

Questions / tests to be addressed

- **Q1 – Is the MQI robust?**
 1. Choose and document the data and stations you want to use for the MQI analysis
 2. Compare FAIRMODEs on-the-fly MQI with own home calculation
 3. Carry out ONE analysis of your choice
 - Check robustness of your MQI with respect to the number of stations
 - Check robustness of your MQI with respect to aggregation area (polygons vs. country)
 - Check robustness of your MQI across pollutants
 - Compare your MQI with others MQI – if beaten by CAMS – analyse the emission data
 - Check MQI ability to assess specific modelling purpose
- **Q2 - Are the MQI stringent enough and consistent among pollutants?**
- **Q3 – Does the fail/pass MQO test ensure a valid distinction between Fit/non-Fit-for-purpose modelling applications ?**



FAIRMODE WG2 MQI Mapping Exercise Contribution from Germany

First interpretation webinar - 3rd June 2024

Q1+Q2 evaluation of on-the-fly MQI

WG2 Data Used in the exercise

Model used: REM-CALGRID (RCG) in 2x2km²

Main uses of the modelling system under the AAQD: Assessment of national/regional air quality, scenario analysis (e. g. national air pollution control program for NEC-directive)

Monitoring Stations data used: fixed monitoring background stations ((sub)urban, rural) in Germany

Emissions: GRETA (2018 Sub 2020, Germany), CAMS (Europe)

Pollutant: all

Area used for the MQI evaluation: Germany

Meteorological year used: 2019

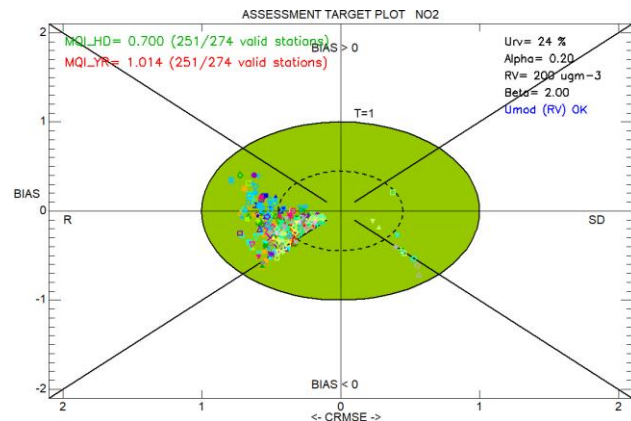
Selected MQI/Stringency level: default

WG2 Evaluation of the FAIRMODE MQI

Comparison of the MQO from FAIRMODE and at home – building trust and understanding differences - Analysis for the non-data assimilated data

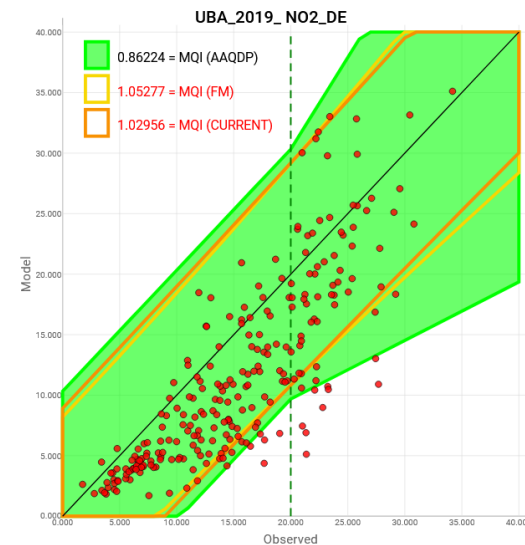
MQI Results from home calculation (Delta-Tool v5.6.1)

NO₂ (annual) → 1.01 (251/274 valid stations)



MQI Results from FAIRMODE platform

NO₂ (annual) → 1.05 (248 stations)

