 # R2 for Mixed Models

Conditional R2: 0.099  
 Marginal R2: 0.097  
 > screenreg(AIM2\_SMN80)

```
=====
----- Model 1 -----
(Intercept) -1.79 ***
              (0.04)
ZLAmnLS80cmc -0.15 ***
              (0.04)
ZLogNATnLS80cmc 0.52 ***
              (0.07)
ZFlights2206gmc 2.67 ***
              (0.26)
ZNightflightrategmc -0.80 ***
              (0.09)
ZTrend2206gmc -0.33 ***
              (0.04)
ZNoiseStarts24gmc -2.77 ***
              (0.27)
HRCc 0.68 ***
              (0.14)
ZLAmnLS80cmc:ZLogNATnLS80cmc 0.10 ***
              (0.03)
-----
```

---

```
AIC                16505.43
BIC                16591.53
Log Likelihood     -8241.71
Num. obs.         18532
Num. groups: Airport3      12
Var: Airport3 (Intercept)  0.01
Var: Airport3.1 ZLog_NAT_n_LS80_cmc  0.04
```

```
=====  
*** p < 0.001; ** p < 0.01; * p < 0.05
```

```
> ranef(AIM2_SMN80)
```

```
$Airport3
  (Intercept) ZLog_NAT_n_LS80_cmc
1      0.021669453      0.30453756
1.1    0.013085886     -0.04267678
1.2    0.016170983     -0.23296564
1.3   -0.042372489     -0.39158847
2      0.100394123      0.12363505
3     -0.028846436      0.25147365
4     -0.108738614     -0.01814829
91    0.017255184      0.01266752
92    0.013161205      0.01826082
93    0.012519794     -0.02195962
94    0.005186029      0.03419440
95   -0.007366868     -0.04247602
```

```
with conditional variances for "Airport3"
```

**4.47.5 Vergleichstests SMN80****4.47.5.1 > anova(CIM\_SMN80, AIM1\_SMN80)**

```
Data: dats
Models:
CIM_SMN80: HSDair ~ ZLamax_n_LS80_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
CIM_SMN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN80:   HRC_c + (1 | Airport3) + ZLamax_n_LS80_cmc:ZLog_NAT_n_LS80_cmc
AIM1_SMN80: HSDair ~ ZLamax_n_LS80_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
AIM1_SMN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM1_SMN80:   HRC_c + (1 + ZLamax_n_LS80_cmc || Airport3) +
ZLamax_n_LS80_cmc:ZLog_NAT_n_LS80_cmc
      npar  AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
CIM_SMN80   10 16537 16615 -8258.5   16517
AIM1_SMN80  11 16507 16593 -8242.4   16485 32.315  1  1.311e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

**4.47.5.2 > anova(CIM\_SMN80, AIM2\_SMN80)**

