



Idea and concept

- analysis of the spatial variability of ultrafine particle concentrations in the east of Berlin-Tegel Airport (TXL)
- focus on both main sources of ultrafine particles: road traffic and airport operations
- comparison of the impact of these two sources

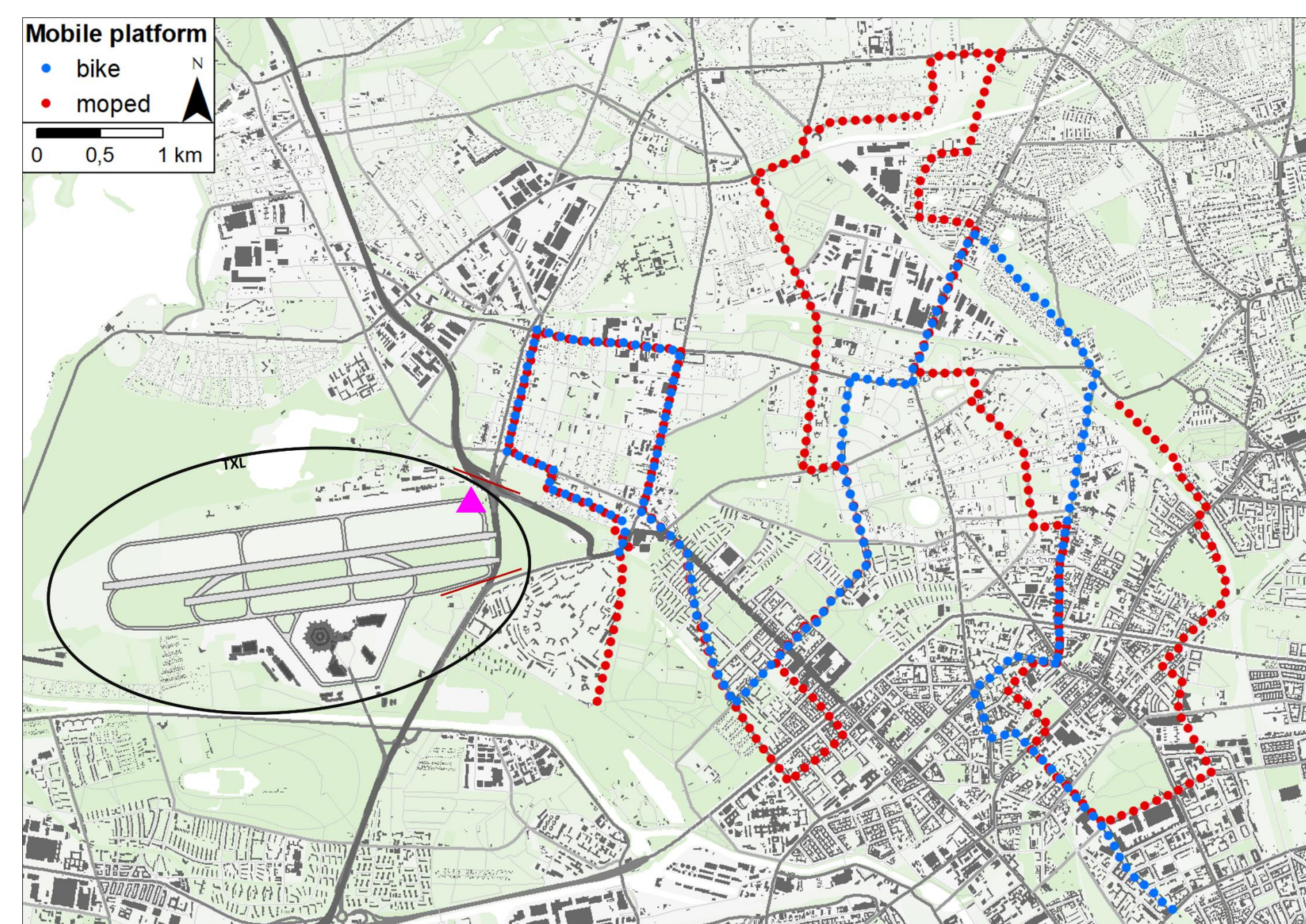


Fig. 1: Study site in the east of TXL, Berlin; blue dots: track points of bicycle measurements; red dots: track points of moped measurements. The highway (dark grey line) leads through an underground tunnel to the east of TXL (between red lines). Pink triangle: weather station of Germany's National Meteorological Service (DWD); data basis: Environmental Atlas Berlin.