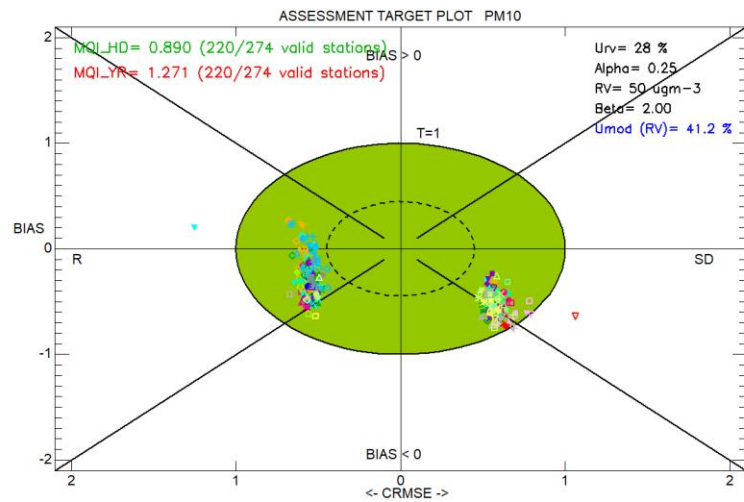


WG2 Evaluation of the FAIRMODE MQI

Comparison of the MQO from FAIRMODE and at home – building trust and understanding differences - Analysis for the non-data assimilated data

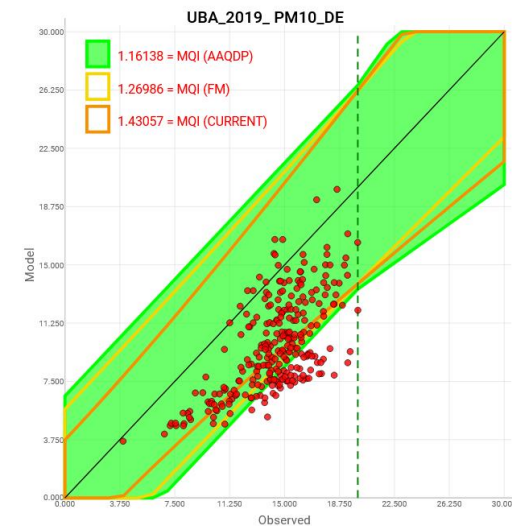
MQI Results from home calculation (Delta-Tool v5.6.1, unc. param. from v7.0)

PM10 (annual) → 1.27 (220/274 valid stations)



MQI Results from FAIRMODE platform

PM10 (annual) → 1.27 (274 stations)

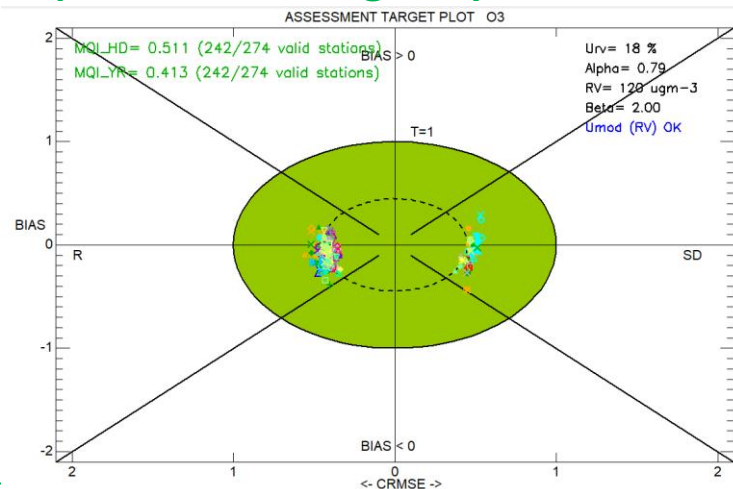


WG2 Evaluation of the FAIRMODE MQI

Comparison of the MQO from FAIRMODE and at home – building trust and understanding differences - Analysis for the non-data assimilated data

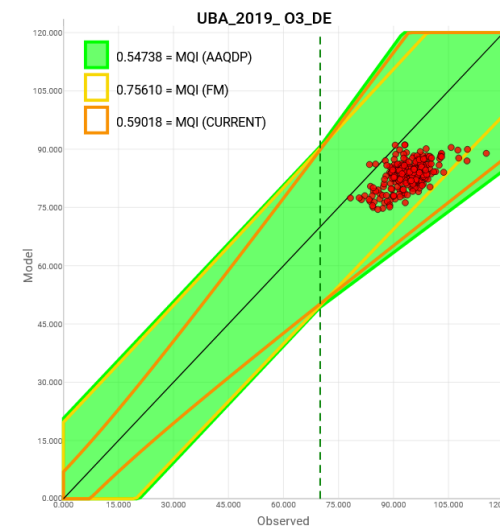
MQI Results from home calculation (Delta-Tool v5.6.1)

