



Ultrafine Particulate Emissions from the Transport Sector: First results from the Net4Cities project



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Motivation

- Net4cities project contributes to the Zero pollution Action Plan.
- Aerosol as well as noise is measured in 11 cities across 10 European countries.
- Capturing emission from urban traffic and from transport hubs like airports and ports.

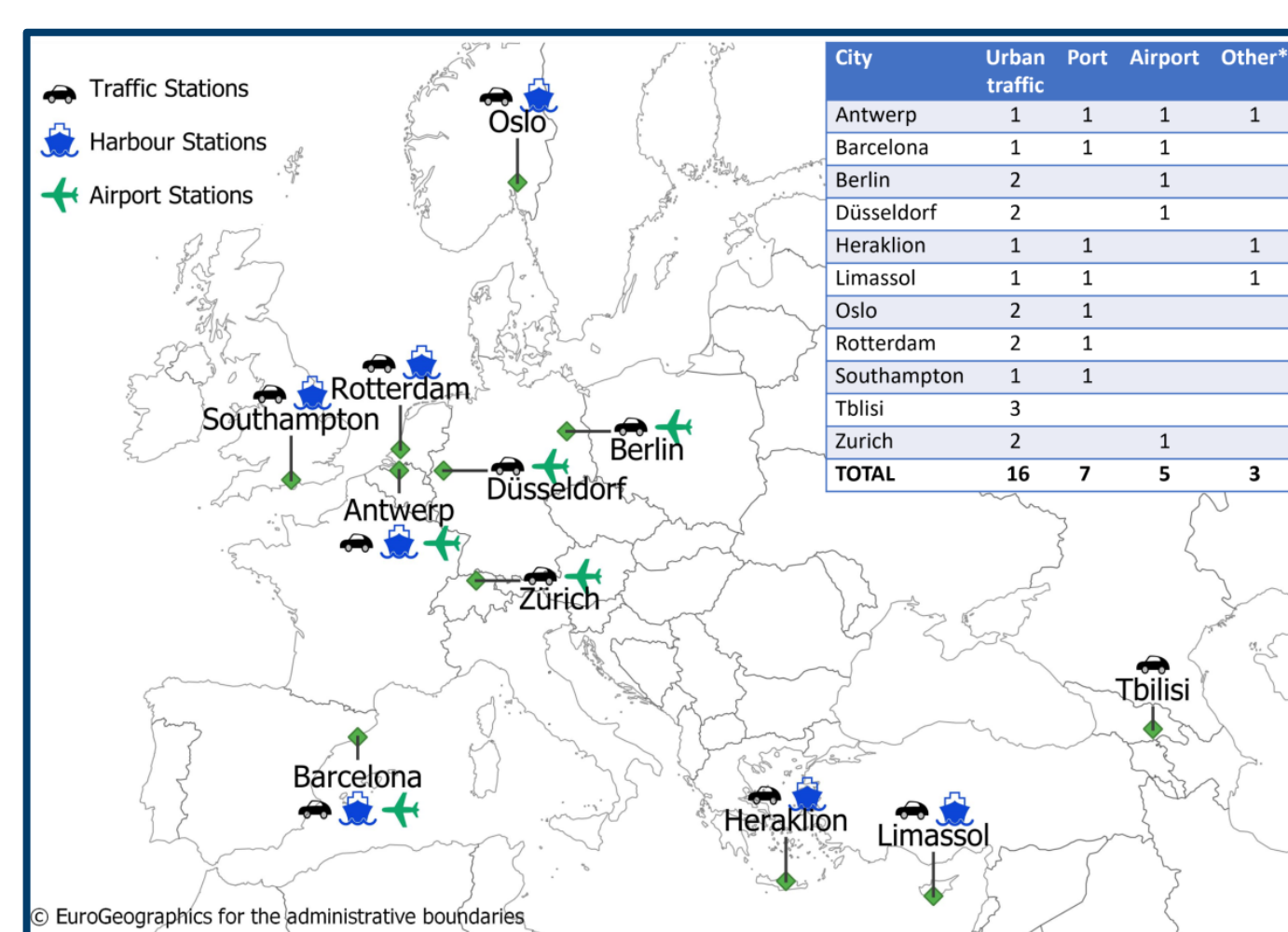


Figure 1. Map of the Net4Cities partner cities across Europe

Monitoring of aerosol is crucial because these tiny particles can penetrate deep into lungs and can have severe health impacts.

