

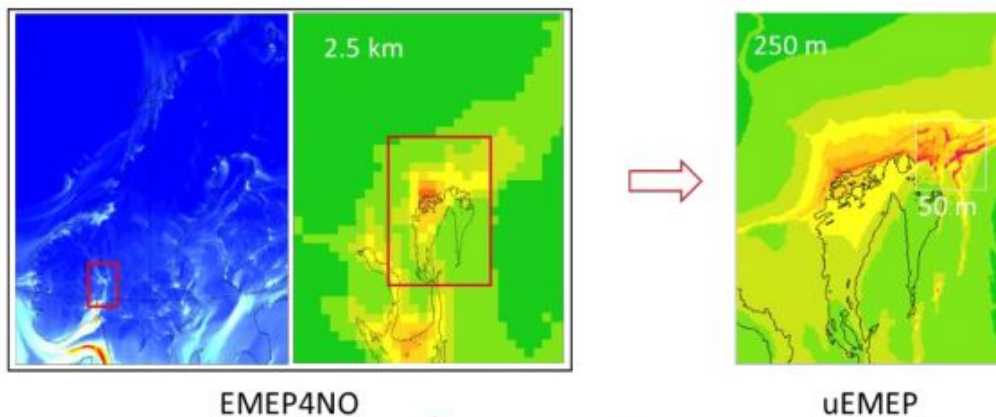
Feedback on new QA/QC indicators

Eivind G. Wærsted
Norwegian Meteorological Institute

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Model setup

- Norwegian air quality forecast
 1. EMEP MSC-W chemistry and transport model (Nordic domain nested in European domain)
 2. Downscale using Gaussian model (urban EMEP) → 50–250 m resolution
- Validation at measurement stations
 - Year: 2019
 - Frequency: Hourly
 - Resolution: 25 m (traffic sources only, other sectors at 250+ m)



NO₂ stations in Norway (>75 % coverage in 2019)

Traffic (UT)



Urban background (UB)



Regional background (RB)



Industrial



NO₂ stations in Norway (>75 % coverage in 2019)

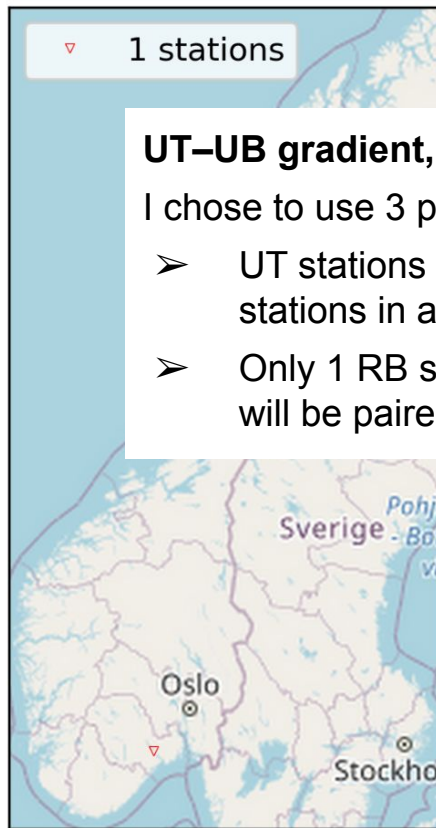
Traffic (UT)



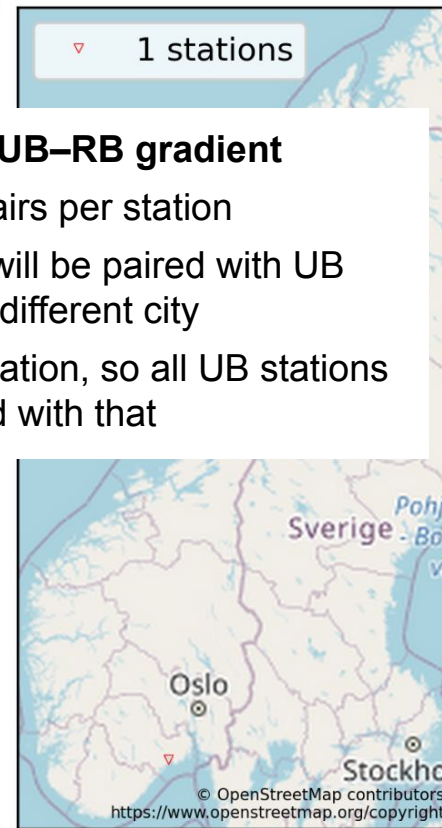
Urban background (UB)