```
Data: dats
Models:
CIM_SMN80: HSDair ~ ZLamax_n_LS80_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
CIM_SMN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
CIM_SMN80:   HRC_c + (1 | Airport3) + ZLamax_n_LS80_cmc:ZLog_NAT_n_LS80_cmc
AIM2_SMN80: HSDair ~ ZLamax_n_LS80_cmc + ZLog_NAT_n_LS80_cmc + ZFlights2206_gmc +
AIM2_SMN80:   ZNightflightrate_gmc + ZTrend2206_gmc + ZNoiseStarts24_gmc +
AIM2_SMN80:   HRC_c + (1 + ZLog_NAT_n_LS80_cmc || Airport3) +
ZLamax_n_LS80_cmc:ZLog_NAT_n_LS80_cmc
      npar  AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
CIM_SMN80   10 16537 16615 -8258.5   16517
AIM2_SMN80  11 16505 16592 -8241.7   16483 33.629  1  6.67e-09 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
```

**4.47.6 FM\_SMN80**

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']

Family: binomial ( logit )

Formula: HSDair ~ ZLAmx\_n\_LS80\_cmc + ZLog\_NAT\_n\_LS80\_cmc + ZFlights2206\_gmc +  
ZNightflightrate\_gmc + ZTrend2206\_gmc + ZNoiseStarts24\_gmc +  
HRC\_c + (1 + ZLAmx\_n\_LS80\_cmc || Airport3) + (1 + ZLog\_NAT\_n\_LS80\_cmc ||  
Airport3) + ZLAmx\_n\_LS80\_cmc:ZLog\_NAT\_n\_LS80\_cmc + ZLAmx\_n\_LS80\_cmc:ZFlights2206\_gmc +  
ZLAmx\_n\_LS80\_cmc:ZNightflightrate\_gmc + ZLAmx\_n\_LS80\_cmc:ZTrend2206\_gmc +  
ZLAmx\_n\_LS80\_cmc:ZNoiseStarts24\_gmc + ZLAmx\_n\_LS80\_cmc:HRC\_c +  
ZLog\_NAT\_n\_LS80\_cmc:ZFlights2206\_gmc + ZLog\_NAT\_n\_LS80\_cmc:ZNightflightrate\_gmc +  
ZLog\_NAT\_n\_LS80\_cmc:ZTrend2206\_gmc + ZLog\_NAT\_n\_LS80\_cmc:ZNoiseStarts24\_gmc +  
ZLog\_NAT\_n\_LS80\_cmc:HRC\_c

Data: dats

AIC	BIC	logLik	deviance	df.resid
16506.7	16686.7	-8230.3	16460.7	18509

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.1738	-0.4879	-0.3961	-0.2986	7.8214

Random effects:

Groups	Name	Variance	Std.Dev.
Airport3	(Intercept)	0.004307	0.06562
Airport3.1	ZLAmx_n_LS80_cmc	0.012698	0.11268
Airport3.2	(Intercept)	0.001814	0.04259
Airport3.3	ZLog_NAT_n_LS80_cmc	0.013473	0.11608

Number of obs: 18532, groups: Airport3, 12

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-1.79575	0.04282	-41.942	< 2e-16 ***
ZLAmx_n_LS80_cmc	-0.30625	0.07736	-3.959	7.53e-05 ***
ZLog_NAT_n_LS80_cmc	0.60251	0.06449	9.342	< 2e-16 ***
ZFlights2206_gmc	2.69041	0.26950	9.983	< 2e-16 ***
ZNightflightrate_gmc	-0.80327	0.09439	-8.510	< 2e-16 ***
ZTrend2206_gmc	-0.34038	0.03928	-8.665	< 2e-16 ***
ZNoiseStarts24_gmc	-2.78038	0.27966	-9.942	< 2e-16 ***
HRC_c	0.67933	0.14704	4.620	3.84e-06 ***
ZLAmx_n_LS80_cmc:ZLog_NAT_n_LS80_cmc	0.10435	0.03258	3.203	0.00136 **
ZLAmx_n_LS80_cmc:ZFlights2206_gmc	0.47489	0.41064	1.156	0.24749
ZLAmx_n_LS80_cmc:ZNightflightrate_gmc	-0.10804	0.12851	-0.841	0.40051
ZLAmx_n_LS80_cmc:ZTrend2206_gmc	-0.01538	0.04165	-0.369	0.71198
ZLAmx_n_LS80_cmc:ZNoiseStarts24_gmc	-0.54186	0.42493	-1.275	0.20225
ZLAmx_n_LS80_cmc:HRC_c	0.20160	0.21507	0.937	0.34857
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc	-0.01798	0.36218	-0.050	0.96040
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc	0.08770	0.12347	0.710	0.47756
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc	0.08606	0.04383	1.963	0.04959 *
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc	0.06784	0.37247	0.182	0.85547
ZLog_NAT_n_LS80_cmc:HRC_c	-0.19064	0.19506	-0.977	0.32840

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation matrix not shown by default, as p = 19 > 12.

Use print(x, correlation=TRUE) or  
vcov(x) if you need it

convergence code: 0

unable to evaluate scaled gradient

Model failed to converge: degenerate Hessian with 1 negative eigenvalues

> performance::icc(FM\_SMN80)

# Intraclass Correlation Coefficient

Adjusted ICC: 0.001

Conditional ICC: 0.001

> performance::r2(FM\_SMN80)

# R2 for Mixed Models

Conditional R2: 0.106

Marginal R2: 0.104

> screenreg(FM\_SMN80)