Measurement methodologies

- Ultrafine particles (UFPs) measured as particle number concentration (PNC) using Airmodus A30 pgCPC (size:10nm-2.5µm).
- Lung deposited surface area (LDSA) measured using Partector 2 technology (Naneos, size: 20-400 nm).
- Air samples are collected in canisters and then analyzed for VOCs using GC-MS/FID.
- NO₂ measured by Duesseldorf city.

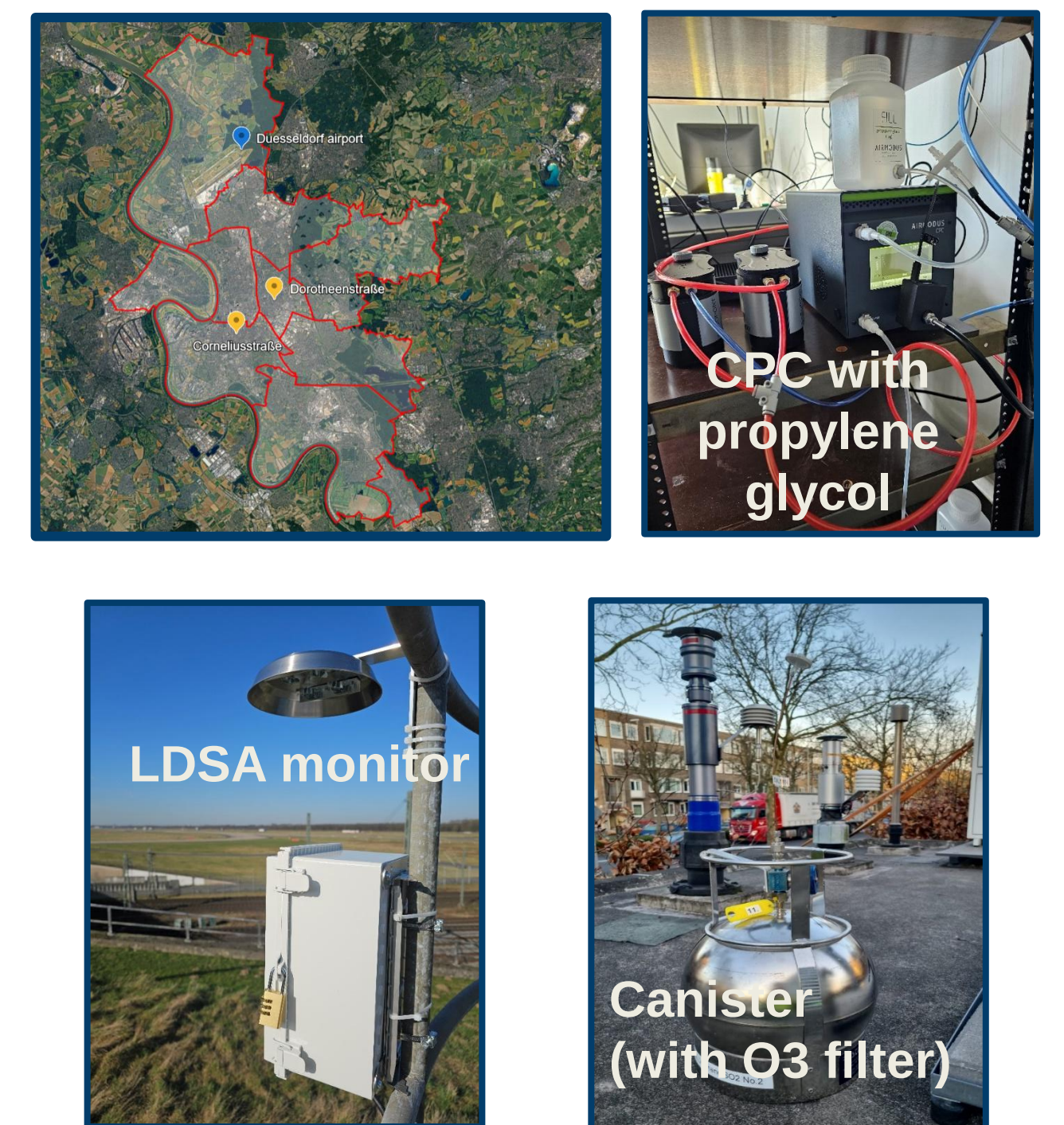