O3 (annual average??) → 0.41



MQI Results from FAIRMODE platform

O3 (peak season) → 0.76 (274 stations)



WG2 MQI robustness – Analysis

Comparison FAIRMODE platform and Delta-Tool

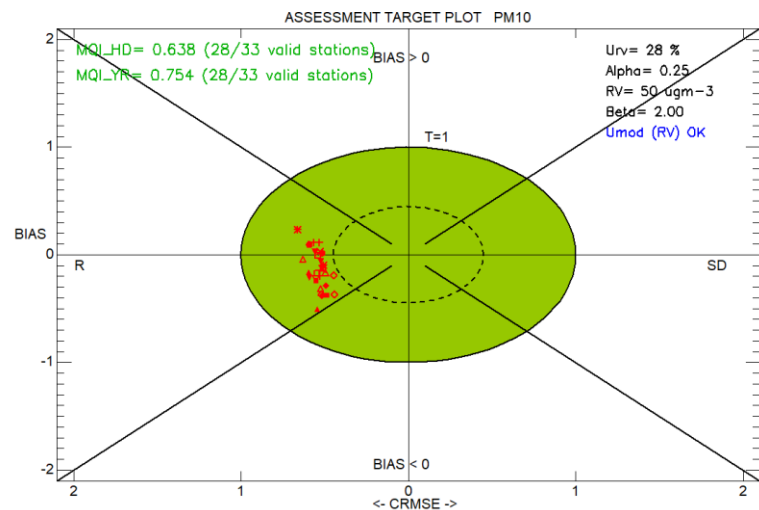
- *Number of stations used for calculating MQI slightly differs between the FAIRMODE platform and the Delta-Tool (Delta-Tool calculations are based on hourly data whereas the FAIRMODE operates on an annual basis)*
- *Small differences exist between MQI from FAIRMODE platform and Delta-Tool for NO₂ and PM₁₀*
- *Larger differences for Ozone. Is the MQI - calculation based on a similar aggregation level? Ozone peak season is used in the FAIRMODE platform. What is calculated internally in Delta-Tool v5.6.1?*

WG2 Evaluation of the MQI robustness - Results

Robustness test I – MQI with respect to aggregation area Nordrhein-Westfalen (mostly urban)

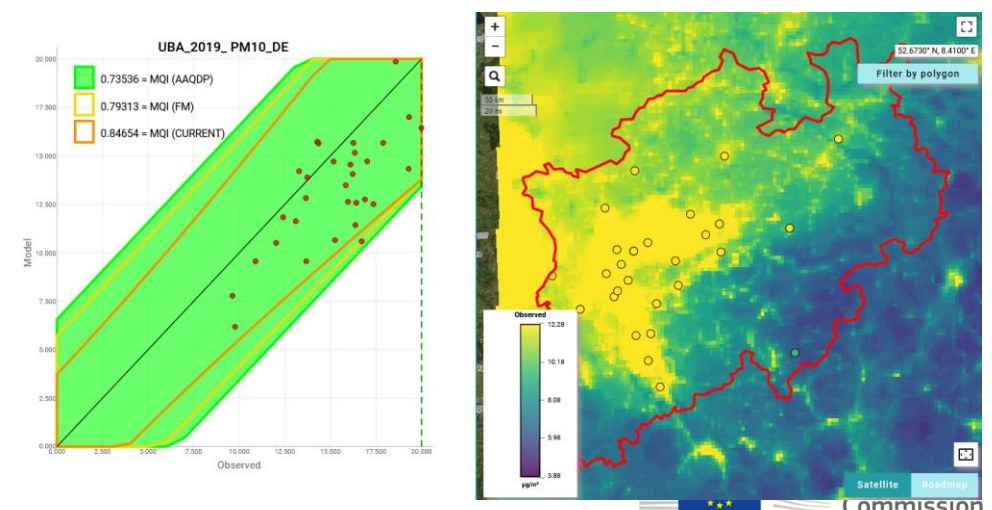
Robustness test I – Results from home calculation

PM10 (annual) → 0.75 (28/33 valid stations)



Robustness test I – Results from FAIRMODE platform

PM10 (annual) → 0.79 (31 stations)