```
=====
-----
Model 1
-----
(Intercept)                -1.80 ***
                           (0.04)
ZLAmx_n_LS80_cmc          -0.31 ***
                           (0.08)
ZLog_NAT_n_LS80_cmc        0.60 ***
                           (0.06)
```

```

ZFlights2206_gmc          2.69 ***
                          (0.27)
ZNightflightrate_gmc     -0.80 ***
                          (0.09)
ZTrend2206_gmc           -0.34 ***
                          (0.04)
ZNoiseStarts24_gmc      -2.78 ***
                          (0.28)
HRC_c                     0.68 ***
                          (0.15)
ZLAmx_n_LS80_cmc:ZLog_NAT_n_LS80_cmc  0.10 **
                          (0.03)
ZLAmx_n_LS80_cmc:ZFlights2206_gmc    0.47
                          (0.41)
ZLAmx_n_LS80_cmc:ZNightflightrate_gmc -0.11
                          (0.13)
ZLAmx_n_LS80_cmc:ZTrend2206_gmc     -0.02
                          (0.04)
ZLAmx_n_LS80_cmc:ZNoiseStarts24_gmc  -0.54
                          (0.42)
ZLAmx_n_LS80_cmc:HRC_c              0.20
                          (0.22)
ZLog_NAT_n_LS80_cmc:ZFlights2206_gmc -0.02
                          (0.36)
ZLog_NAT_n_LS80_cmc:ZNightflightrate_gmc  0.09
                          (0.12)
ZLog_NAT_n_LS80_cmc:ZTrend2206_gmc    0.09 *
                          (0.04)
ZLog_NAT_n_LS80_cmc:ZNoiseStarts24_gmc  0.07
                          (0.37)
ZLog_NAT_n_LS80_cmc:HRC_c           -0.19
                          (0.20)
-----
AIC                               16506.70
BIC                               16686.73
Log Likelihood                    -8230.35
Num. obs.                          18532
Num. groups: Airport3              12
Var: Airport3 (Intercept)           0.00
Var: Airport3.1 ZLAmx_n_LS80_cmc    0.01
Var: Airport3.2 (Intercept)         0.00
Var: Airport3.3 ZLog_NAT_n_LS80_cmc 0.01
=====
*** p < 0.001; ** p < 0.01; * p < 0.05
> ranef(FM_SMN80)
$Airport3
  (Intercept) ZLAmx_n_LS80_cmc (Intercept) ZLog_NAT_n_LS80_cmc
1      0.021875563      0.1287217218  0.009214223      0.145341635
1.1    0.007328899     -0.0655249435  0.003087011      0.028011300
1.2    0.009933049     -0.0228714152  0.004183908     -0.075238488
1.3   -0.034114371     -0.1102208664 -0.014369342     -0.155461437
2      0.078428144     -0.0214847473  0.033034781      0.127800449
3     -0.022821426      0.0061857270 -0.009612631     -0.050093960
4     -0.083598814      0.0739232916 -0.035212723     -0.014748862
91     0.013922796      0.0004778601  0.005864432      0.003698251
92     0.010078361     -0.1289177709  0.004245114      0.006569775
93     0.008626891      0.0737171245  0.003633740     -0.076521752
94     0.003468098     -0.0094831929  0.001460800     -0.014808793
95    -0.003367722      0.0868430178 -0.001418521      0.071168507

```

with conditional variances for "Airport3"