Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

WG5 – Pilot activity Assessment
Italy NO_2 2015

FAIRMODE Pilot Exercise session – Tallinn, 26/6/2018

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working group:

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- We run the national model for Italy MINNI for supporting national policy (scenarios, NECD, AQD infringement procedures), but do not do the assessment/reporting for the AQD

- By national law, Italian Regions are in charge of AQD assessment/reporting

- We use currently available model performance indicators (RMSE, bias, MFB, MFE, correlation) and evaluation criteria (PM: Boylan and Russell 2006)

- **Our objectives in WG5: test the Delta tool for model performance on concentrations - providing concentration maps for intercomparisons with EU and Fairmode members**

- **Model: AMS-MINNI, 4 km resolution**

- **Run: 2015, based on National Emission Inventory (CLRTAP submission 2017), detailed at NUTS3 level (provinces)**

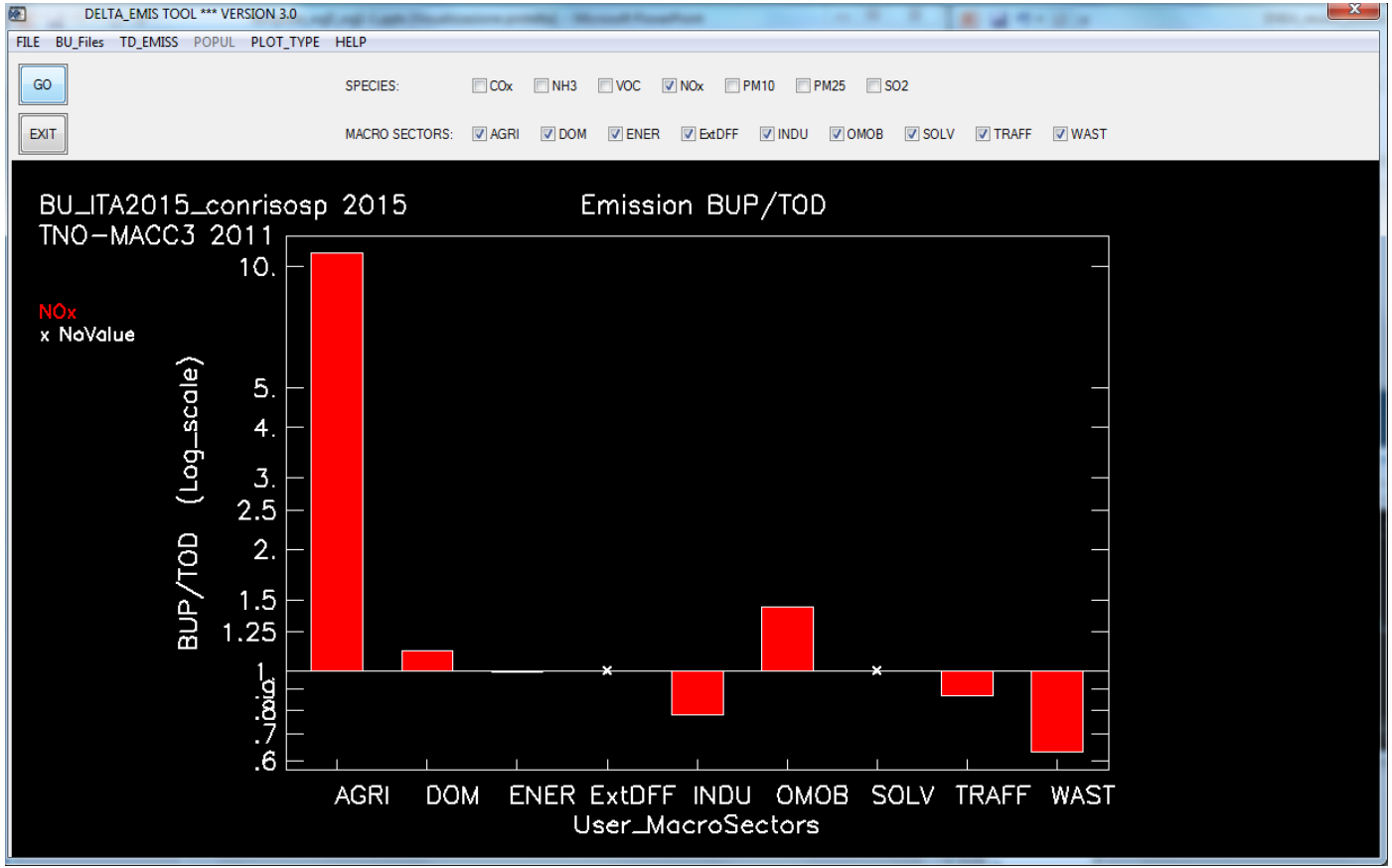
- **Pollutants: NO_2**

  > PM10 and PM2.5 are under investigation, as it is the first time we run with Saharan dust BC (CAMS global) and revised NEI values for biomass-fueled residential heating (after a national survey on consumptions in 2013), with a major increase on time series of PM emissions estimates. Model setup is still not satisfactory…

