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0.1° x 0.1° emissions for CLRTAP modelling - experience and feedback

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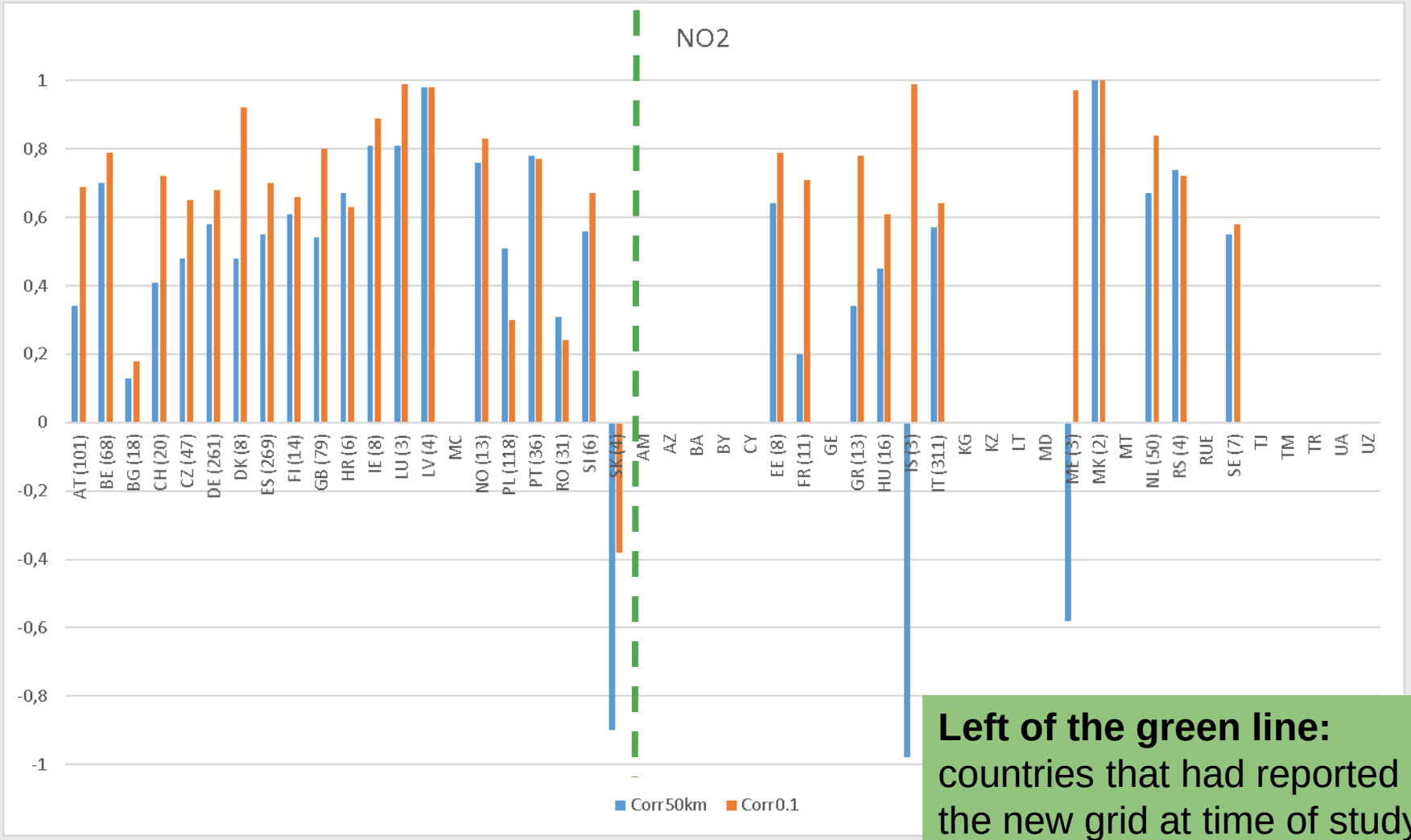
Status EMEP 0.1° x 0.1° emissions

- By June 2018, 28 countries have reported gridded sectoral emissions in the new 0.1° x 0.1° longitude-latitude grid
  - For year 2015: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, FYR Macedonia, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Switzerland, United Kingdom
  - For year 2016: Finland, Malta and Switzerland (FI and MT too late for this year's reporting)
- Remaining areas: gap filled and spatially distributed by CEIP
- Other fixes
  - Italy: all sectors replaced with EDGAR proxies
  - Poland: *sector F_RoadTransport* replaced with EDGAR proxy
  - Portugal: *sector F_RoadTransport* replaced with EDGAR proxy