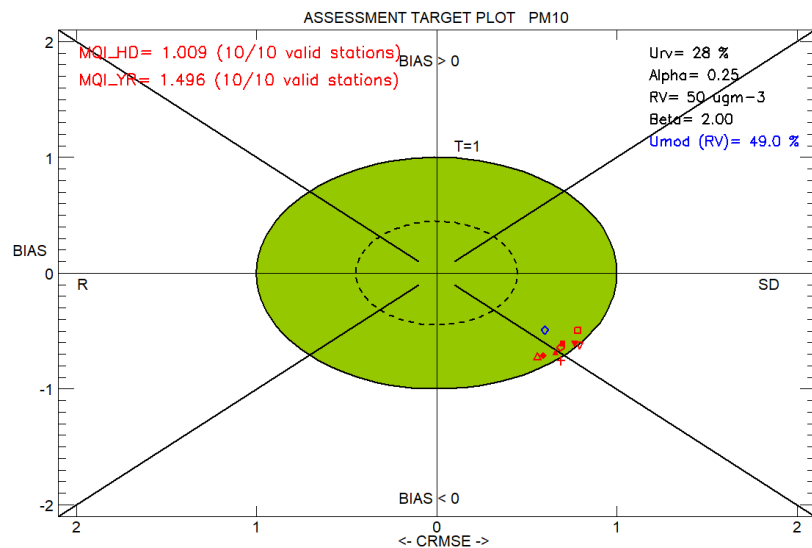


WG2 Evaluation of the MQI robustness - Results

Robustness test I – MQI with respect to aggregation area Mecklenburg-Vorpommern (mostly rural)

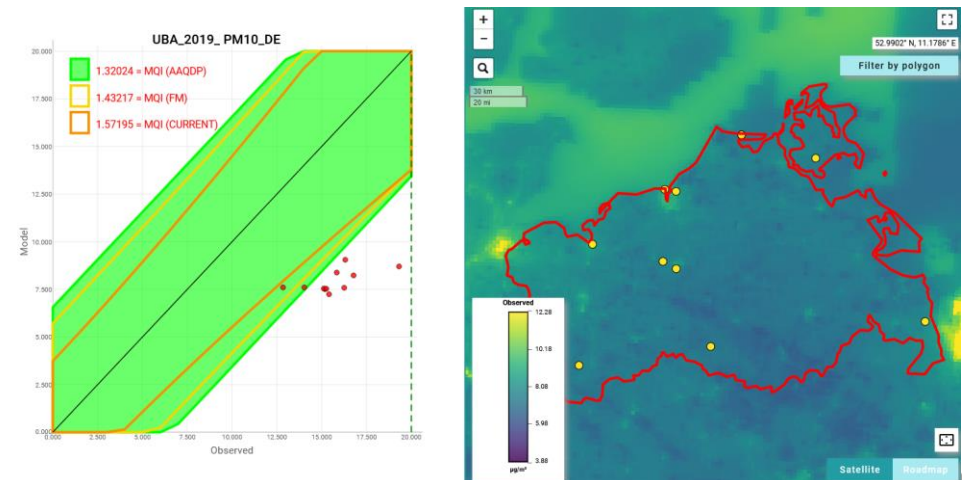
Robustness test I – Results from home calculation

PM10 (annual) → 1.50 (10/10 valid stations)



Robustness test I – Results from FAIRMODE platform

PM10 (annual) → 1.43 (11 stations)

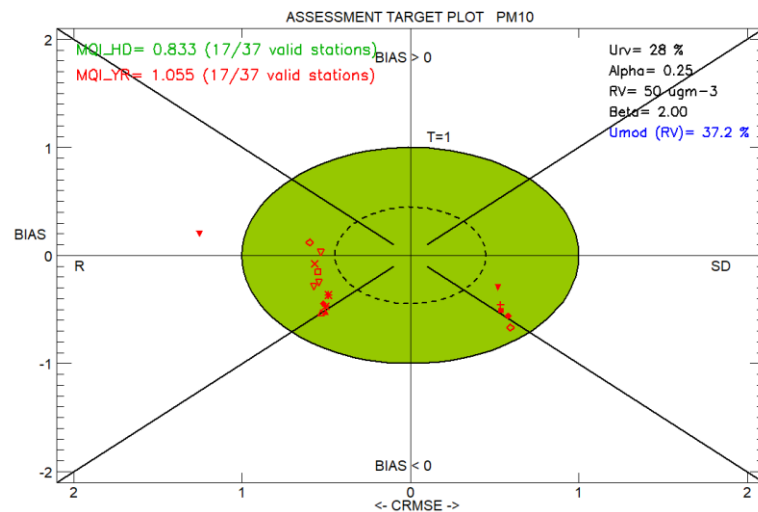


WG2 Evaluation of the MQI robustness - Results

Robustness test I – MQI with respect to aggregation area Bayern (rural/urban including mountain areas)

