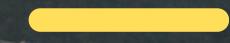


**Multi-scale drivers of PM<sub>2.5</sub> and PM<sub>10</sub> extremes in the Valley of Mexico:  
Synoptic regimes, boundary-layer stability, and ENSO modulation**

# stage one



## Context & Objective

Exploratory Analysis of PM Extremes

- Stage 1 exploratory analysis
- Monthly PM extremes over the Valley of Mexico
- Diurnal timing of daily PM maxima (hour-of-maximum diagnostic)
- Data suitability and synoptic signal

# Data & Methodology

## Monthly Composites

- Data:
  - PM2.5 / PM10 (daily city-mean, 2012–2024)
  - NARR 500 hPa (H, U, V)
  - Event definition: monthly p90 (within each month-year)
- Methodology:
  - Monthly p90 → event days
  - Daily climatology → H' anomalies
  - Composite of H', winds, significance
  - Monthly stratification (12 panels per pollutant)



## Diurnal PM Maxima

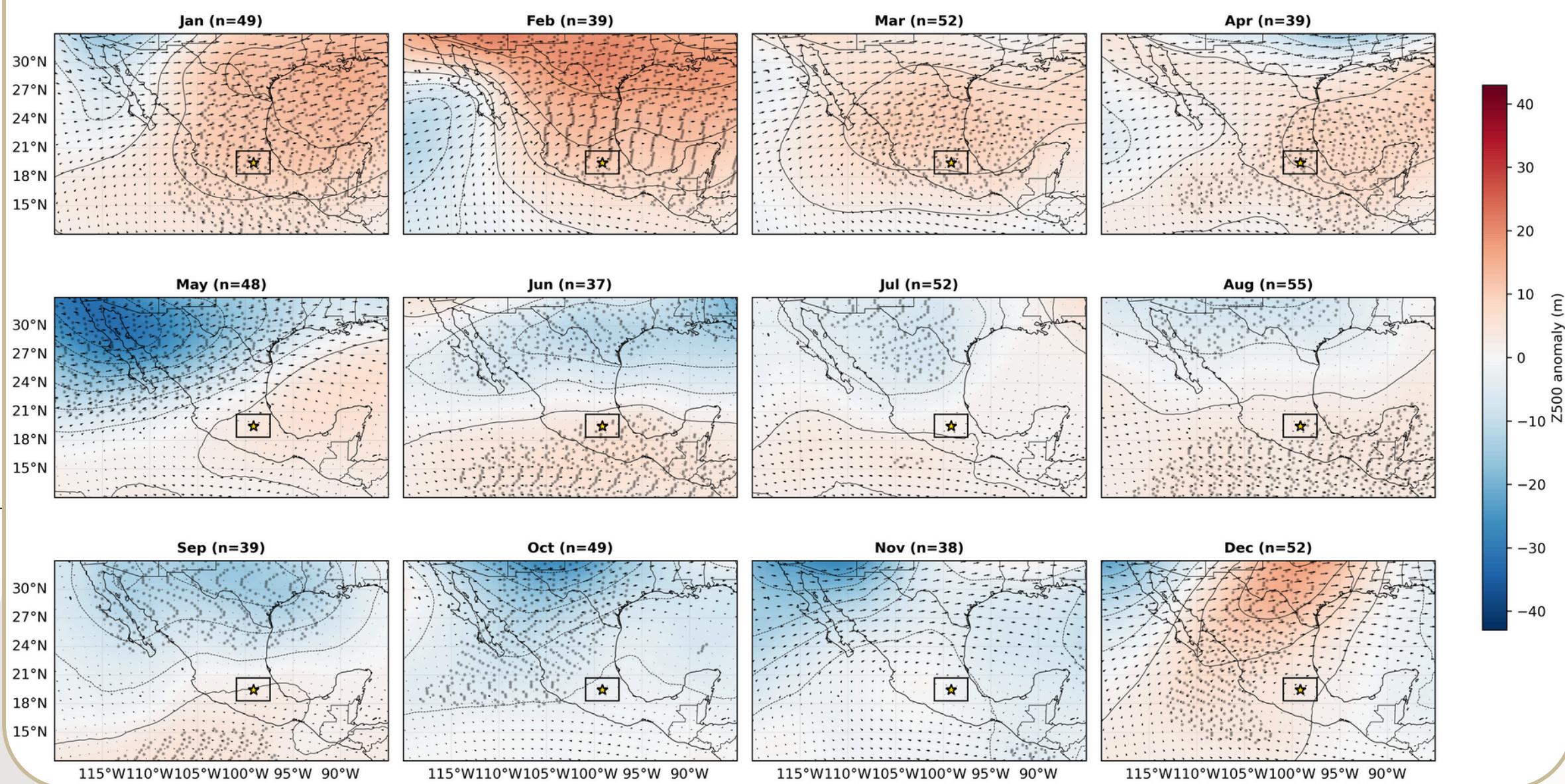
- Data:
  - RAMA hourly PM2.5 (2003–2023) and PM10 (1995–2023)
  - City-wide station network (all available stations per year)
- Methodology:
  - Hourly data aggregated by calendar day
  - Daily maximum concentration identified across stations
  - Hour of occurrence recorded for each daily maximum
  - Monthly stratification (12 months)
  - Scatter of daily maxima vs hour of occurrence
  - Linear trend fitted per month