NO_x emissions: ITA 2015 (BUP) vs TNO-MACCIII 2011 (TOD)

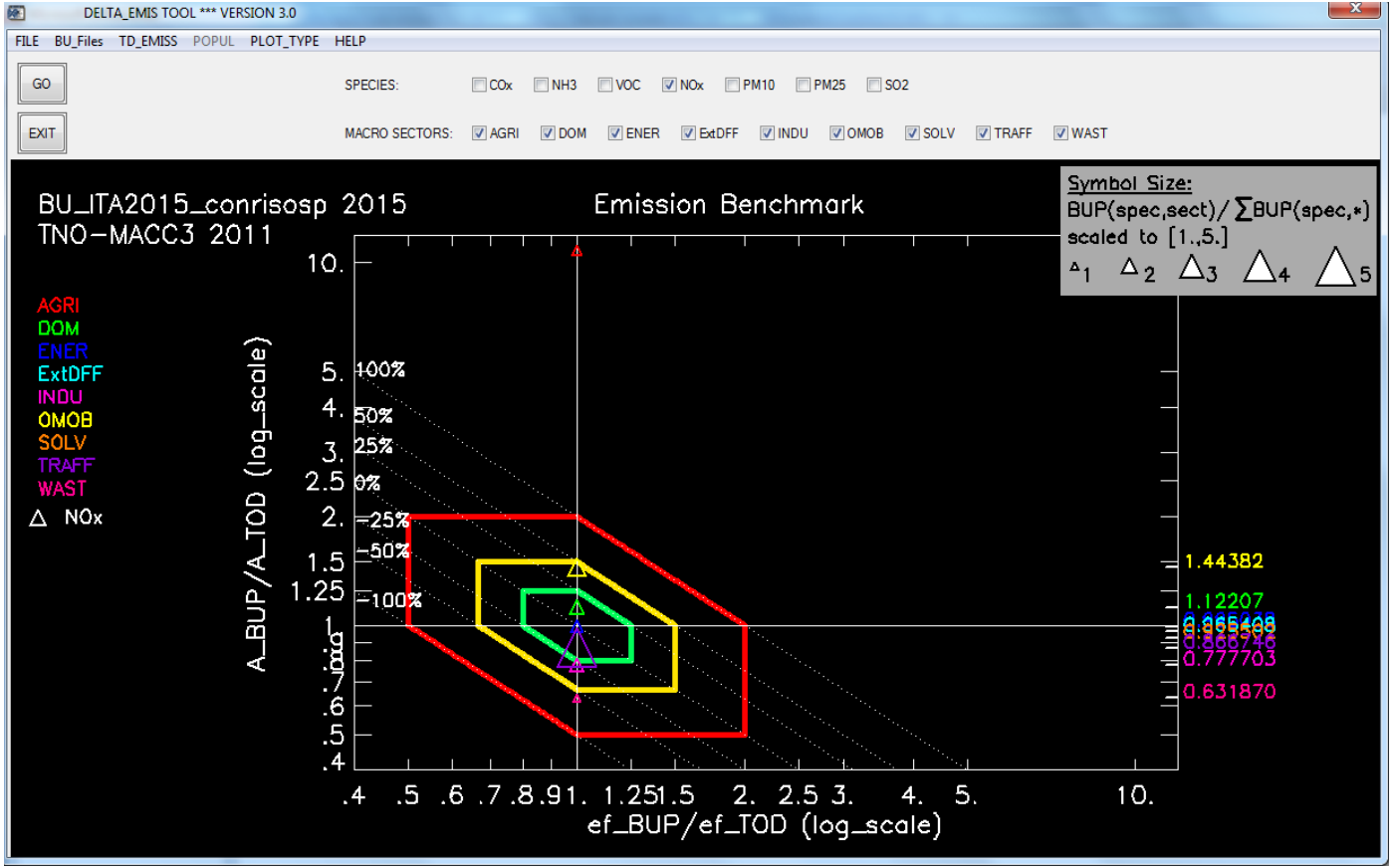
- at Plenary meeting in February we have presented 2010 emissions, as 2015 values were not ready
- of course, benchmarking BU 2015 with TD 2011 makes limited sense

Bar plot NO_x



- reasonable differences, like with BU_ITA2010
- AGRI is much higher in BUP…like in BU_ITA2010

Diamond plot NO_x



being NOx the pivotal specie for the plot, EFs have the same values.