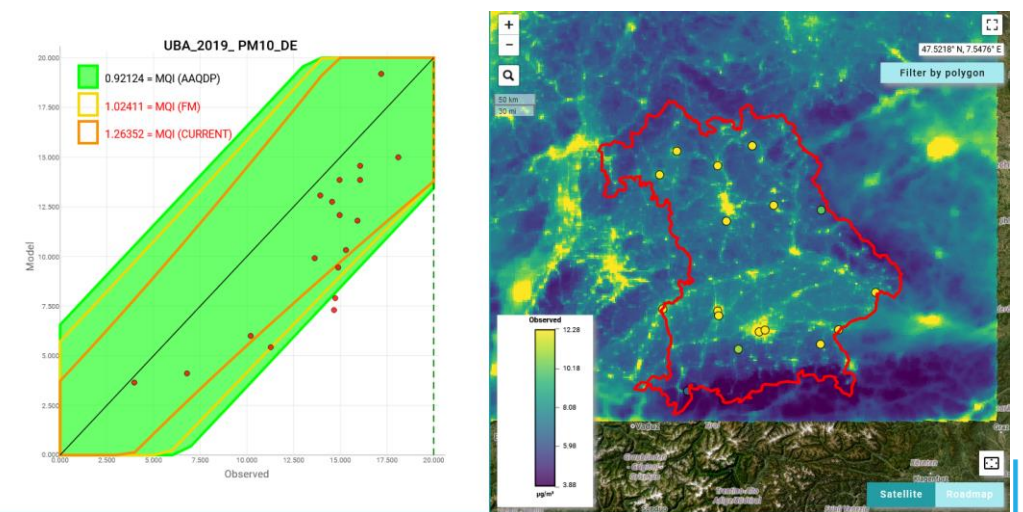
Robustness test I – Results from home calculation

PM10 (annual) → 1.06 (17/37 valid stations)



Robustness test I – Results from FAIRMODE platform

PM10 (annual) → 1.02 (18 stations)



WG2 MQI robustness – Analysis

Robustness test I – MQI with respect to aggregation area (polygons vs. country)

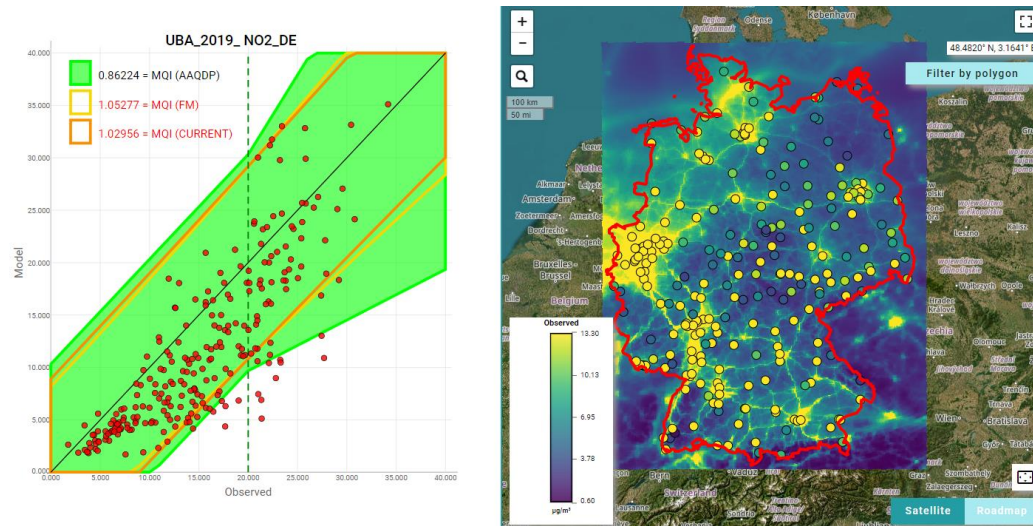
- ***MQI varies from region to region***
- ***One modelling application might fail in one region but pass in another region***
- ***Conclusions regarding MQI drawn on national level can not be transferred to a smaller region in the country → If a modelling application used for assessment purposes on zone level, MQI has to be calculated individually for every zone***
- ***Additional exercise on zone level (next workshop)***