Methods

- TSI CPC 3007 for observations of particle number concentration (PNC)
- median PNC per 100 m road segment and run
- $\frac{PNC_{total}}{PNC_{total}}$ as PNC of each road segment divided by the mean per run

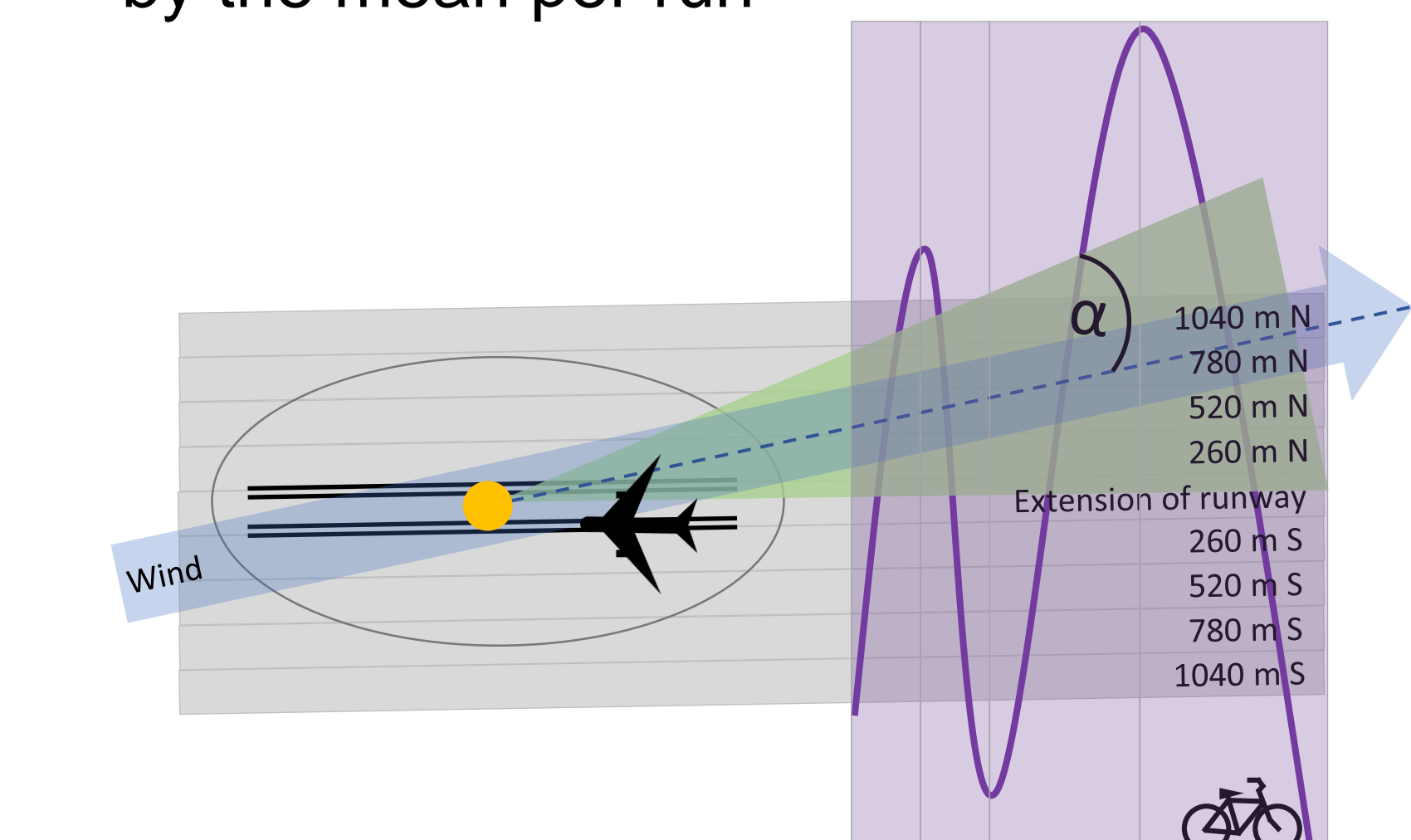


Fig. 2: Green zone: road segments defined as downwind of the airport. For α , the three angles $\pm 10^\circ$, $\pm 20^\circ$ or $\pm 45^\circ$ are used. Angles are calculated in reference to the centre of the airport (orange dot). Grey zone: Track points defined as within the flight path. Zones are named according to their distance north or south of the extension of the runway.