Testing EMEP 0.1°x0.1° emissions

- For 2015, model runs have been performed using both 0.1° x 0.1° and 50km x 50km emissions
- For 2016, model runs have been performed using 0.1° x 0.1° emissions
- Evaluation is made against EMEP (background) and Airbase measurements (rural, suburban, urban, excluding traffic stations)

NO_2 – spatial correlation within each country



Left of the green line: countries that had reported in the new grid at time of study
Parenthesis: number of sites

Improved spatial correlation for NO_2
Some countries should be revised (e.g. BG, PL, RO)

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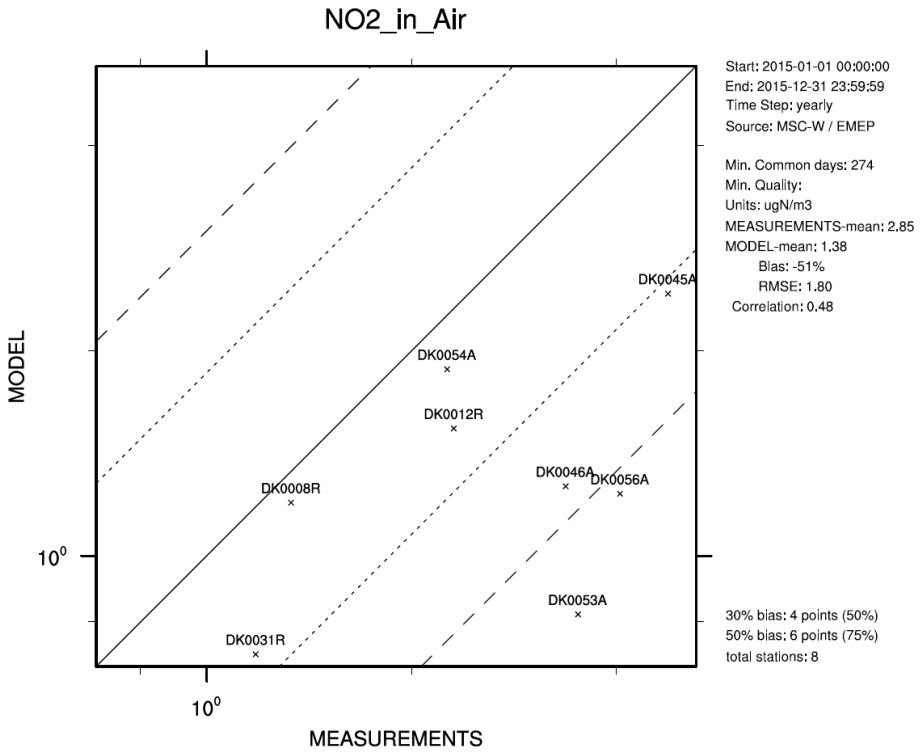
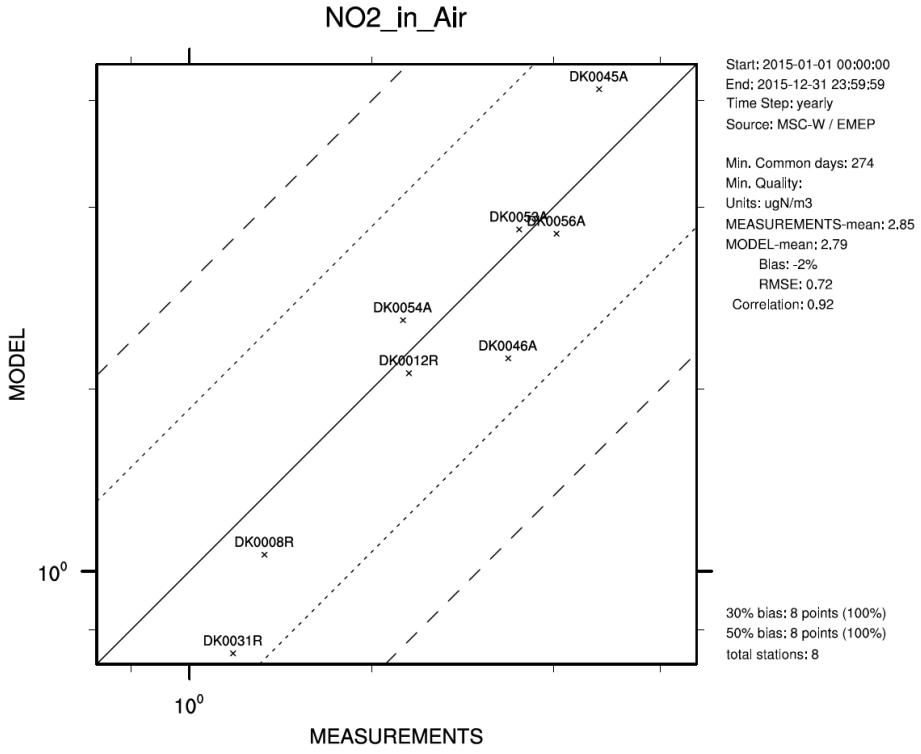
Denmark