WG2 Evaluation of the MQI robustness - Results

Stringency test I – MQI including traffic stations for regional model evaluation

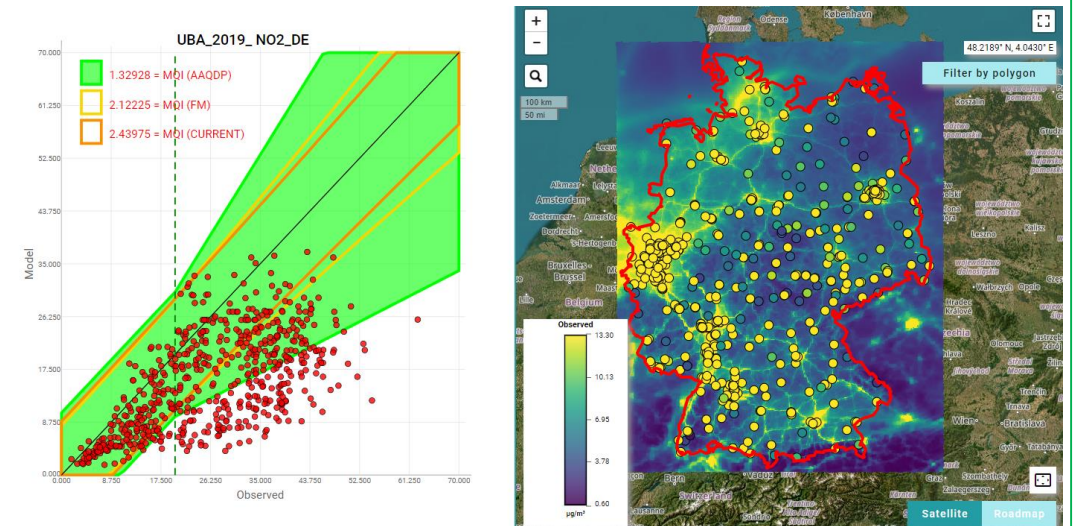
Stringency test I – without traffic

NO₂ (annual) → 1.05 (286 valid stations)



Stringency test I – with traffic

NO₂ (annual) → 2.12 (614 stations)