Activity levels reasonably different, like in the bar plot.

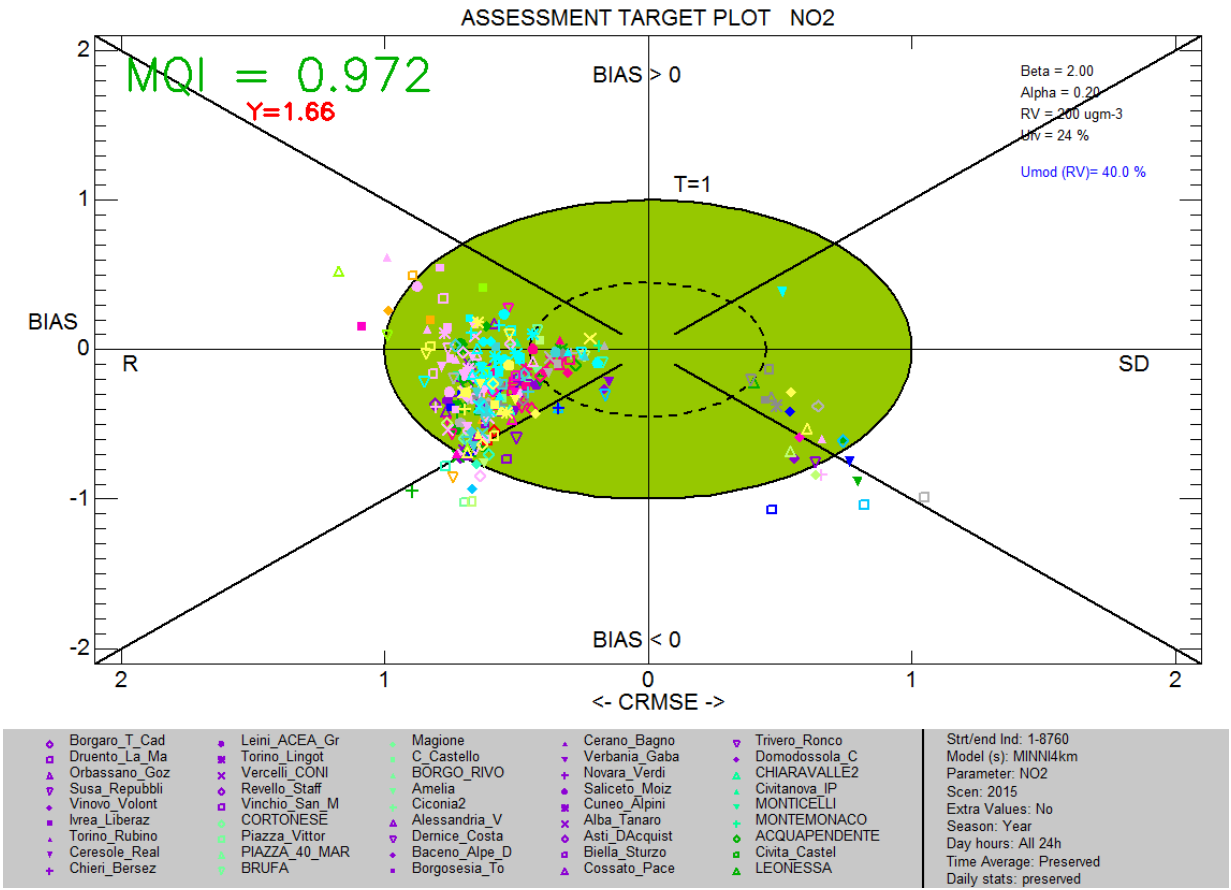
- NOx – AGRI: in terms of mass emitted, not a first-level issue