Significantly improved spatial correlation



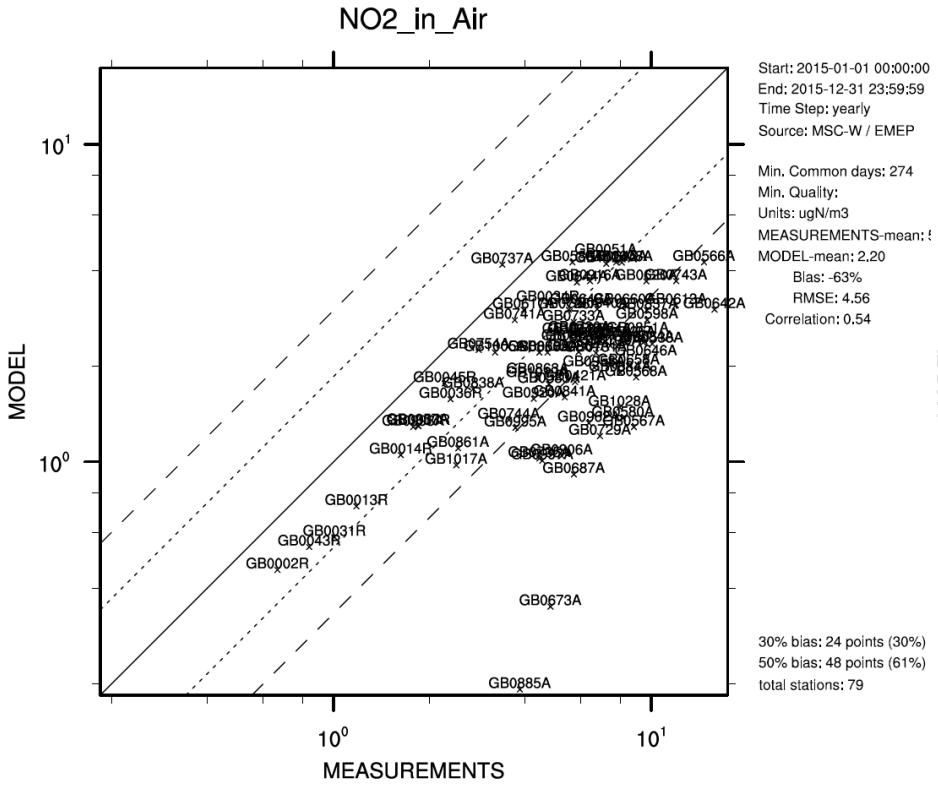


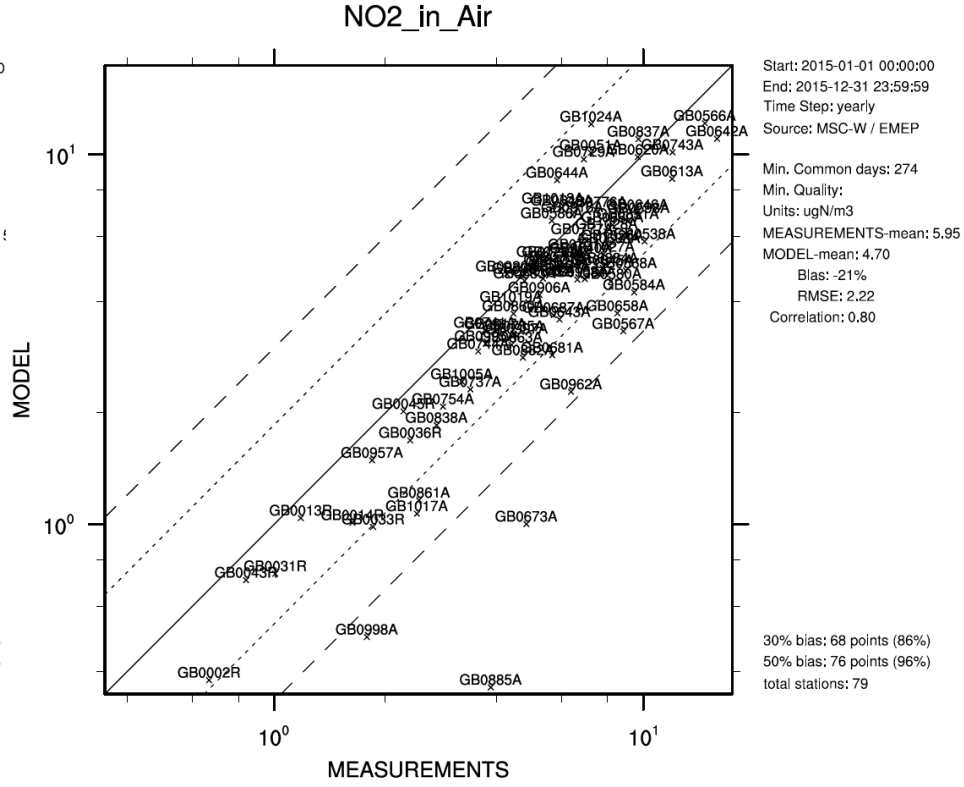
Old emissions (50km x 50km)

New emissions (0.1° x 0.1°)