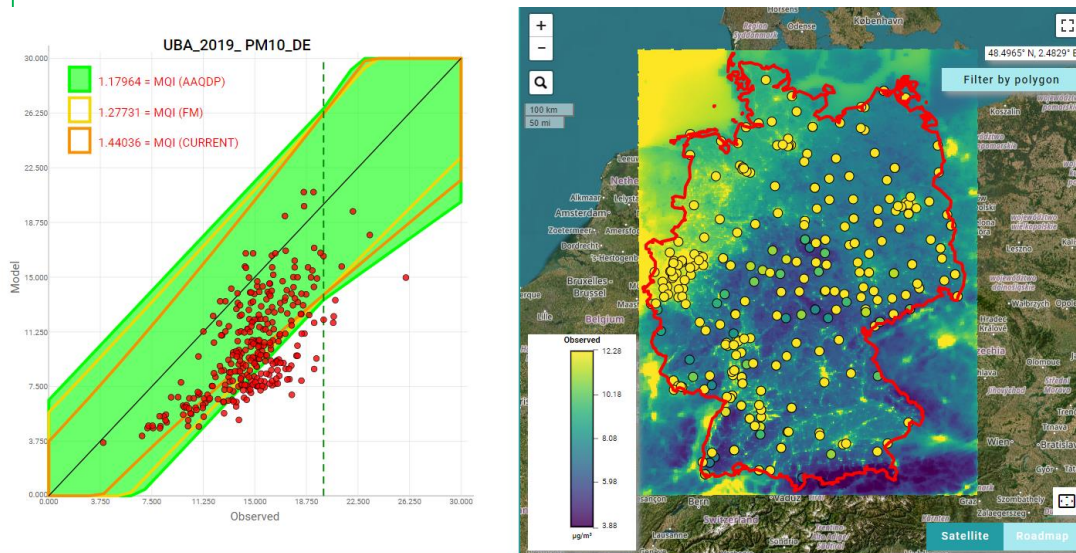


WG2 Evaluation of the MQI robustness - Results

Stringency test I – MQI including traffic stations for regional model evaluation

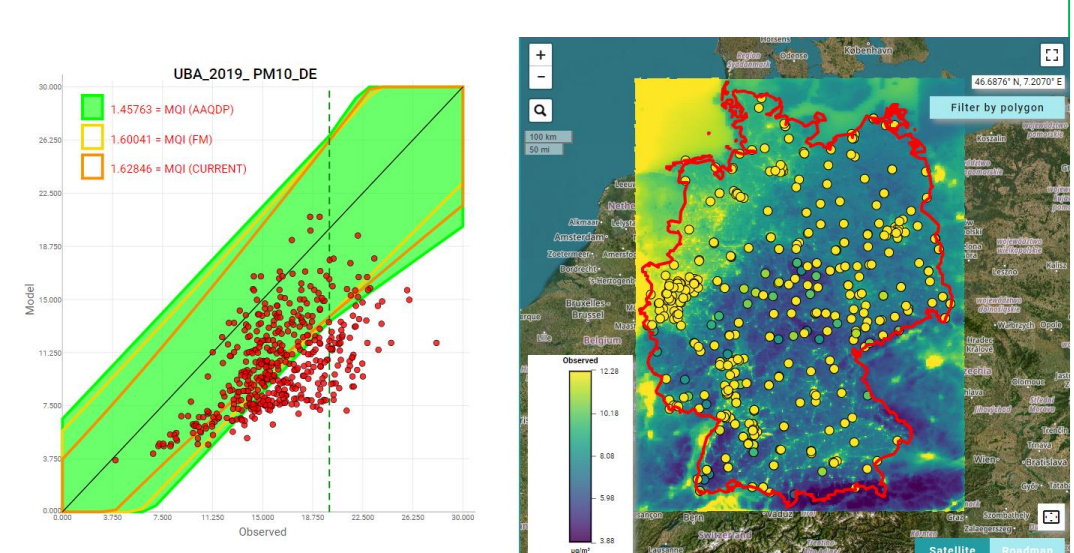
Stringency test I – without traffic

PM10 (annual) → 1.28 (310 valid stations)



Stringency test I – with traffic

PM10 (annual) → 1.60 (466 stations)