# Monthly Composites

PM2.5



PM2.5: Monthly Z500' composites (p90 within month-year), 2012-2024

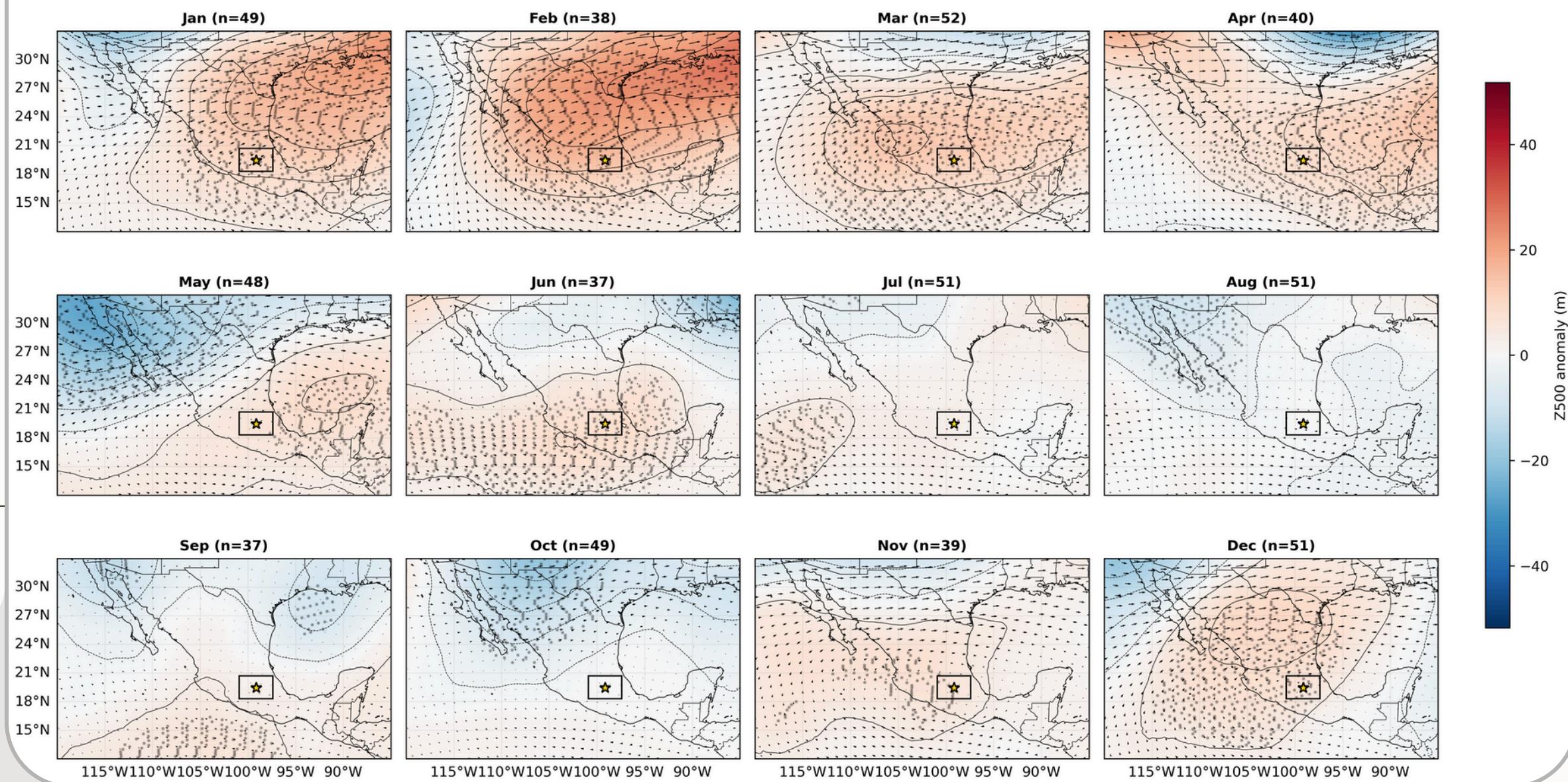