All is similar to using BU_ITA2010

NO_2 concentrations: ITA 2015

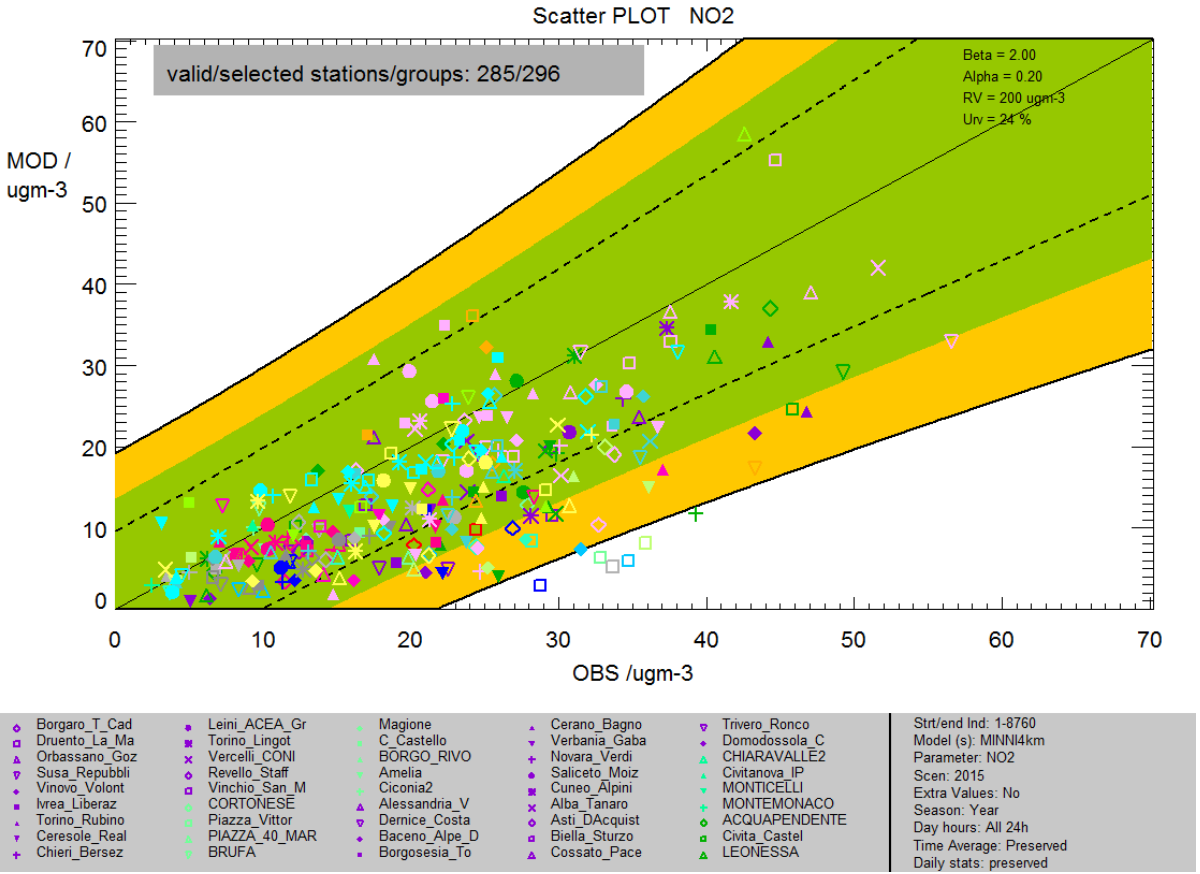
- Assessment on all available background stations (296)
- No assimilation of observations