Regional background (RB)



Industrial

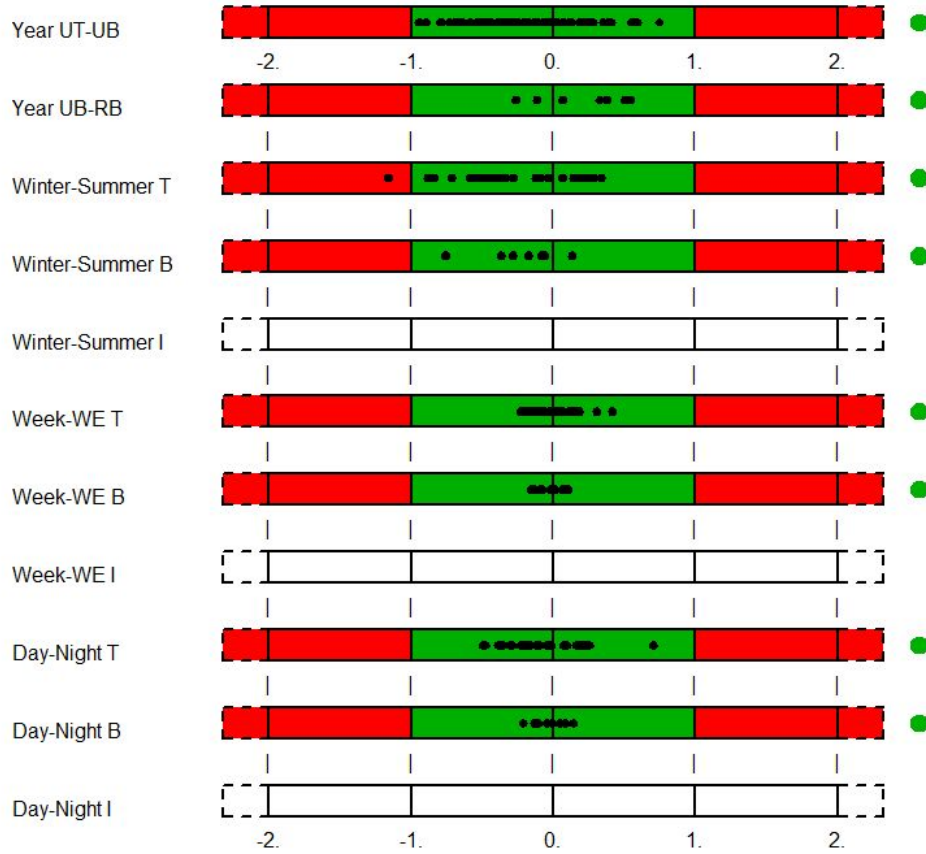


UT-UB gradient, UB-RB gradient

I chose to use 3 pairs per station

- UT stations will be paired with UB stations in a different city
- Only 1 RB station, so all UB stations will be paired with that

Hourly NO₂



No industry statistics:

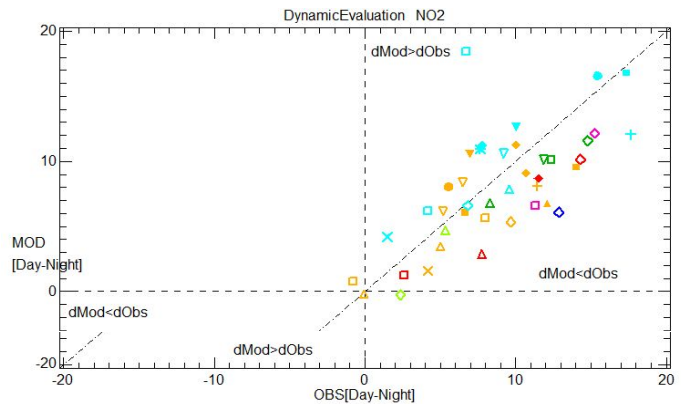
- At least 2 stations required?