United Kingdom

Significantly improved spatial correlation



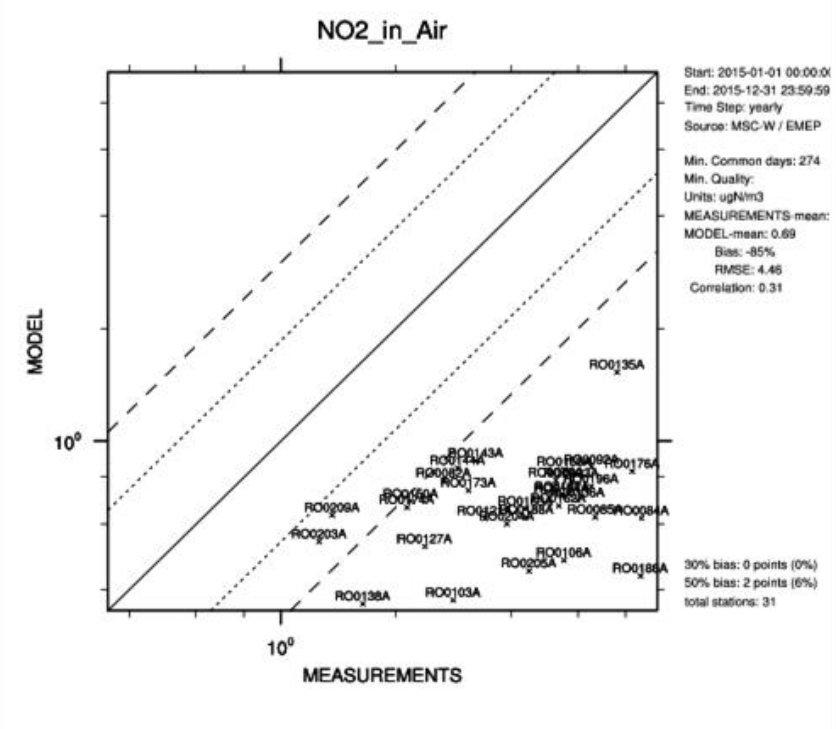


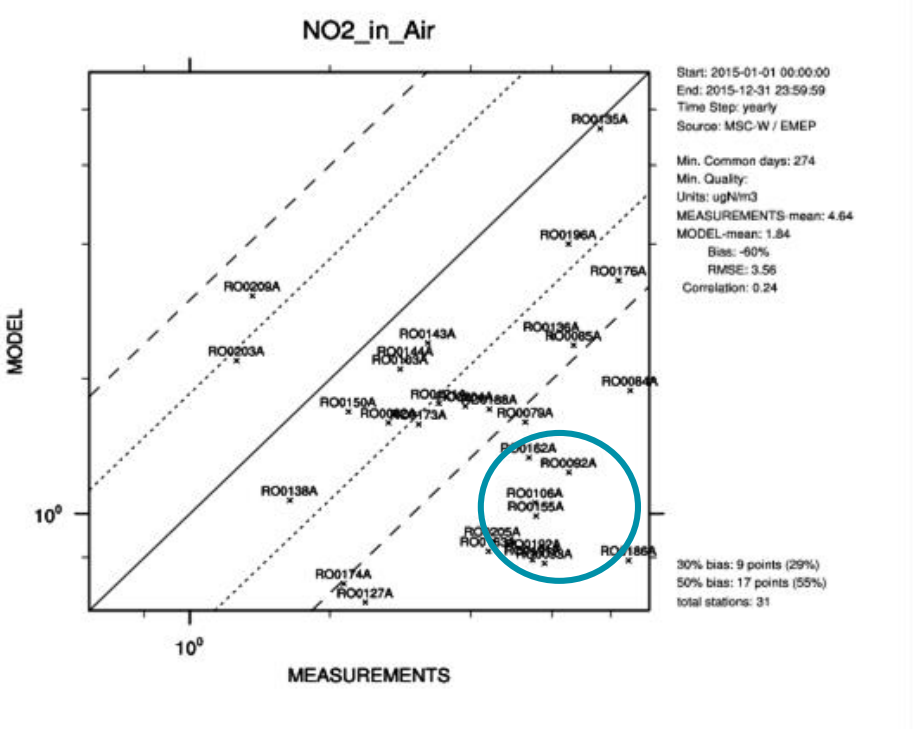
Old emissions (50km x 50km)

New emissions (0.1° x 0.1°)

Romania

