FAIRMODE WG2 MQI Mapping Exercise Contribution from MET Norway Europe and Norway

Second interpretation webinar - 3rd September 2024

Q1 + Q2+ Q3 evaluation of on-the-fly MQI

WG2: A note on my aims

Does the MQI reflect the expected results, concerning fit-for-purpose modelling?

Do local bottom-up models and emissions give better MQI's?

How much does data assimilation impact on the MQI?

Choice of pollutant, impact on MQI?

General testing the platform.

Comparing uEMEP to other models in Europe (Europe, Belgium, Poland)

WG2: Data Used in the exercise

Model used: *uEMEP/EMEP, Europe - annual means (250 m), Norway – hourly means (100 m)*

Main uses of the modelling system under the AAQD: *Part of the revision process in Europe*

Monitoring Stations data used: *EEA, all stations*

Emissions: *Europe - downscaled EMEP emissions, Norway - national bottom-up emissions*

Pollutant: *Europe and Norway - NO2, PM2.5, PM10*

Area used for the MQI evaluation: *Europe and Norway*

Meteorological year used: *2019*

Selected MQI/Stringency level: *AAQDP/1*

WG2: A note on the models used

Selected models that cover Europe:

CAMS reanalysis with CAMS emissions and data assimilation

EMEP with EMEP emissions and no data assimilation

uEMEP-EU with downscaled EMEP emissions (250 m) and no data assimilation

Selected models that cover Norway:

CAMS reanalysis with CAMS emissions and data assimilation

EMEP with EMEP emissions and no data assimilation

uEMEP-EU with downscaled EMEP emissions (250 m) and no data assimilation

uEMEP-NO with bottom-up emissions for Norway (100 m) and no data assimilation

WG2: Evaluation of the MQI - Overview

Overall comparison of model MQI results, pollutant dependency

Checked failure rates for NO2, PM2.5 and PM10 for background stations only, with and without data assimilation

Without data assimilation

NO$_2$	MQI > 1	Total
NO$_2$	10	16
PM$_{2.5}$	2	13
PM$_{10}$	11	15

With data assimilation

NO$_2$	MQI > 1	Total
NO$_2$	1	8
PM$_{2.5}$	0	8
PM$_{10}$	1	8

Is it really more difficult to model NO2 and PM10 than PM2.5?

Are the measurement uncertainties much larger for PM2.5?

Is it that the spatial gradients for PM2.5 are much less?

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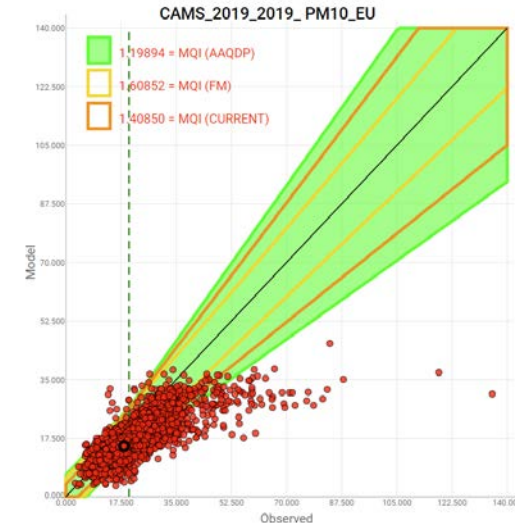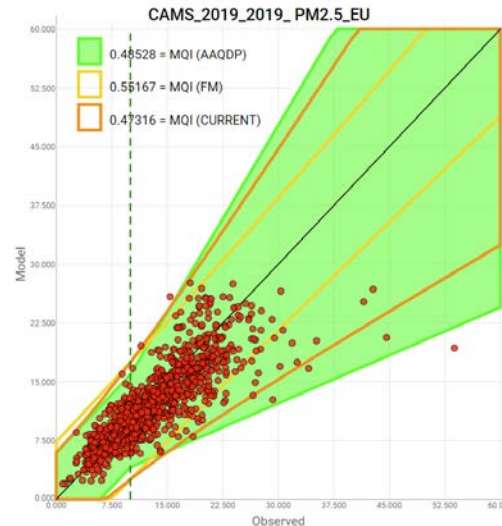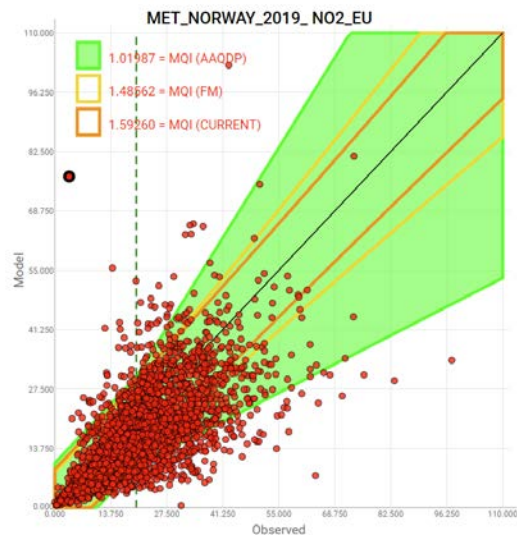# WG2: Evaluation of the MQI - Europe