Impact of airport operations and road traffic on ultrafine particle number concentrations

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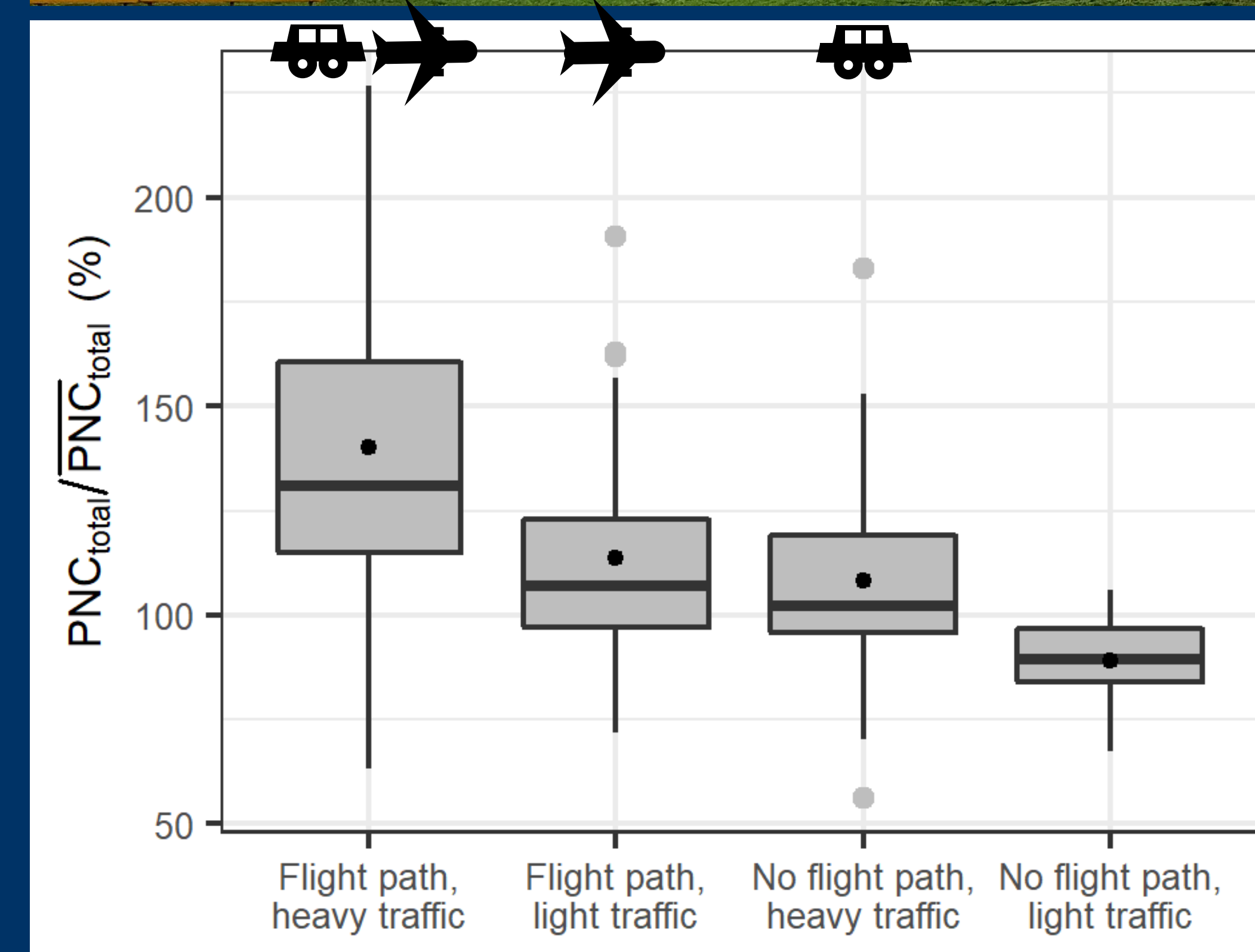


Fig. 6: $\frac{PNC_{total}}{PNC_{total}}$ averaged per run for four categories.