NO_2 concentrations: ITA 2015 – target plot

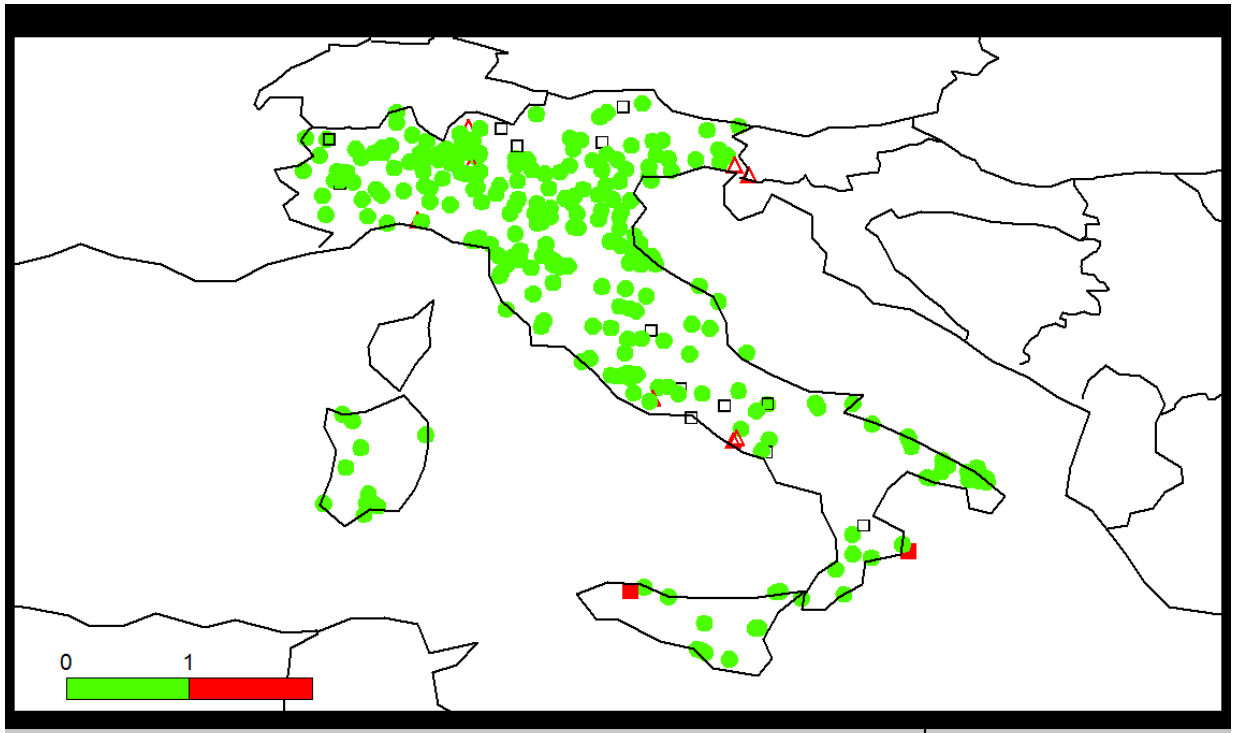


- MQO fulfilled on time series, not fulfilled on yearly averages
- Bias generally < 0 : underestimation, coherently with 4 km resolution and limits of TD emissions
- Error associated to R indicator prevails on σ differences

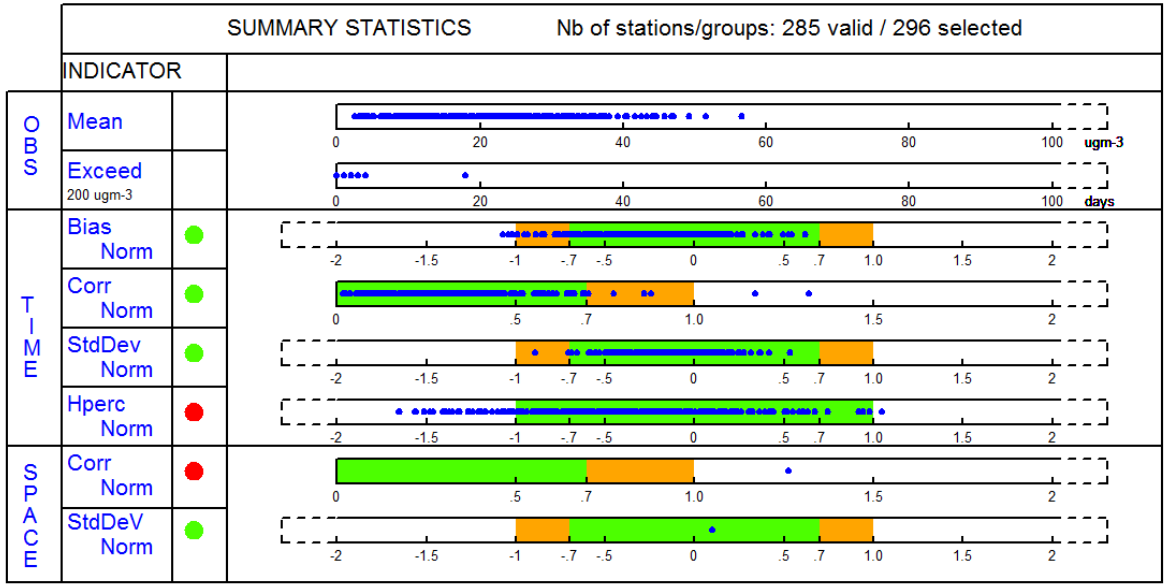
NO_2 concentrations: ITA 2015 – scatter plot



NO_2 concentrations: ITA 2015 – MQI map



NO_2 concentrations: ITA 2015 – report



- Hperc, i.e. law indicator on hourly exceedances (99.8 percentile), does not fulfill the MQO