Worse spatial correlation, but better results for several stations.
(Sources missing in gridding? Or non-representative stations?)





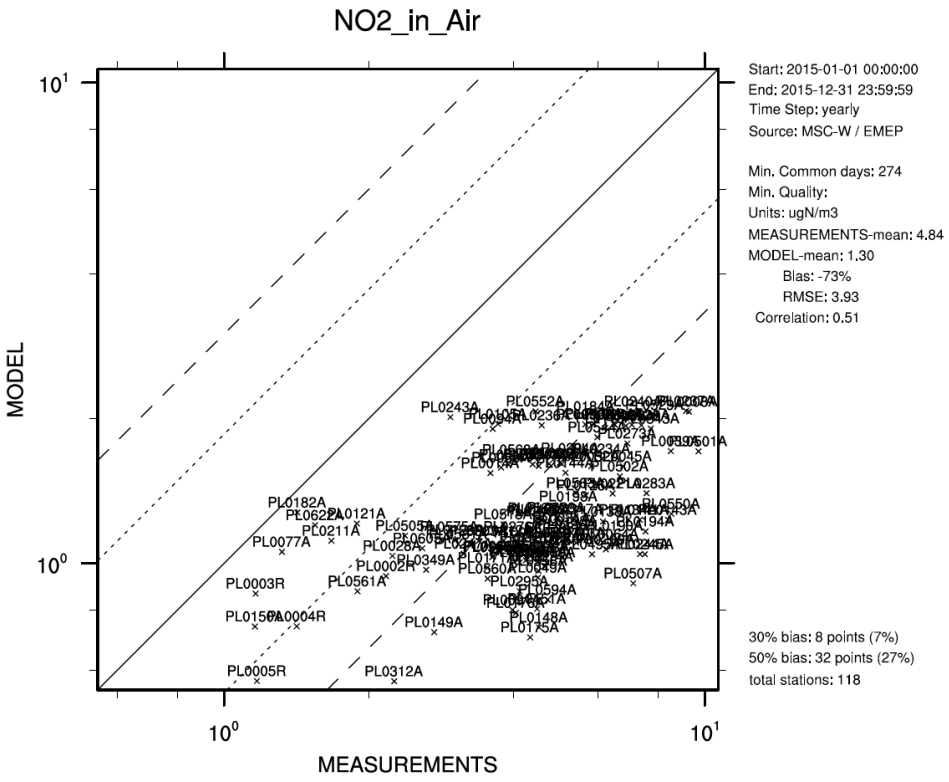
Old emissions (50km x 50km)