Does the MQI reflect the expected model results for European models?

Comparison in Europe of CAMS, EMEP and uEMEP-EU, MQI (AAQDP)

NO$_2$	All	BG
CAMS	1.38	1.05
EMEP	1.44	1.17
uEMEP-EU	1.02	0.84

PM$_{2.5}$	All	BG
CAMS	0.48	0.46
EMEP	0.76	0.72
uEMEP-EU	0.66	0.62

| PM$_{10}$	All	BG
CAMS	1.12	1.05
EMEP	2.03	1.92
uEMEP-EU	1.44	1.33

WG2: Evaluation of the MQI - Norway

European models in Norway and local bottom-up modelling

Comparison in Norway of CAMS, EMEP, uEMEP-EU and uEMEP-NO MQI (AAQDP)

NO$_2$	All	BG
CAMS	1.62	1.06
EMEP	1.75	1.45
uEMEP-EU	1.16	0.69
uEMEP-NO	0.67	0.47

PM$_{2.5}$	All	BG
CAMS	0.52	0.31
EMEP	0.86	0.57
uEMEP-EU	0.51	0.35
uEMEP-NO	0.42	0.21

PM$_{10}$	All	BG
CAMS	1.51	0.75
EMEP	2.32	1.68
uEMEP-EU	1.67	1.15
uEMEP-NO	0.96	0.45

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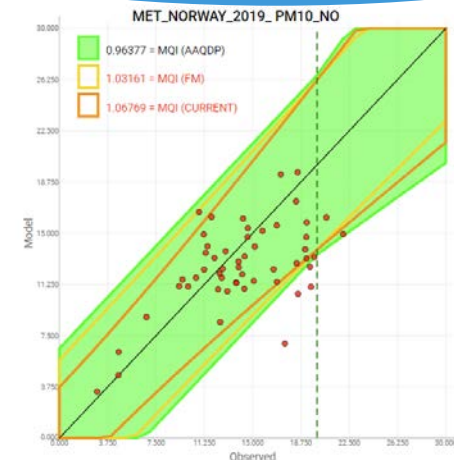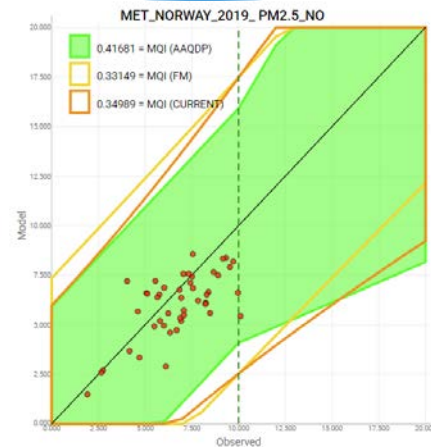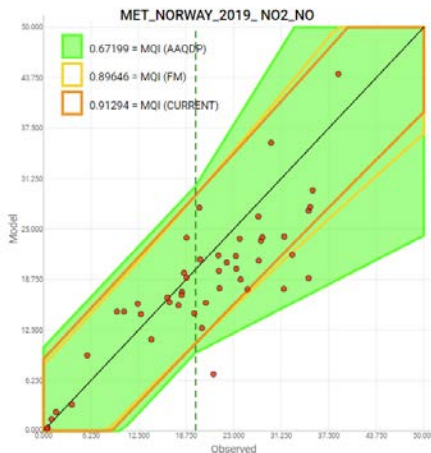
WG2: Evaluation of the MQI – Belgium