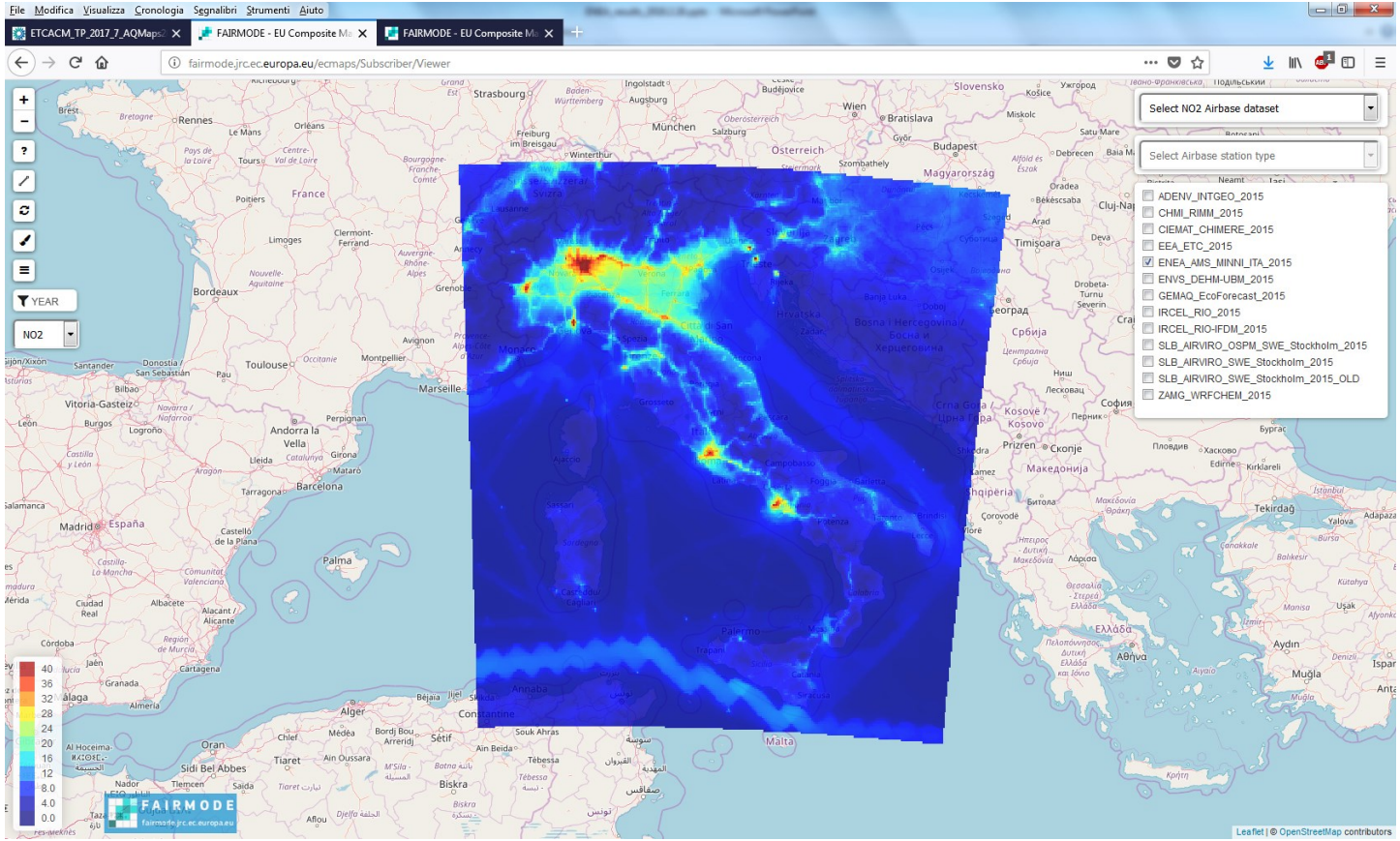
> need to work on hourly peaks

- Corr Norm, i.e. the spatial correlation, does not fulfill the MQO…*but*:

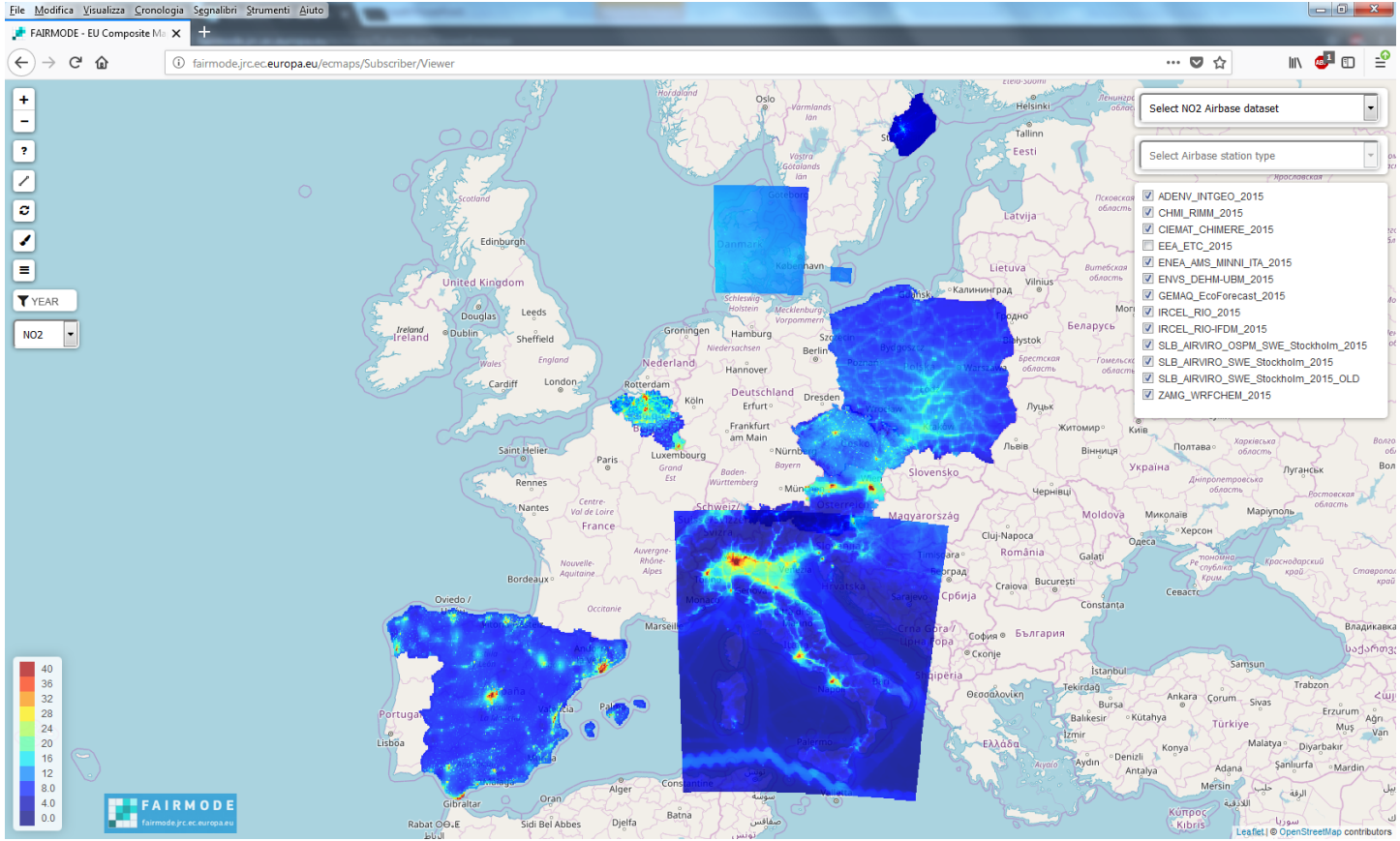
it is not clear how spatial features are captured, since no reference to stations positions or related distances seems to be included in the formulation (eq. 16 and 17 in DELTA_UserGuide_V5_5.pdf)

Performance Criteria satisfied
Performance Criteria satisfied; Error dominated by corresponding Indicator
TIME: >90% of stations fulfills the Performance Criteria
SPACE: Dot fulfills the Performance Criteria
TIME: <90% of stations fulfills the Performance Criteria
SPACE: Dot does not fulfill the Performance Criteria