Figure 2. Study locations and Net4cities equipment at Duesseldorf

Temporal variation in UFPs and LDSA

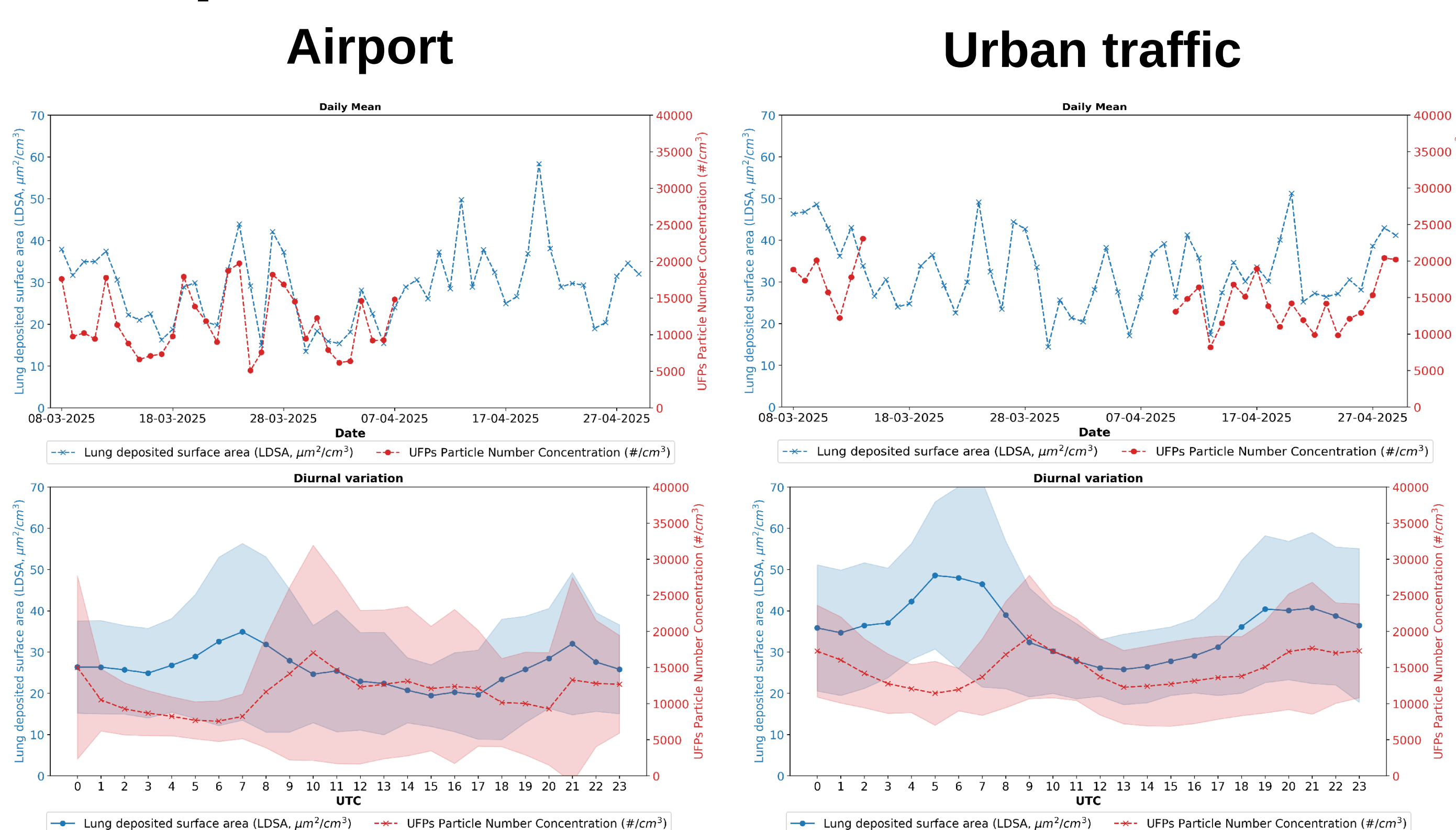


Figure 3. Daily mean and diurnal variation (standard deviation as shaded region) of UFPs and LDSA

LDSA : 28±16 µm²/cm³
PNC: 11934±9553 #/cm³

LDSA: 33±15 µm²/cm³
PNC: 15167±6878 #/cm³

- Higher PNC and LDSA at traffic site compared to airport.
- UFP peak later than LDSA during the day.