Definitions:

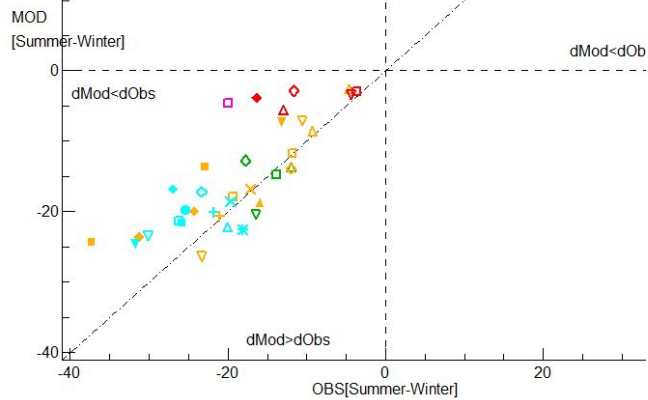
- Day vs. night: Assumes times are local solar time?
- Winter and Summer: 6-month or 3-month seasons?

Hourly NO₂

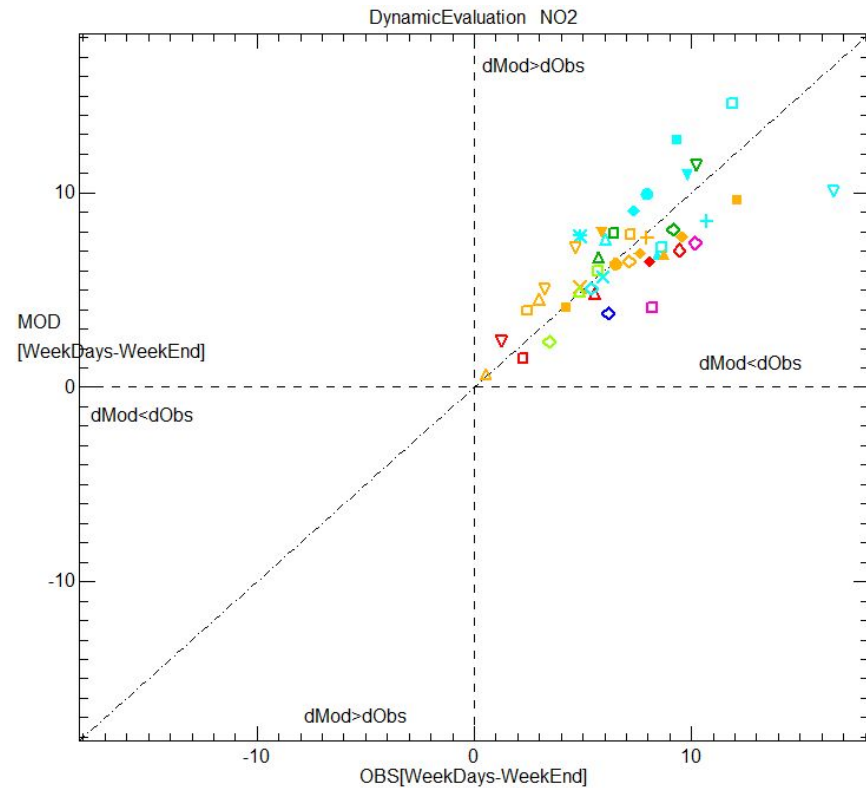
Day–Night



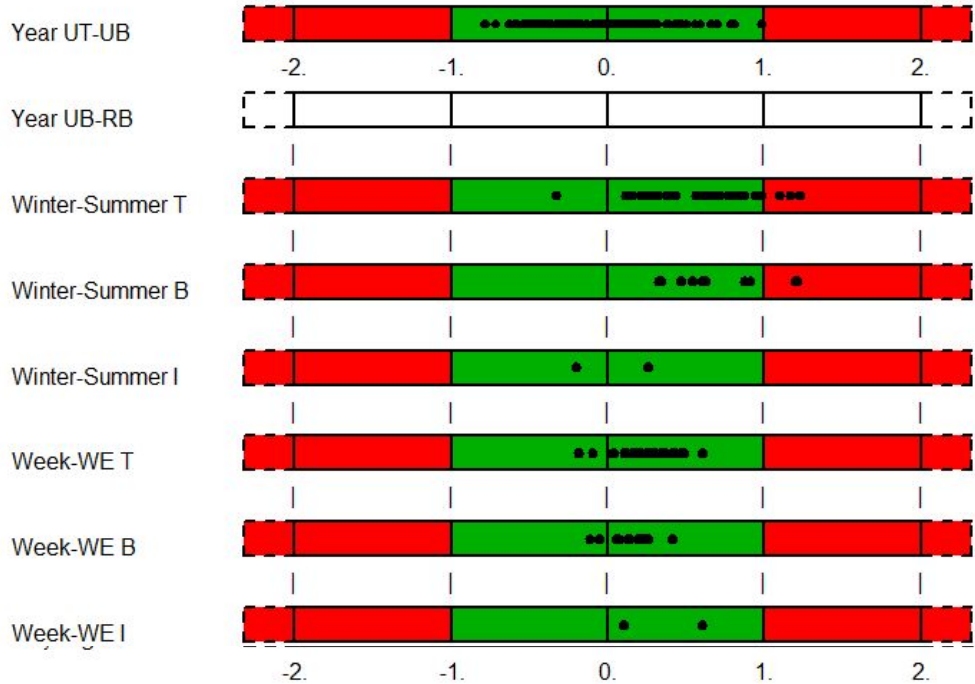