Comparison high resolution bottom-up data assimilated model with downscaled top-down model

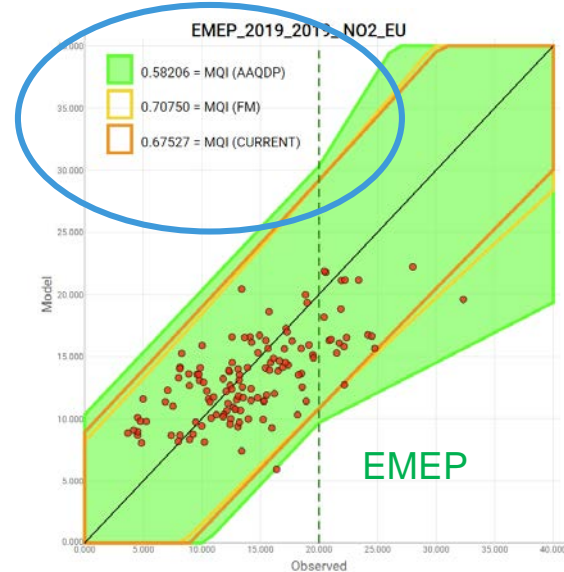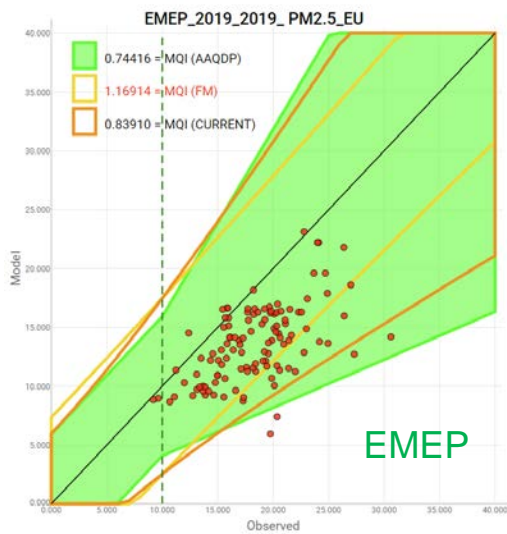*Comparison in Belgium of ATMOSTREET and uEMEP-EU, MQI (AAQDP)*