VOCs as possible precursors for particles

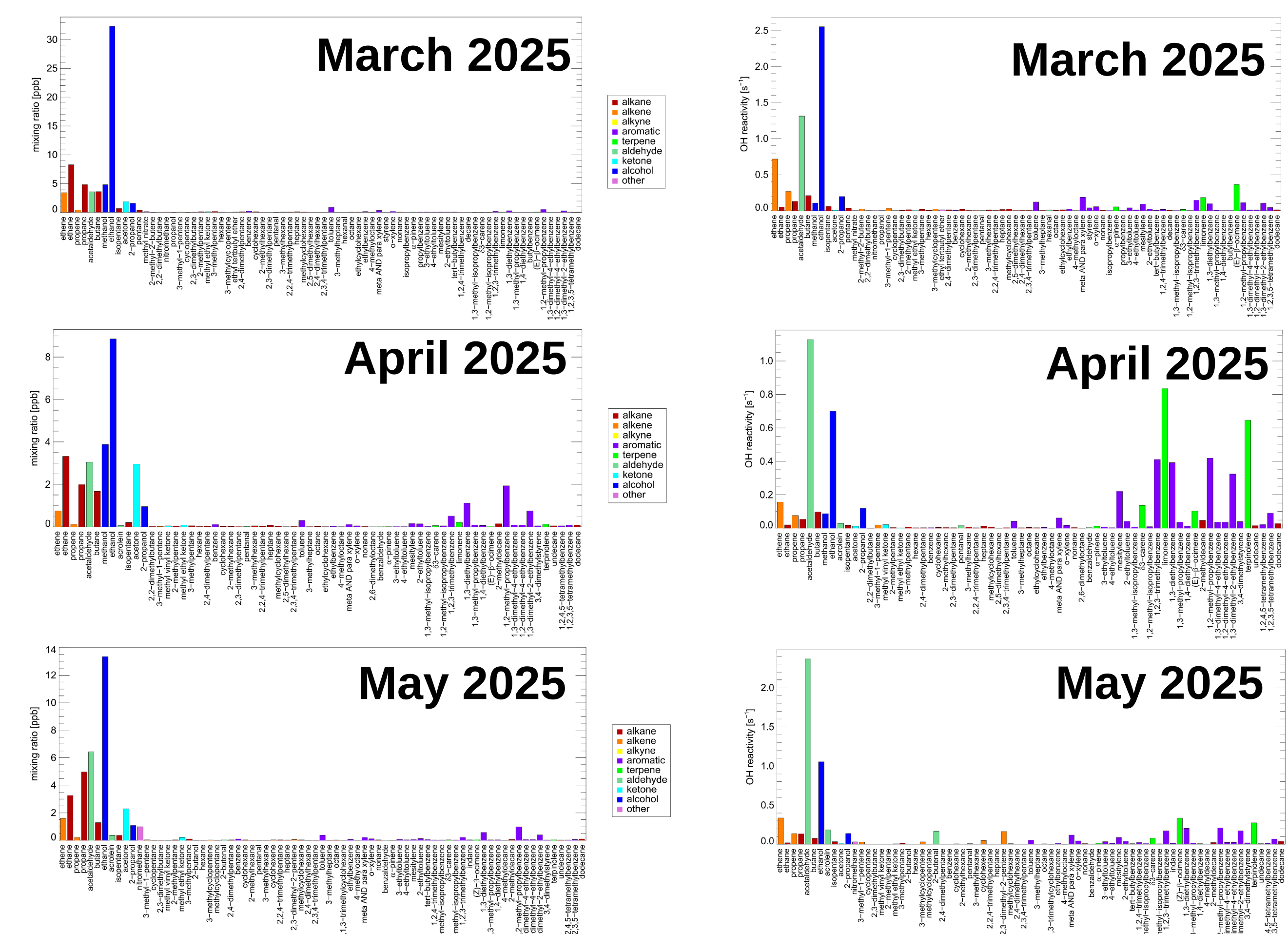


Figure 4. Mixing ratio and OH reactivity of VOCs at urban traffic

- High concentrations of OVOCs (like ethanol and aldehydes).
- Turnover of compounds like terpenes with OH is high despite their low concentration

LDSA and UFPs versus NO₂ at urban traffic

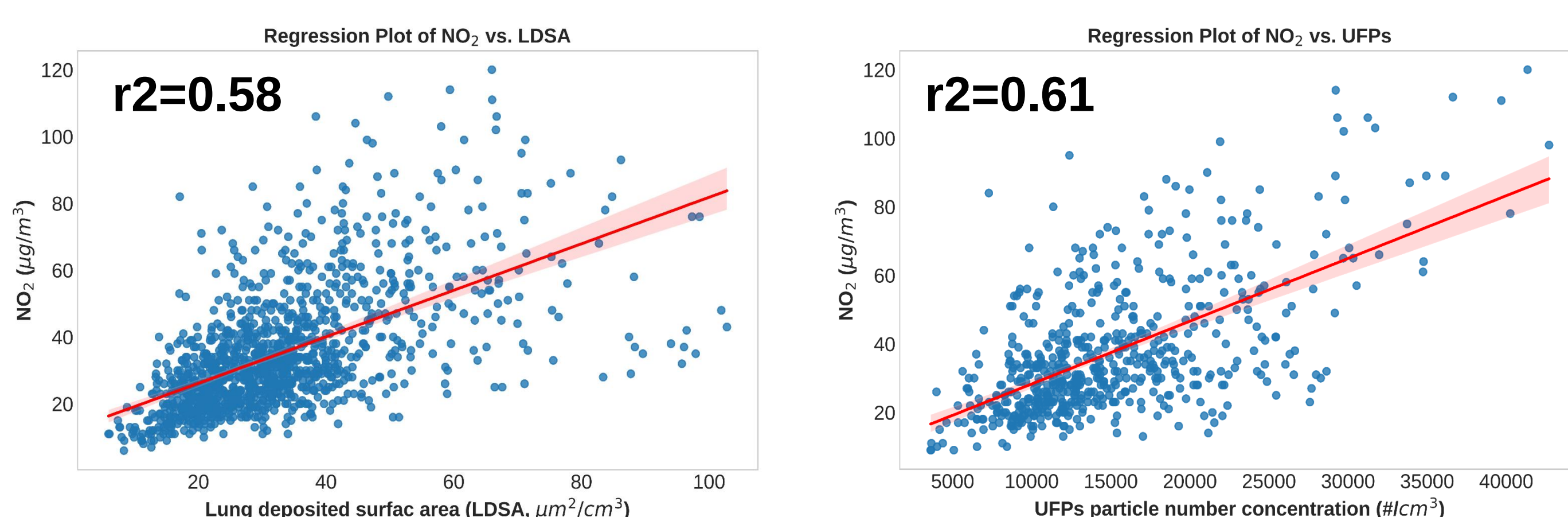


Figure 5. Regression plot of NO₂ versus LDSA and UFPs (hourly data)

- Moderate correlation between LDSA, UFPs with NO₂ at urban traffic

Future prospects

- Continuing the measurement of UFP, LDSA, VOCs along with trace gases and NH₃ and investigate their relationships.
- Understanding the difference in pollutants profile between airport and urban traffic.

