



# Impact of the closure of Berlin-Tegel Airport on ultrafine particle concentration

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## Idea and concept

- ultrafine particle (UFP) concentrations before and after the closure of Berlin-Tegel Airport (TXL)
- consideration of both road traffic and airport operations as sources of UFP
- analysis of changes in both overall particle number concentration (PNC) as well as peak concentrations

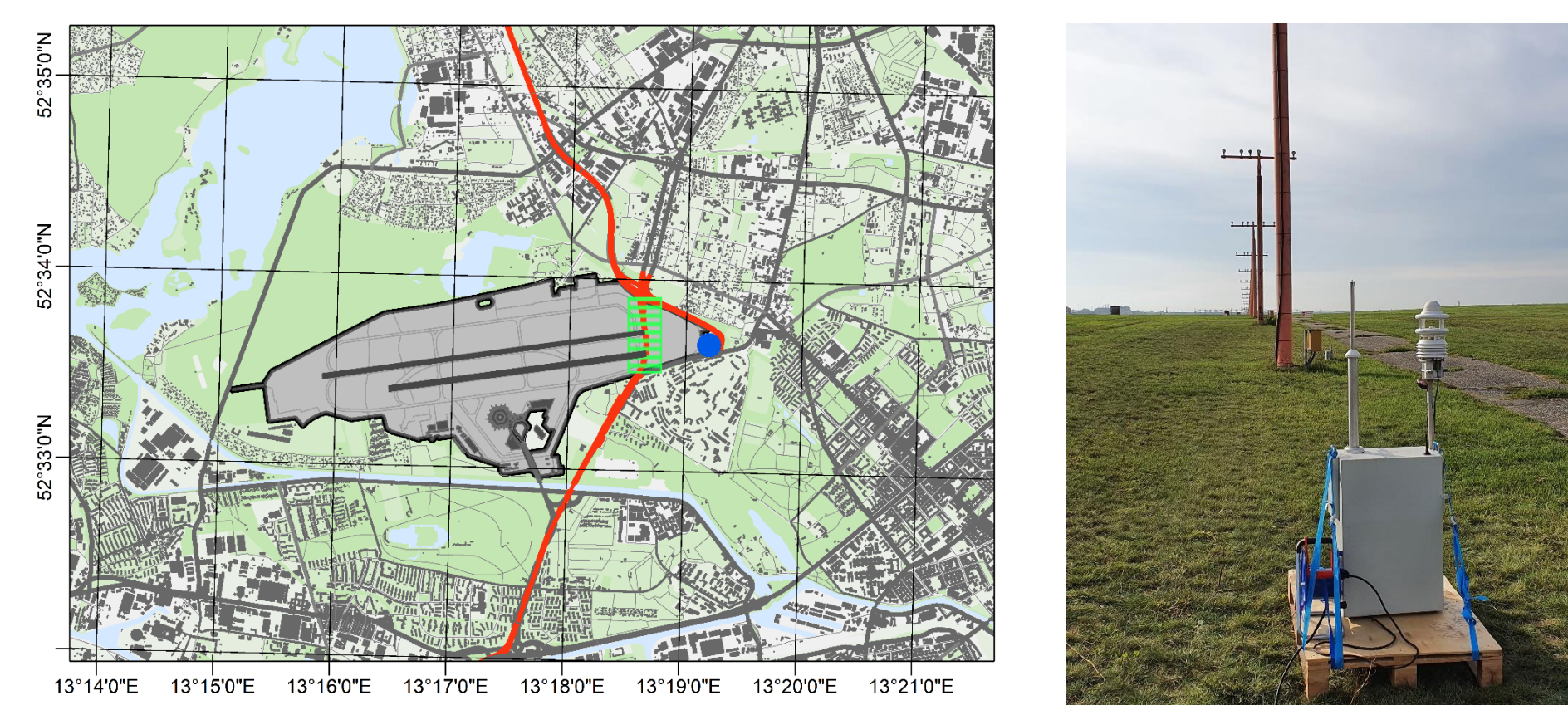


Fig. 1: Left: study site: Berlin-Tegel Airport; blue dots: measurement station. The highway (red line) leads through an underground tunnel to the east of TXL (green rectangle). Grey area: airfield; data basis: Environmental Atlas Berlin. Right: Measurement station: Grimm EDM465 UFPC and Lufft WS600-UMB.