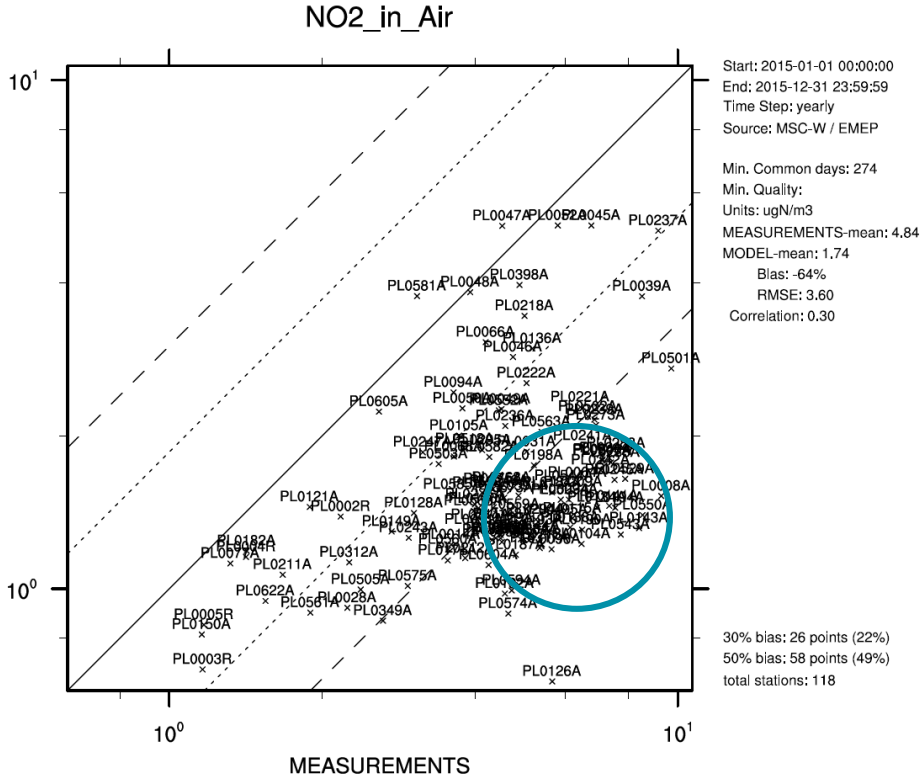
New emissions (0.1° x 0.1°)

Feedback from the country would be very useful, (emissions, observations, local modelling).

Poland

Worse spatial correlation, but better results for several stations.
(Sources missing in gridding? Or non-representative stations?)