Impact of road and air traffic

- road traffic leads to significantly increased PNC
- higher than average PNC in the lee of the airport with winds from the west and south-west
- clear but spatially limited impact of TXL in north-south direction across the flight path
- PNC decreases significantly with growing distance to the airport
- categorized variables explain more spatial variability than uncategorized ones

The airport operations lead to significantly increased PNC. These are roughly comparable to the effect of busy roads in the neighbourhood. The closure of TXL in late 2020 will have considerably improved air quality in the residential urban areas in the close vicinity of the airfield.

Publication

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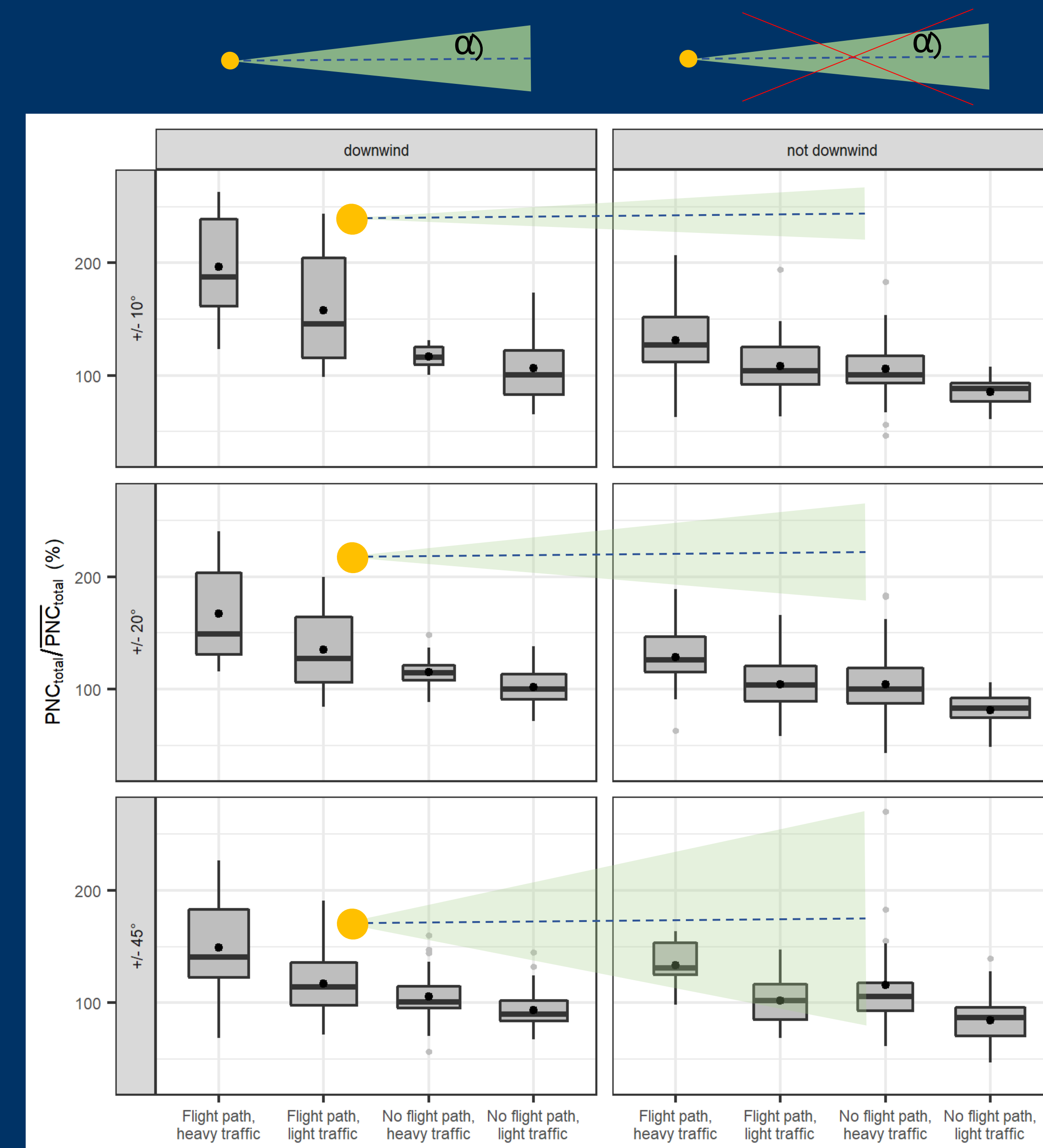


Fig. 7: Comparison of track points located downwind (dark grey boxes) and those non downwind (light grey boxes) of the runway.