NO_2 concentrations: ITA 2015 - map

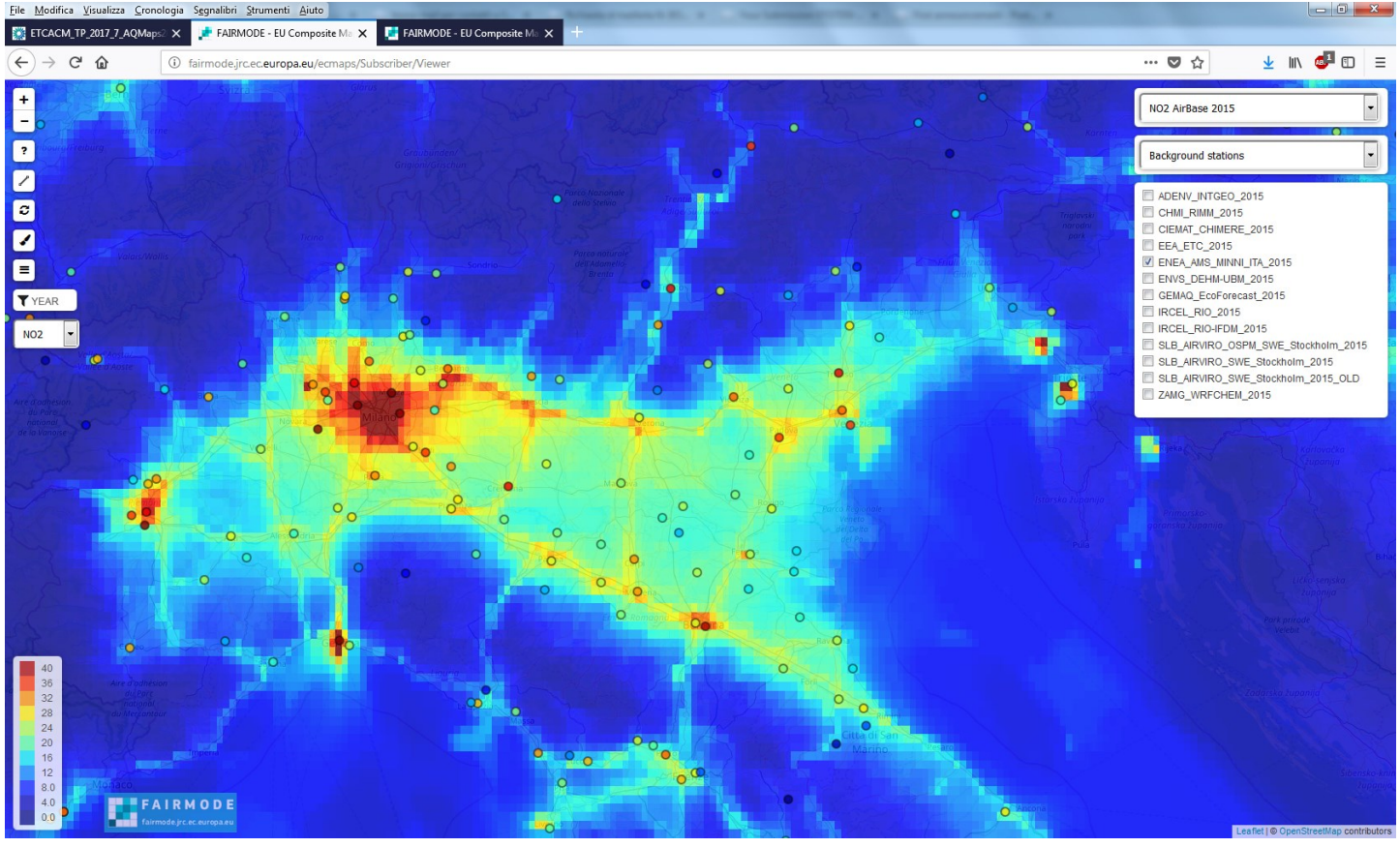


NO_2 concentrations: ITA 2015 - map



- Border discrepancies are not significant due to low values on the Alps

NO_2 concentrations: ITA 2015 - map



- Spatial pattern of observations is reproduced
- Local under/overestimations

Pilot Exercise for Italy
Main conclusions on assessment

What did you learn about your modelled concentrations through the Pilot study?

- Our performance on NO_2 (background stations) is a good starting point
- Main problems on correlation in time and on 99.8 percentile of hourly values: need to investigate hourly profiles of emission and meteorology

What do you think of the concentration benchmarking tools available in FAIRMODE? Are they useful? How?

- See next slide

What do you propose to improve air quality modelling, more in general, at local scale?

- *(cannot answer for the local scale)*

“Delta tool” - Italy

What did you learn from the “delta tool” application?

- We found the delta tool useful because it provides a quick and comprehensive validation of model performances.
  - The usage of different statistical indicators along with the possibility of identifying the dominant ones can be useful in order to point out the main sources of errors.
  - The dynamic evaluation can support the evaluation of model performances in describing chemical and physical processes.

- Using MQO and MPC:
  - provides an answer to the question if a model application is “good enough”
  - allows to compare different model simulations (different models, different versions or parametrizations of the same model, etc…)

“Composite mapping concentrations” – Italy

What did you learn from the “composite mapping” application?

- Our map values are in line with other maps

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