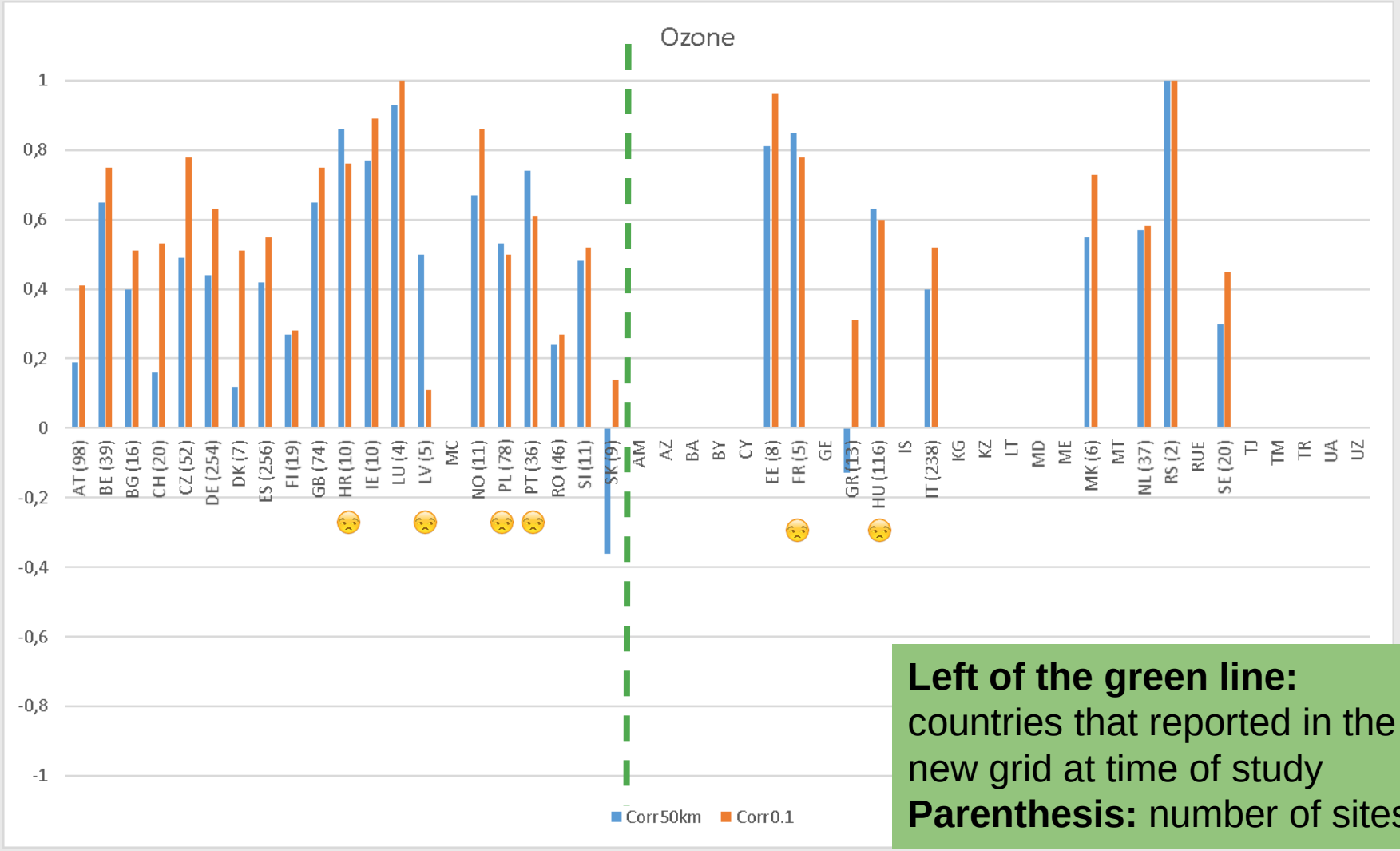


Old emissions (50km x 50km)

New emissions (0.1° x 0.1°)

Feedback from the country would be very useful,
(emissions, observations, local modelling).

O_3 mean – spatial correlation within each country



Left of the green line: countries that reported in the new grid at time of study
Parenthesis: number of sites

- ✓ Large improvements in O_3 related to the NO_2 improvements
- ✓ Improved spatial correlation for O_3 – titration effects better represented
- ✓ Improved results for long-term exposure and deposition