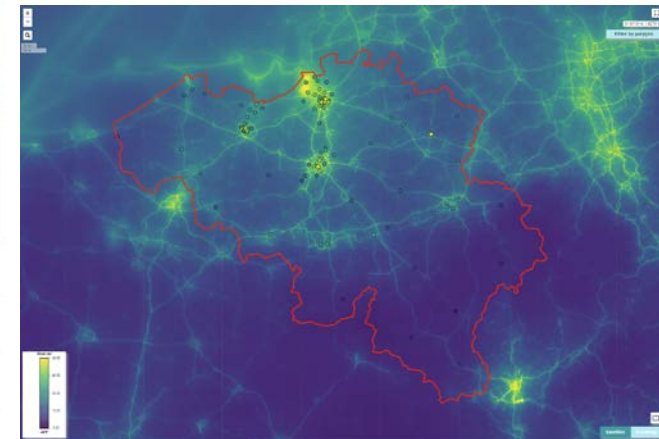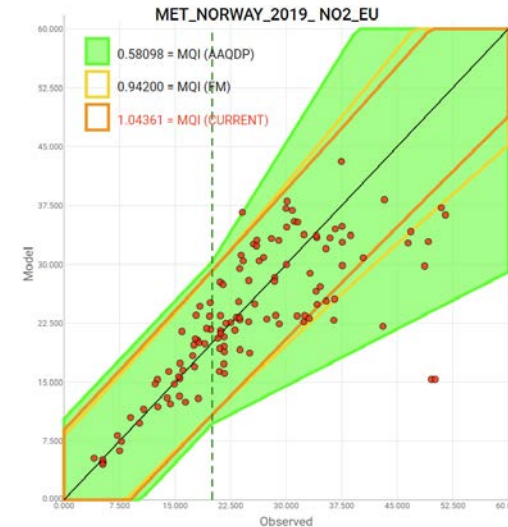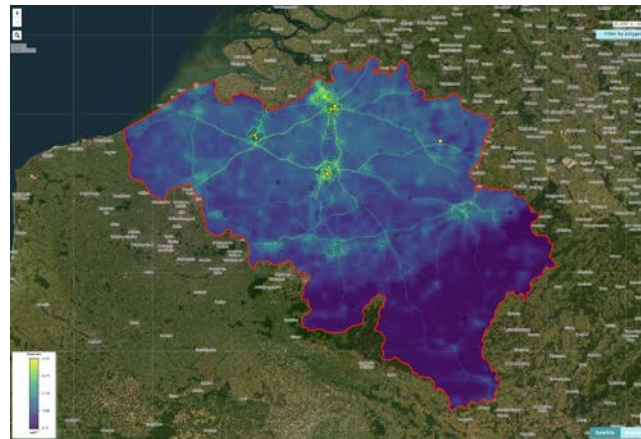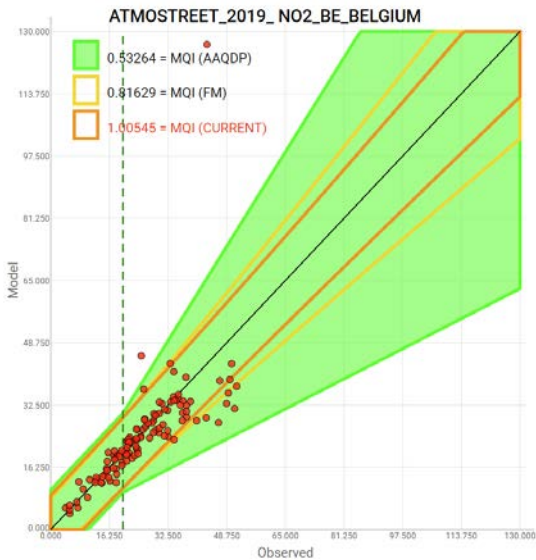
NO$_2$	All	BG
ATMOSTREET	0.53	0.34
uEMEP-EU	0.58	0.53