Road traffic vs. airport operations

- high traffic volume and a location within the approach corridor in the lee of the airport lead to the highest PNC
- lowest PNC occurs in areas with low traffic volume outside the airport's approach corridor
- an increased traffic volume outside the airport impact area is comparable to the effect of light traffic inside the approach corridor, both in mean concentration and in the dispersion of PNC



Results

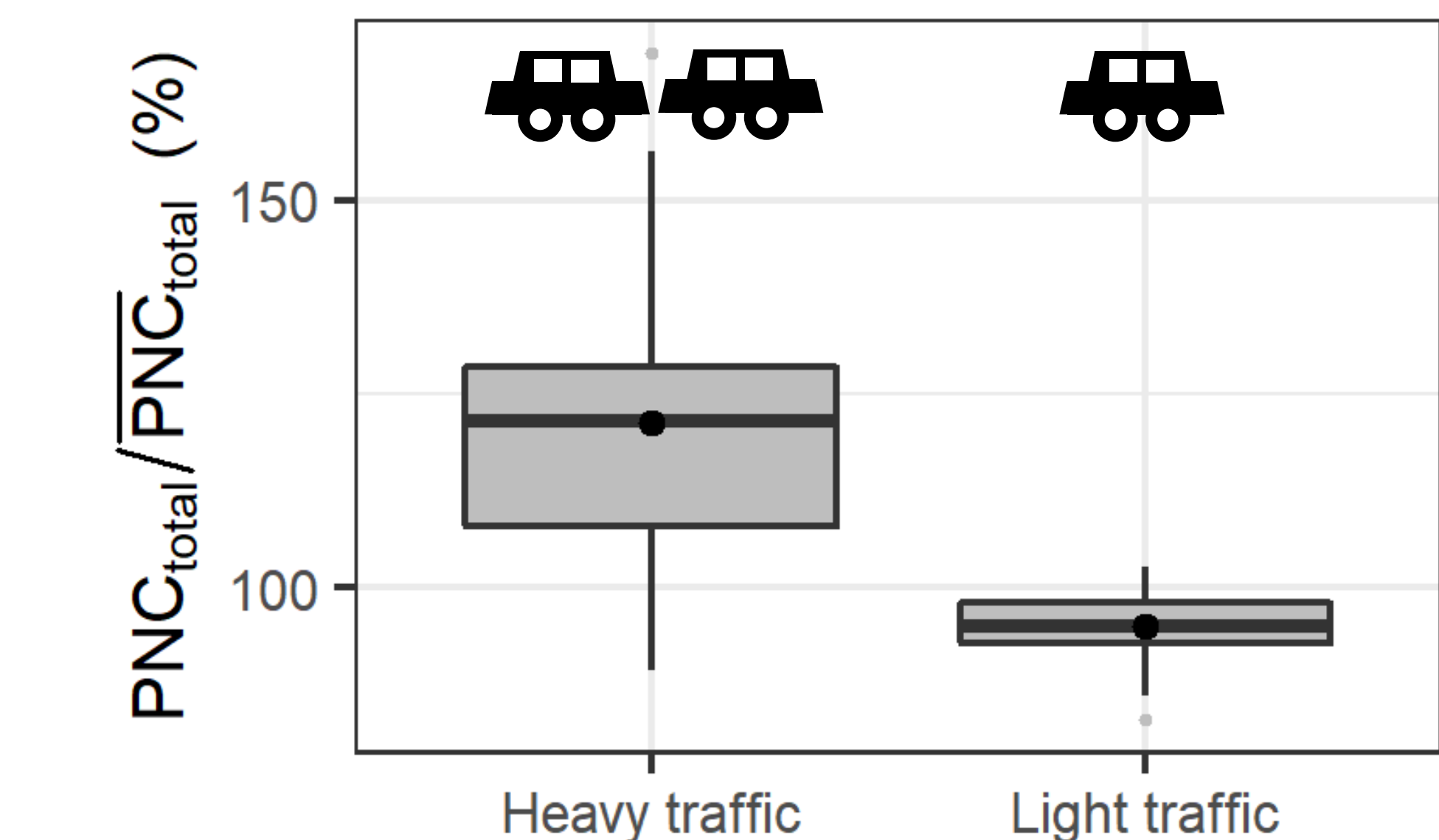


Fig. 3: Comparison of $\frac{PNC_{total}}{PNC_{total}}$ for heavy and light traffic areas.