## Methods

- observations: 20 October – 3 December 2020. TXL closed on 8 November
- Grimm EDM465 UFPC and Lufft WS600-UMB with 5-sec resolution
- wind directions 215°–305° → CPC downwind of the airport
- wind directions 0°–90° → CPC downwind of the motorway access road and road network
- PNC peak: combination of local maximum within a 5 min time span and daily outliers

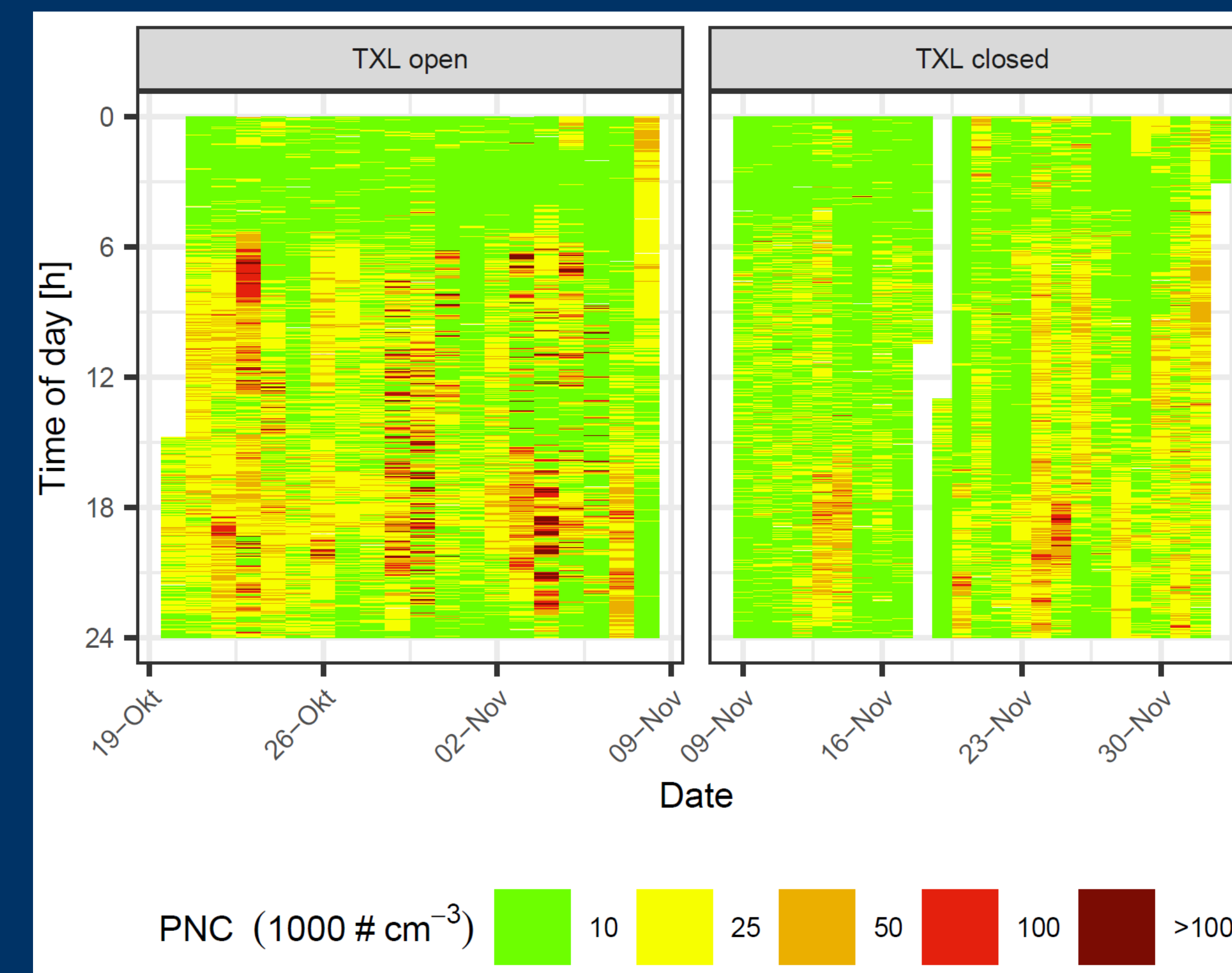


Fig. 4: Particle number concentration observations for the periods before and after the closure of Berlin-Tegel Airport.

## Changes after the closure of TXL

- mean PNC decreased by 41%, median PNC by 29% during the day
- no decrease in PNC between 23:00 and 6:00 h
- downwind of the airport: significant reduction of minimum (21%\*), mean (68%\*\*\*), and max (85%\*\*\*), and standard deviation (89%\*\*\*) of PNC
- no relevant changes in PNC downwind of the motorway access road and road network
- PNC decreases in all statistical measures (p-values < .001), if the downwind sector of the roads is excluded from the analysis

## Changes in PNC peaks

Downwind of the airfield

- number of peaks decreases by 30%\*\*\*
- mean peak length decreases from 58 s to 22 s\*\*\*
- mean PNC and maximum of peaks decreases by 70%\*\*\*

Downwind of the motorway access road and road network

- number of peaks increases 2.8-fold\*\*\*
- no significant change in peak lengths
- mean PNC peaks decrease by 30%\*\*\*
- maximum PNC peak by 25%\*\*\*

→ Impact of the roads on PNC becomes more pronounced.