# Monthly Composites

PM10



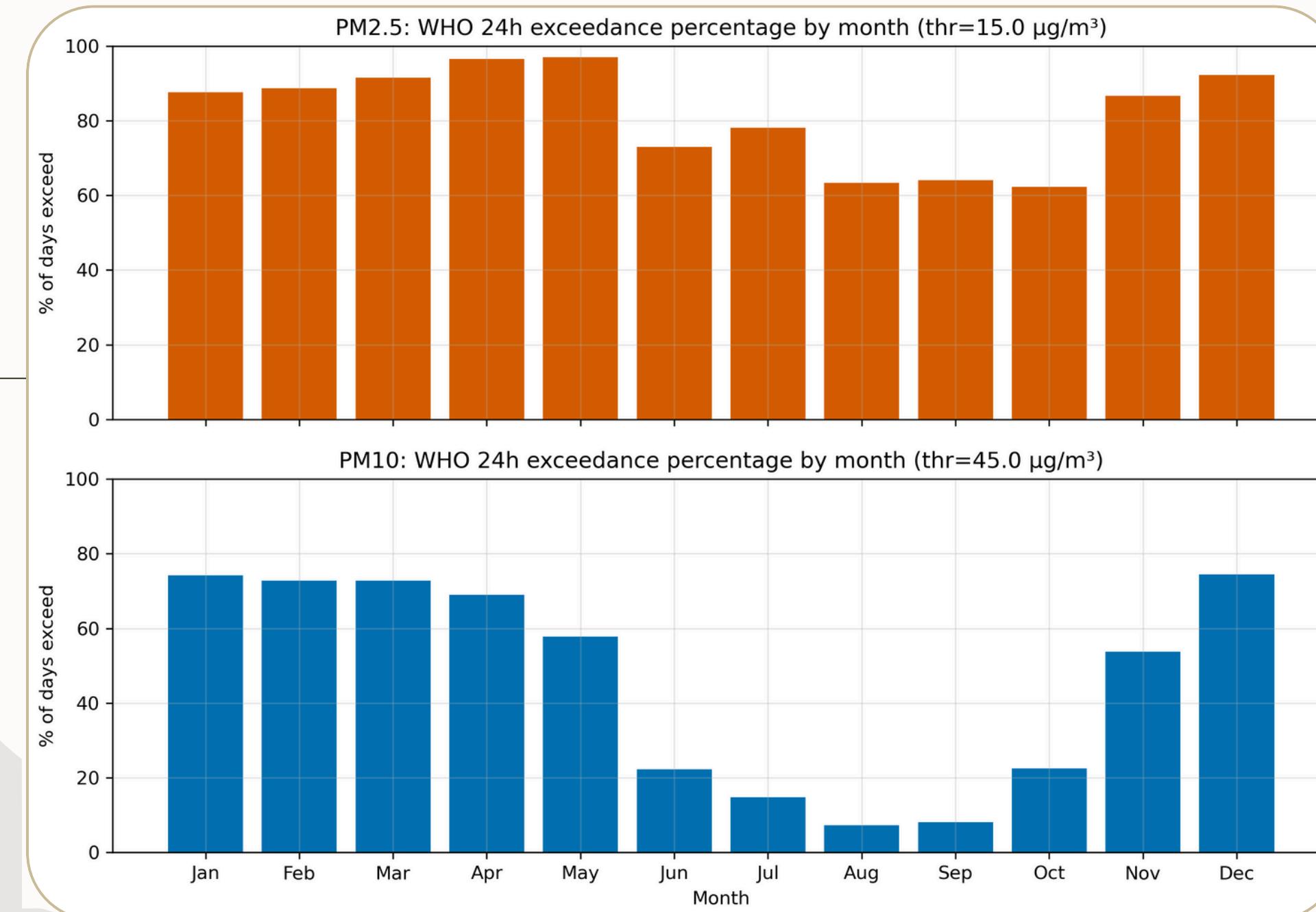
PM10: Monthly Z500' composites (p90 within month-year), 2012-2024