Summer–Winter



Weekdays–Weekend

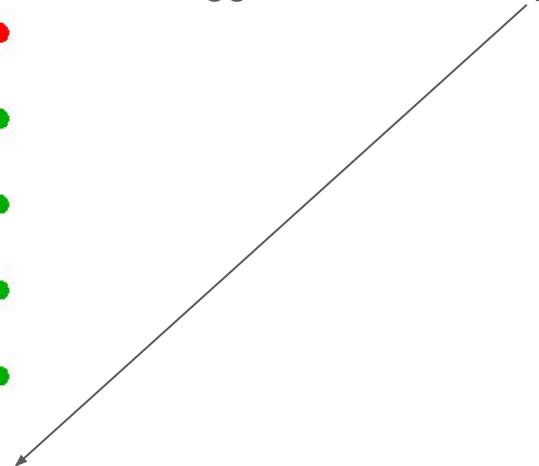


Daily mean PM10

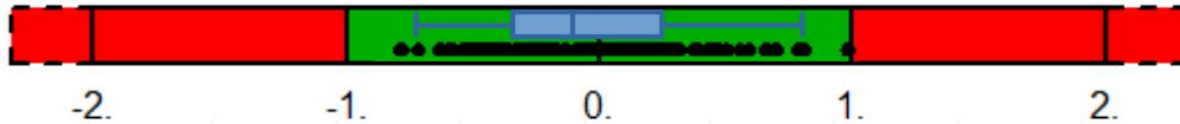


● Visualization of spatial gradients

- Many dots → hard to see statistical properties
- Suggestion: Add box plot?