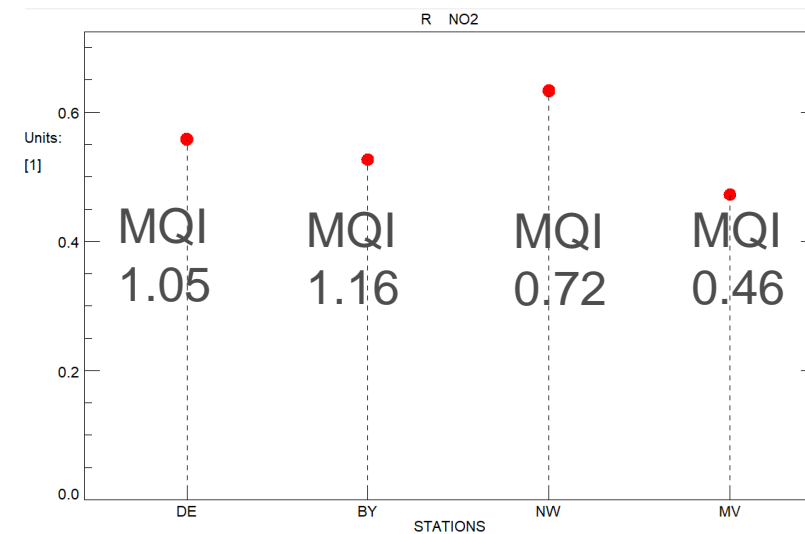
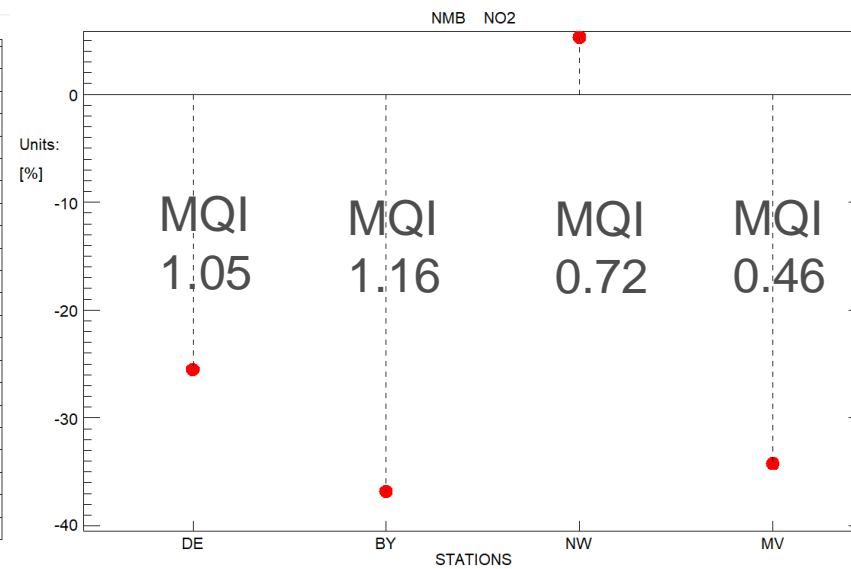
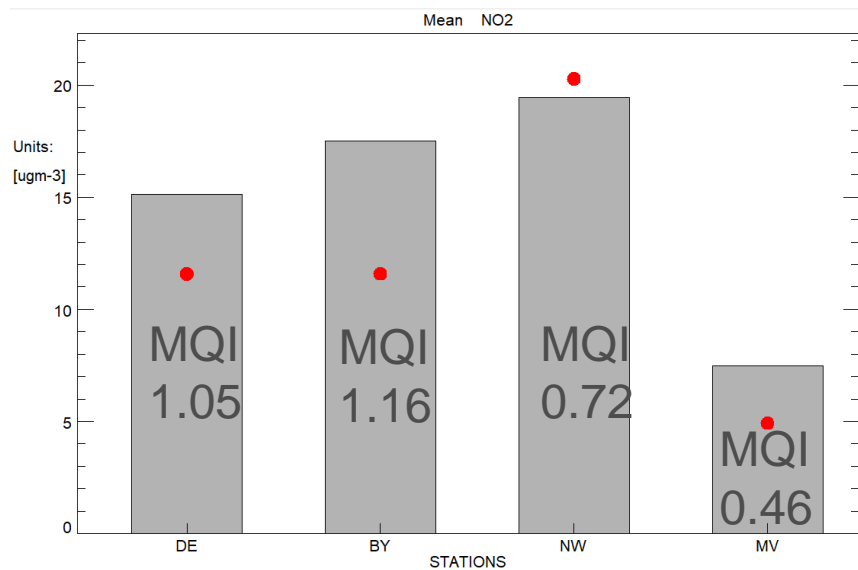
WG2 MQI robustness – Analysis

Stringency test I – MQI including traffic stations for regional model evaluation

- ***NO2 MQI significantly increases when traffic stations are included but raw model without assimilation always fails the MQO***
- ***PM10 MQI slightly increases when traffic stations are included but raw model without assimilation always fails the MQO***
- ***It is possible to adjust the stringency so that raw model fails MQO with traffic stations and passes MQO without traffic stations but then the stringency varies from model to model and from pollutant to pollutant***

WG2 Evaluation of the MQI robustness - Results

Stringency test II – MQI comparison with Mean, normalized Bias and Correlation



WG2 MQI robustness – Analysis

Stringency test II – MQI comparison with Mean, normalized Bias and Correlation

- ***For mixed urban and rural regions (DE, NW and BY) similar tendency in MQI as in statistical metrics (e. g. passing MQI → small deviation between model and measurement)***
- ***For mostly rural regions with low concentrations (MV), MQI passes but the statistical metrics show a high deviation between model and measurement → Due to high measurement uncertainty at low concentrations***
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WG2 MQI robustness – Questions & suggestions

- Please use this slide to list any questions on the data, on the platform or the methods that you would like to share and any suggestions for improvement of the FAIRMODE MQI platform
- Overall a very good platform for quick a calculation of MQI with nice visualization and opportunities for testing
- It would be good to allow for a calculation of hourly/daily MQI (modelled station data on hourly basis could be submitted)

Thank-you