# WHO Exceedance Context



- PM2.5: high exceedance year-round
- PM10: strong winter signal

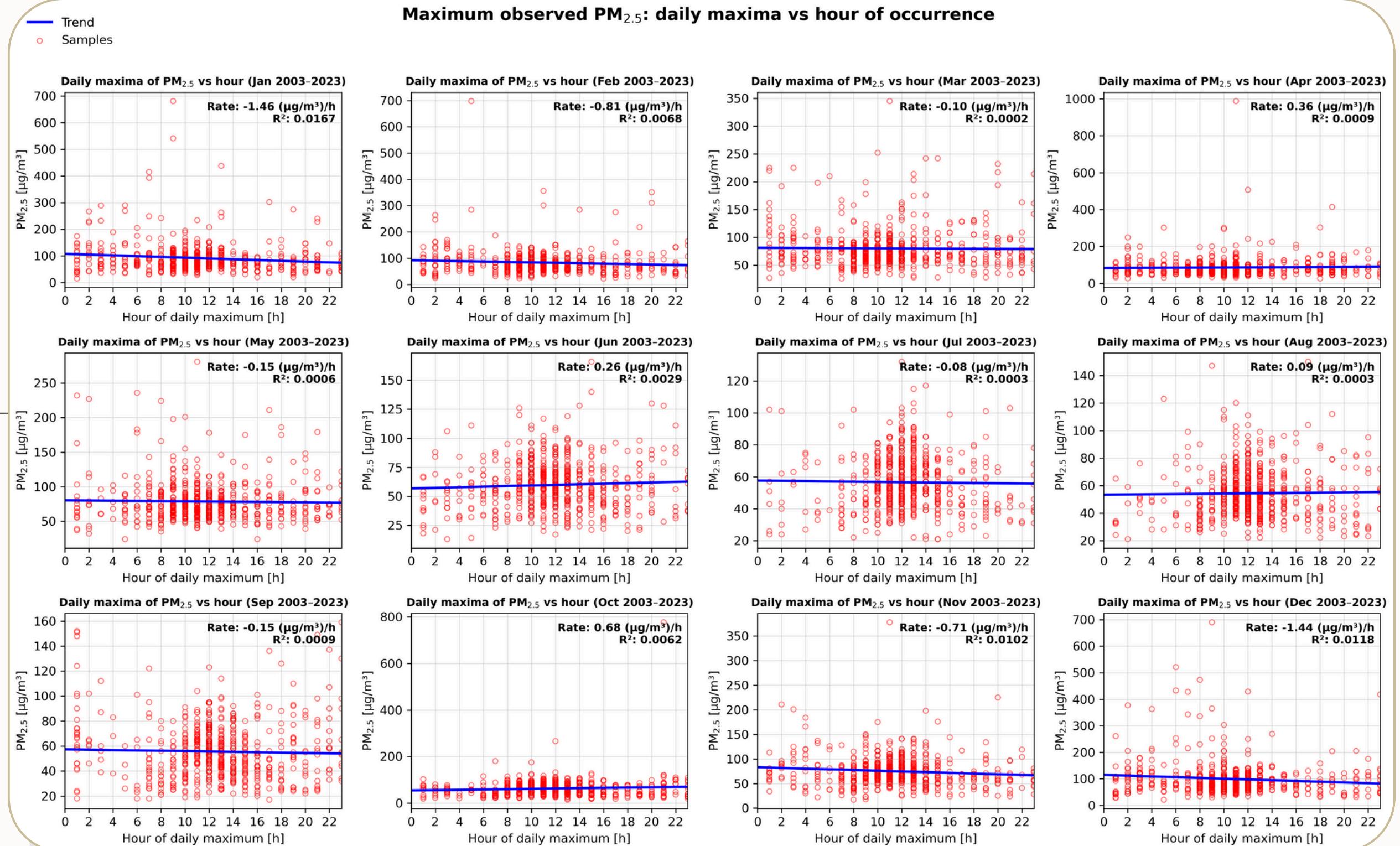


# Diurnal Diagnosis

## PM2.5



**Maximum observed PM<sub>2.5</sub>: daily maxima vs hour of occurrence**

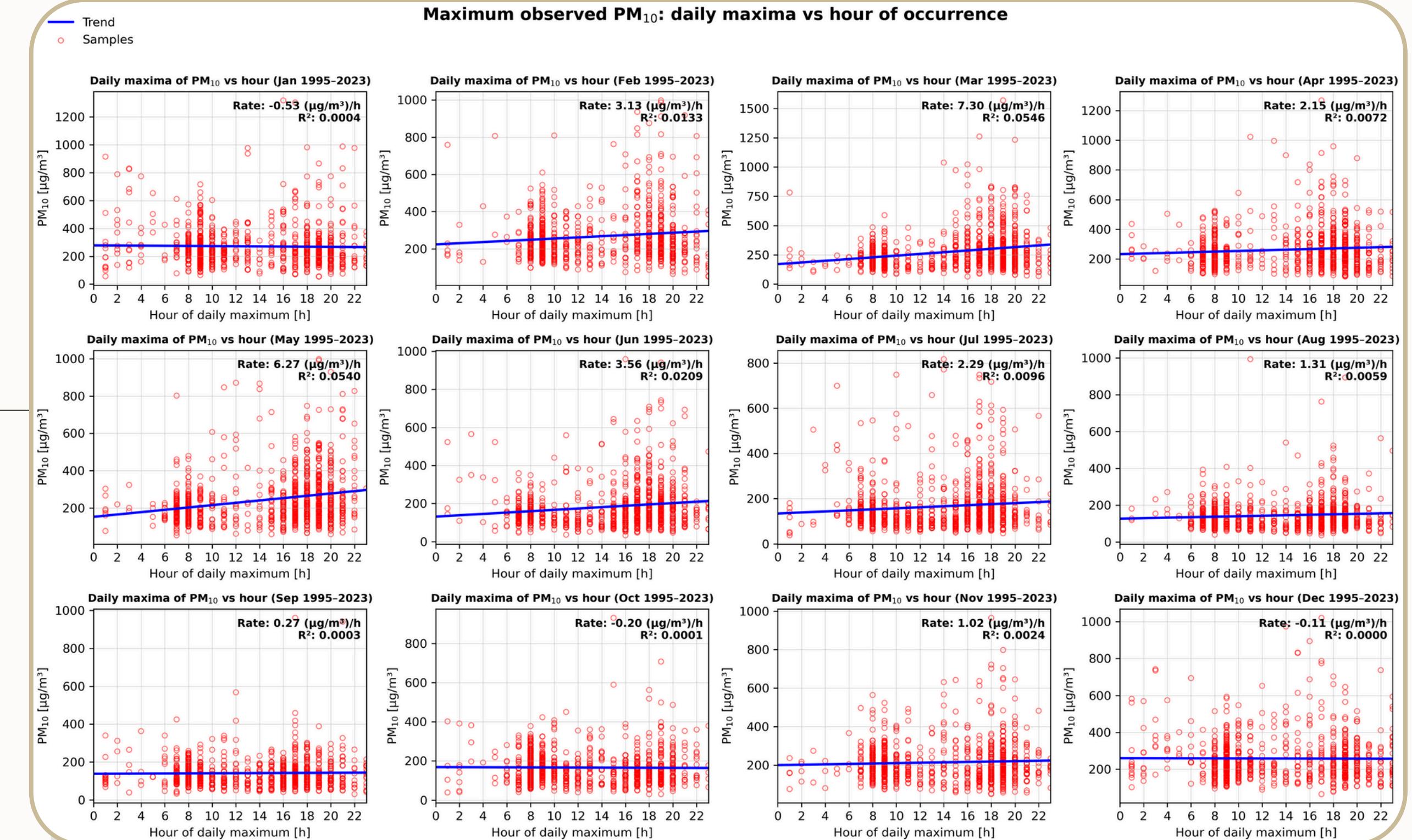


# Diurnal Diagnosis

## PM10



**Maximum observed PM<sub>10</sub>: daily maxima vs hour of occurrence**



# Next Steps

(Stage 1 → early Stage 2)

- • Finalize the selection of the PM dataset to be used (own data vs. ICAYCC datasets), including temporal resolution and spatial representativeness.
- Refine the definition of PM2.5 and PM10 pollution episodes, including the choice between percentile-based and threshold-based criteria, and identify key hours/months/seasons for focused analysis.
- Proceed with seasonal and monthly stratification and baseline episode climatology, as a basis for subsequent targeted composite analysis.



# thank you!