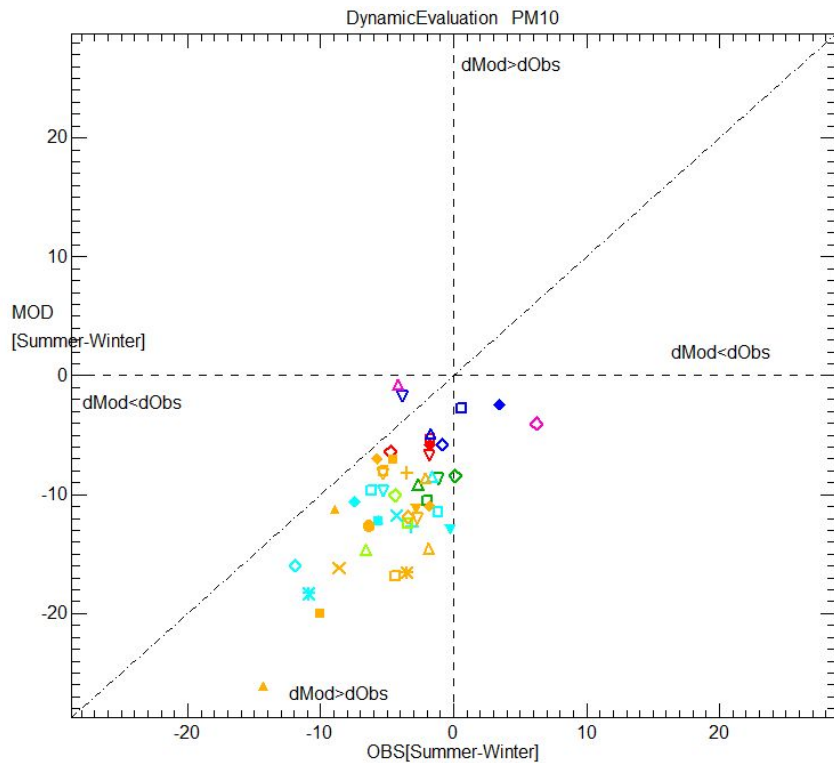
Year UT-UB



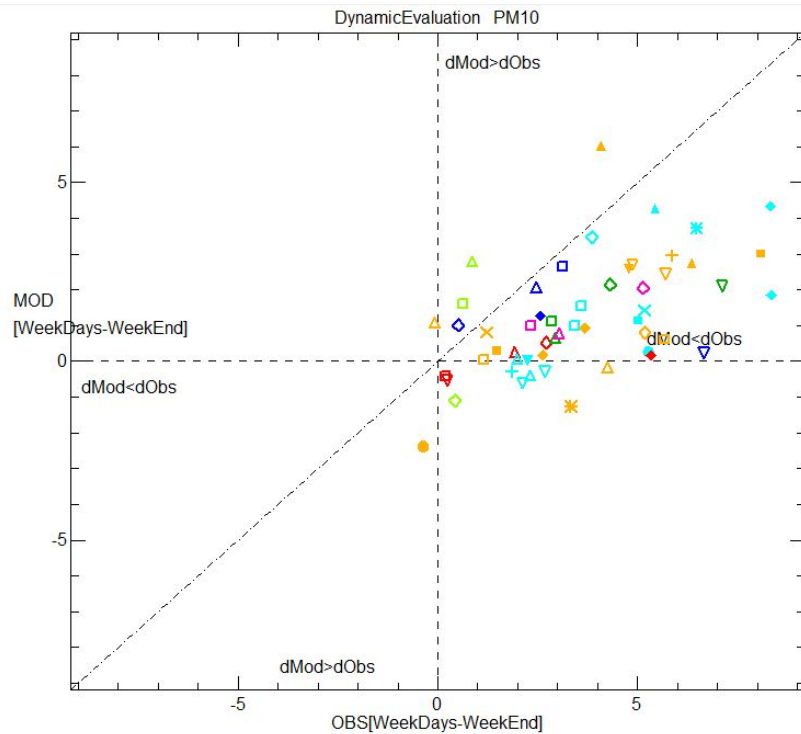
●

Daily mean PM10

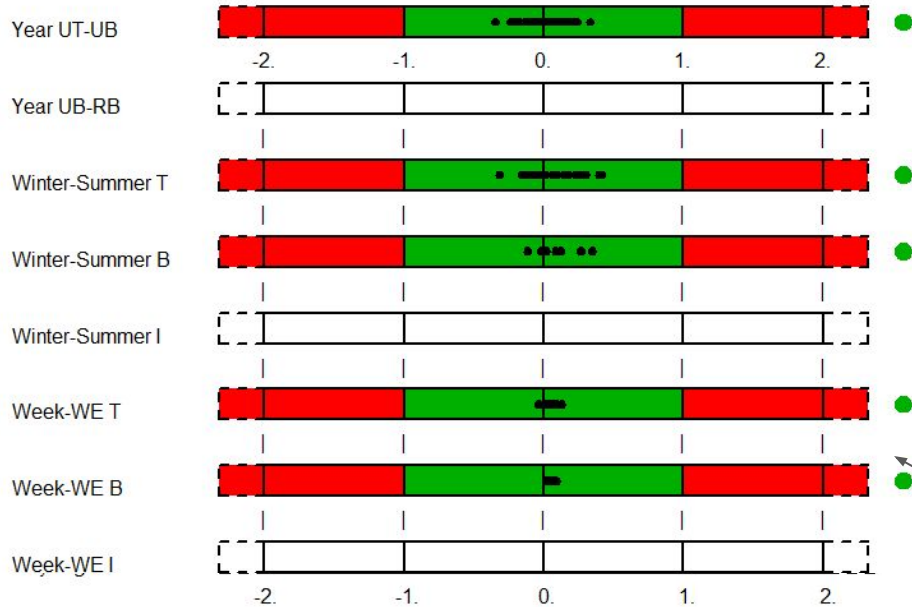
Summer–Winter



Weekdays–Weekend



Daily mean PM2.5

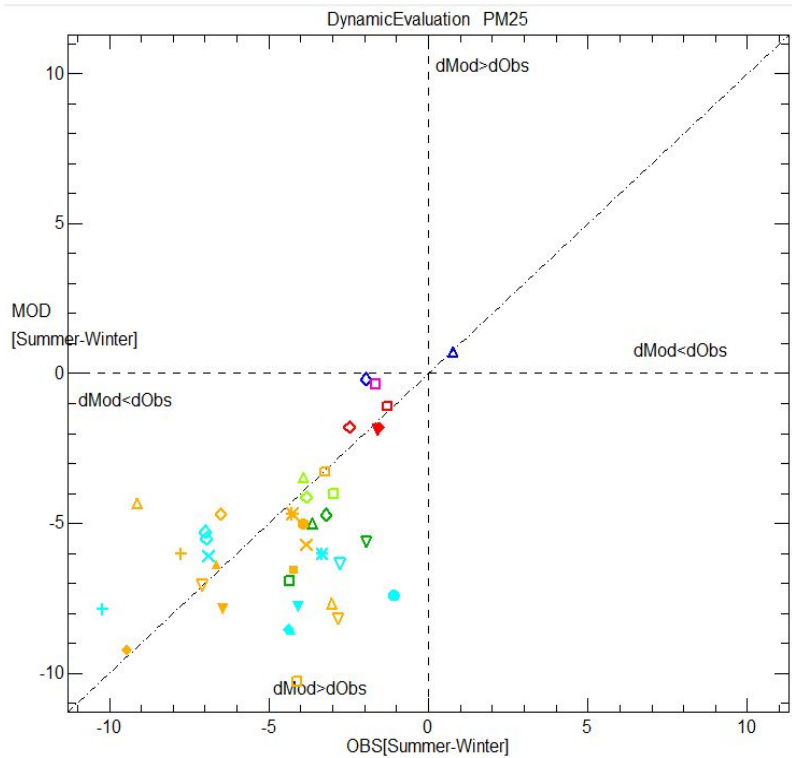


- Indicators show very good performance for PM2.5
- Two possible explanations:
 1. Gradients are well captured
 2. Gradients are insignificant (i.e. $INC / Diff$ is small compared to RMS_U)
- Can distinguish from scatterplot.
 - But no scatterplot for spatial gradients.

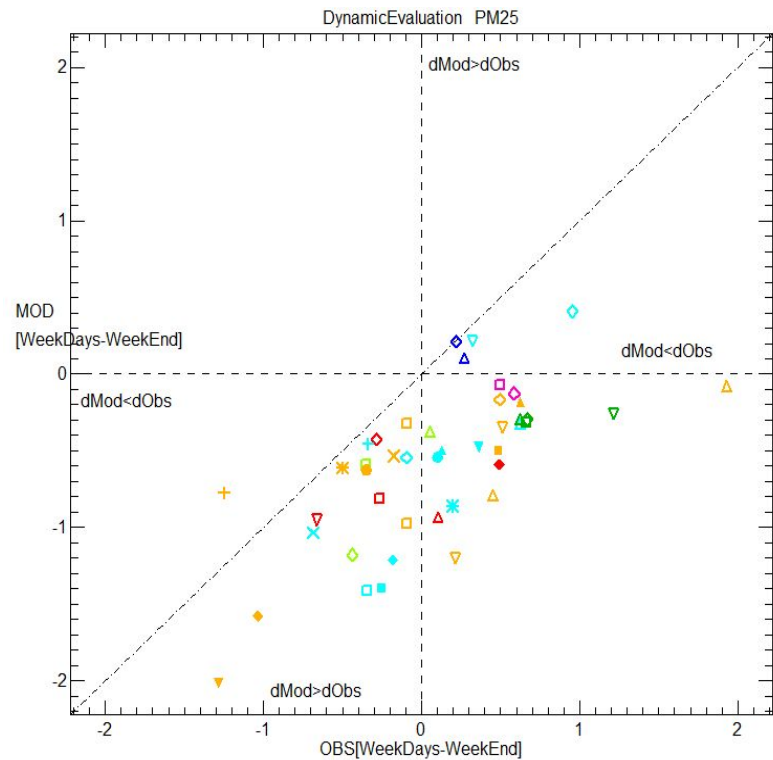
$$MPI = \frac{WeekDiff_{traffic}^{mod} - WeekDiff_{traffic}^{obs}}{\beta RMS_{\bar{U}}}$$

Daily mean PM2.5

Summer–Winter



Weekday–Weekend



Summary

General impression:

- New indicators are useful as complement to MQO

Conceptual remarks:

- Is it intended to calculate increments across different urban areas?
- Is it intended MPI should always be “good” if increments / differences are smaller than observation uncertainty?

Visualization remarks:

- Scatterplot for UT–UB and UB–RB increments could be useful (e.g. to see if good MPI is due to increments / differences being smaller than measurement uncertainty)
- Boxplot addition when number of points is large?

Technical remarks:

- Proper definitions for day/night and winter/summer (and how to deal with time zone)
- **Bug:** Forecast MQI figures became unavailable when installing the Delta plugin