PM$_{2.5}$	All	BG
ATMOSTREET	0.21	0.18
uEMEP-EU	0.28	0.29

PM$_{10}$	All	BG
ATMOSTREET	0.55	0.46
uEMEP-EU	1.01	0.95

WG2: Evaluation of the MQI – Poland (background)
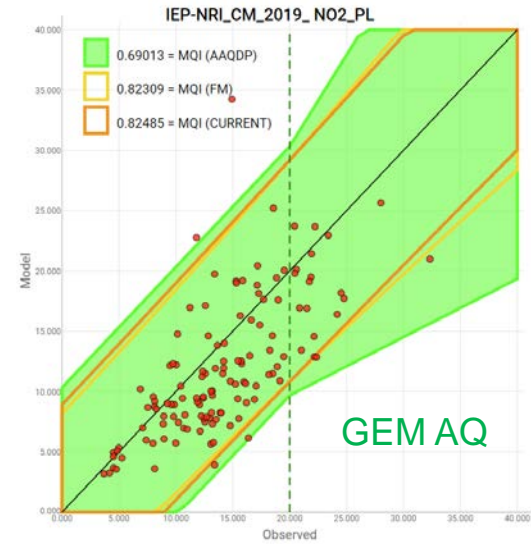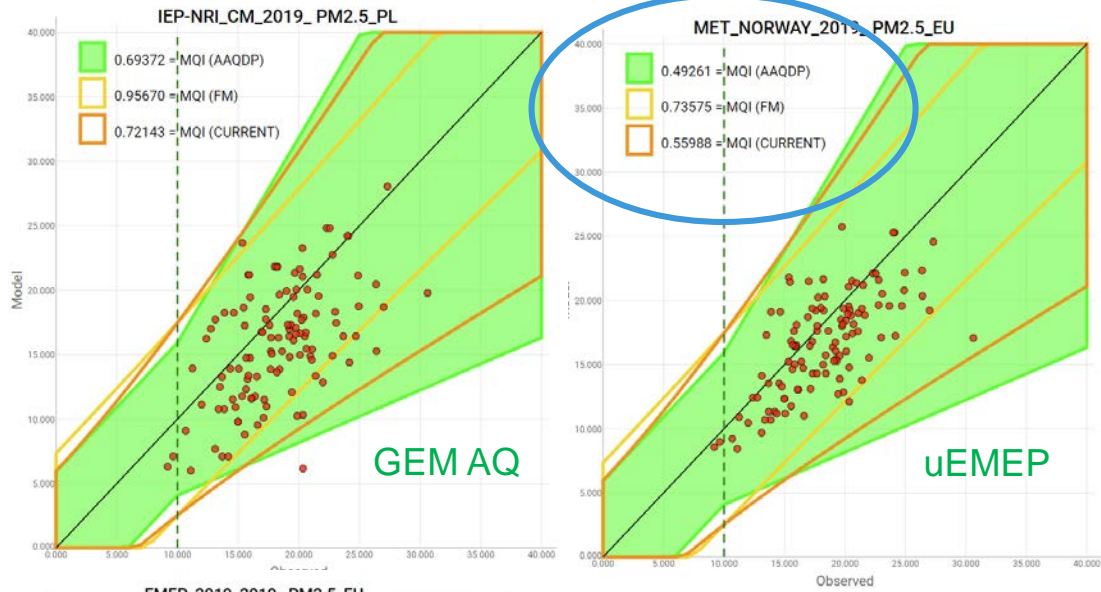
PM2.5

NO2

Questions answered

- **Q1 – Is the MQI robust?**

  - *Did not compare to in house calculations*

  - *MQI seems to be indicative of general model uncertainty, no surprises found*

- **Q2 - Are the MQI stringent enough and consistent among pollutants?**

  - **It is not stringent enough for PM2.5**

- **Q3 – Does the fail/pass MQO test ensure a valid distinction between Fit/non-Fit-for-purpose modelling applications ?**

  - **For PM10 and NO2 it seems to be strict enough, with most models failing without data assimilation. A single number will never answer the fit-for-purpose question.**

  - **MQO test is not very useful for PM2.5, as it is now.**

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WG2: MQI robustness – some points

- Polygons usually work, but not always (selecting from drop down tab usually fixes this). Also after cancelling a polygon it remains on the map

- Allow manual typing of stringency

- Could not always type in scale values, sometimes could, sometimes couldn't.

- I thought it was possible to remove stations from the scatter plot but could not find out how this worked.

- The detailed metadata is mostly technical database things, just a few useful bits of information. Could not see model resolution.

- Clicking on the model grids gives you the wrong numbers (shifted ½ a grid?). Is this the data behind or the grid presentation that is shifted? Is it correctly matched to the station position?

Thank-you

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