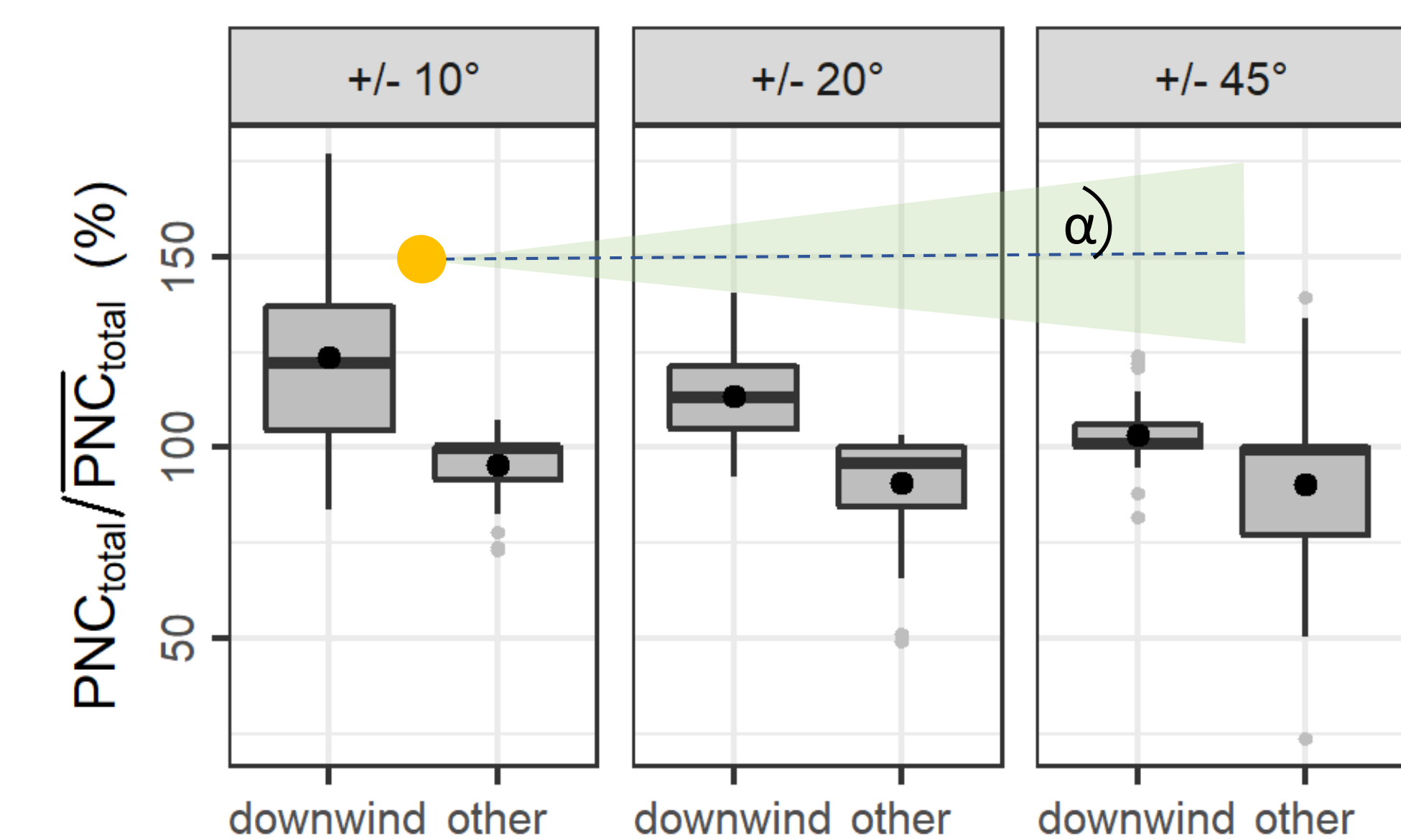


Fig. 4: Comparison of $\frac{PNC_{total}}{PNC_{total}}$ for track points downwind of the airport to those not downwind. The category downwind was classified in three ways: track points within $\pm 10^\circ$, $\pm 20^\circ$ or $\pm 45^\circ$ downwind of the prevailing wind direction.