## Publication

Fritz S, Aust S and Sauter T (2022), Impact of the closure of Berlin-Tegel Airport on ultrafine particle number concentrations on the airfield. Front. Environ. Sci. 10:1061584. doi: 10.3389/fenvs.2022.1061584

## Results

	PNC [# cm <sup>-3</sup> ]							
	Median	Mean	Min-max		SD			
	Day**	Night <sup>(-)</sup>	Day**	Night <sup>(-)</sup>	Day**	Night <sup>(-)</sup>	Day**	Night <sup>(-)</sup>
TXL open	13,250	7,318	17,986	8,138	6,724–102,752	5,622–26,344	14,115	3,117
TXL closed	9,400	6,522	10,594	7,389	5,278–41,320	4,808–27,155	4,572	3,314

Tab. 1: Means of hourly PNC (day/night) for the times before and after the closure of TXL. Nighttime flight restrictions occurred between 23:00 and 06:00. Asterisks show p-values for unequal variances t-tests of PNC before and after the closure of TXL (p-value < .05: \*; p-value < .01: \*\*; p-value > .05: <sup>(-)</sup>).

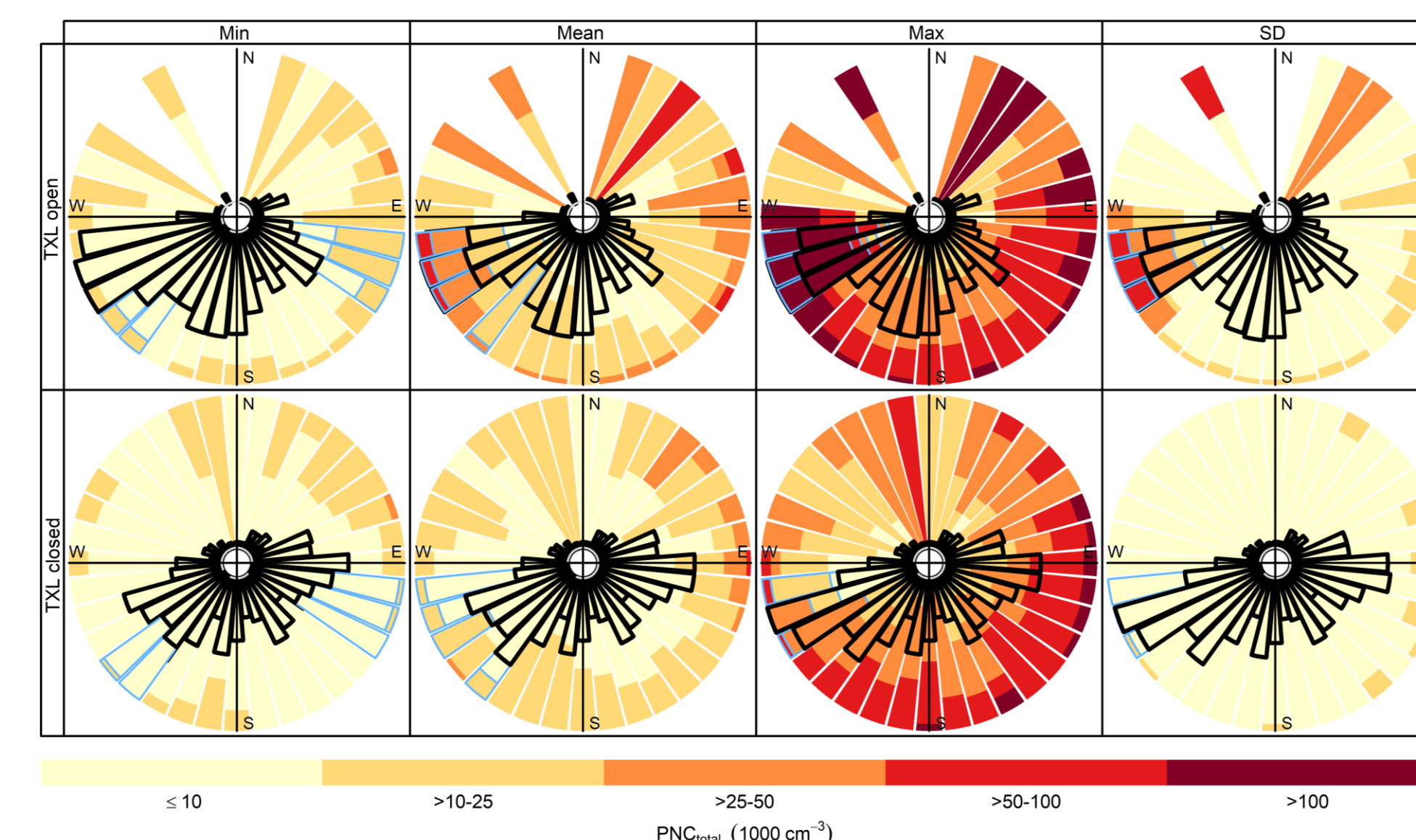


Fig. 2: Pollutant roses of hourly PNC before and after TXL closed normalized per 10° wind direction. Black outline: frequency of the observed wind direction. Blue outline and separation lines: angles with highly significant changes of PNC (p-value < .001) after the closure of the airport.