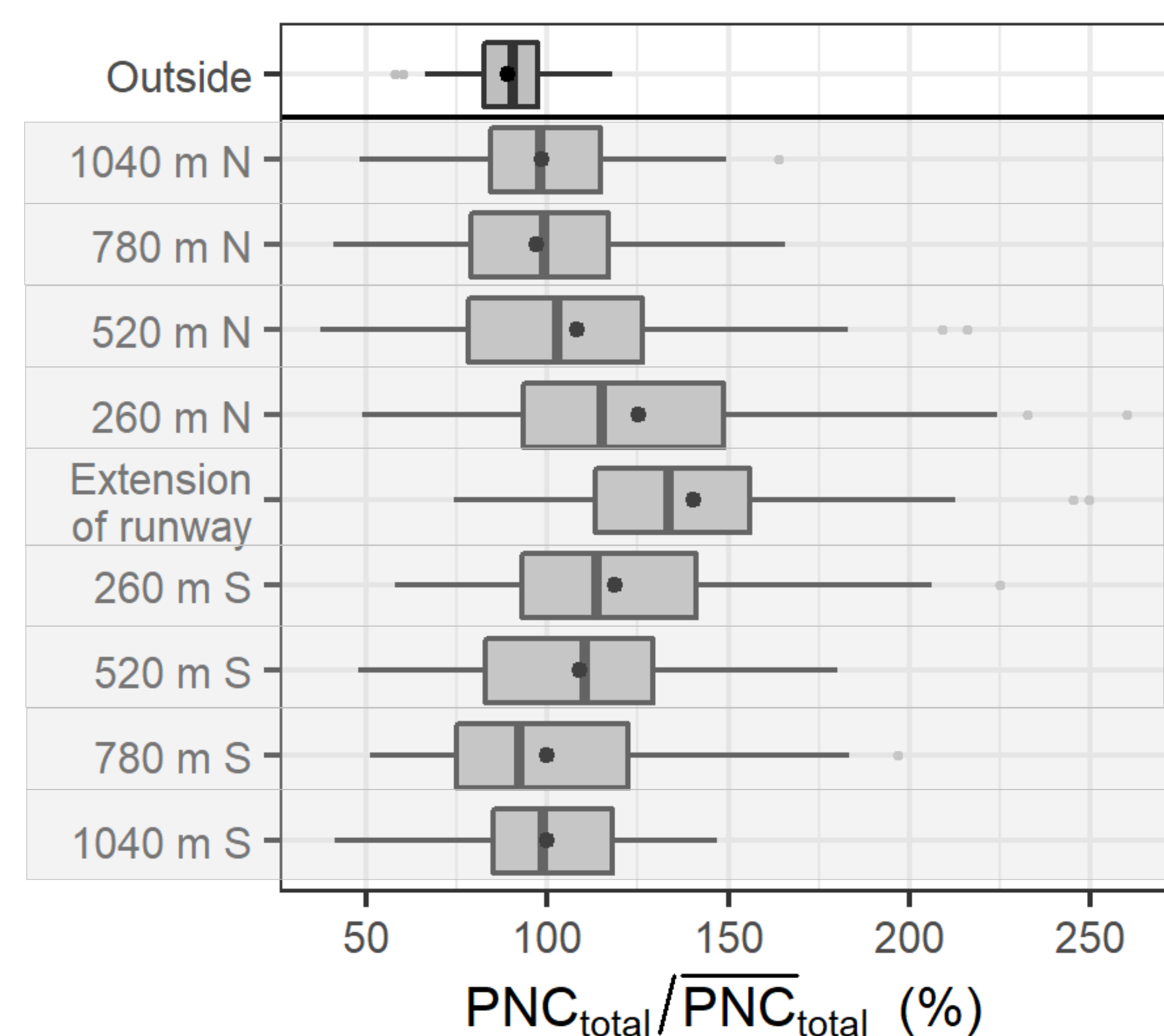


Fig. 5: $\frac{PNC_{total}}{PNC_{total}}$ with increasing distance to the north and south of the extension of the runways.