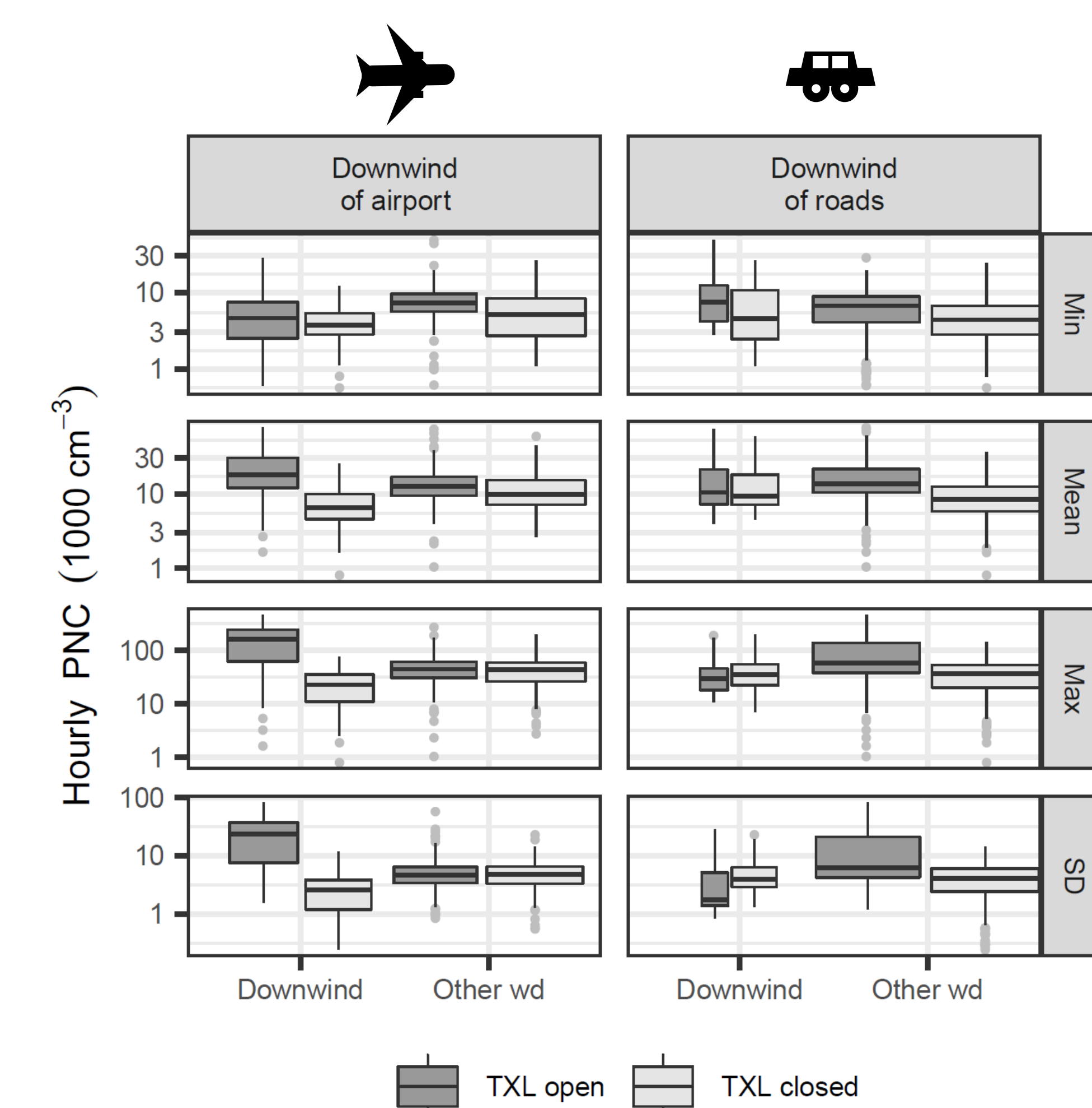


Fig. 3: PNC before and after the closure of TXL. Downwind of the runways: wind directions 215°–305°, downwind of the motorway access road: wind directions 0°–90°. Only data included for 6:00 h and 23:00 h. Box widths proportional to the number of observations.