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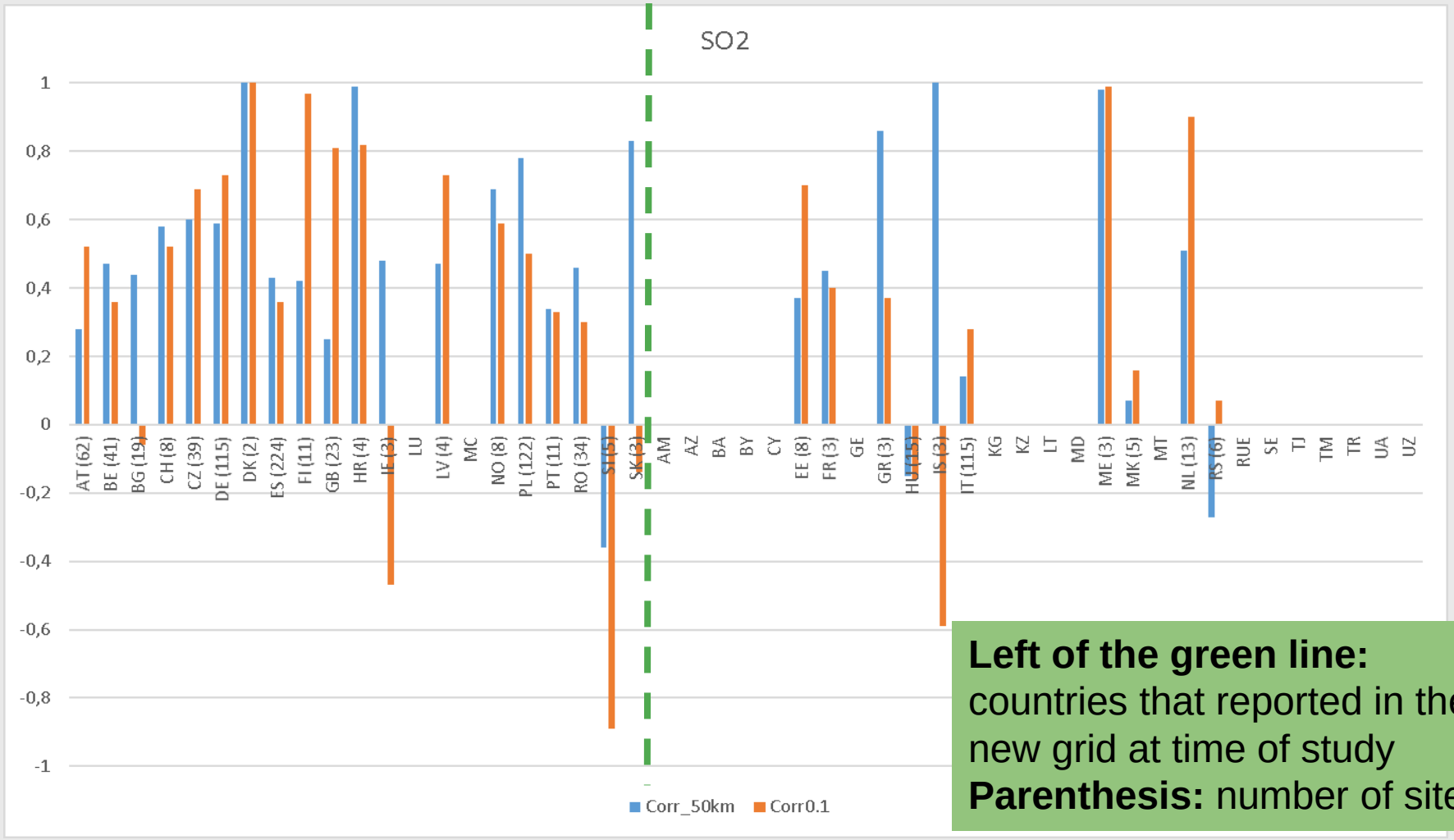
SO_2 – spatial correlation within each country



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More difficult to use surface observations of SO_2 to validate SO_x emissions since a large part arises from sources not located at the surface.
Mixed results.

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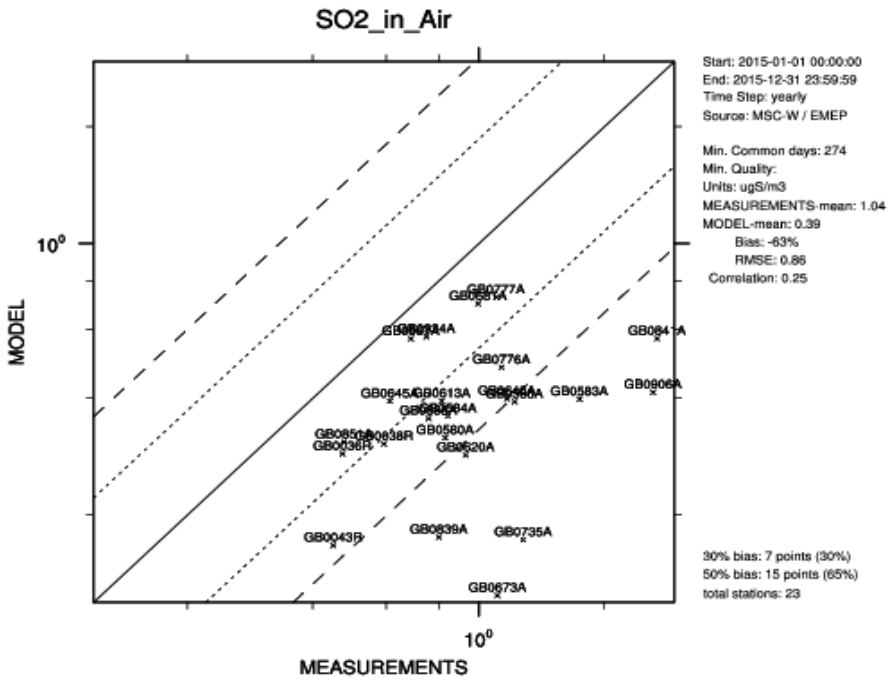
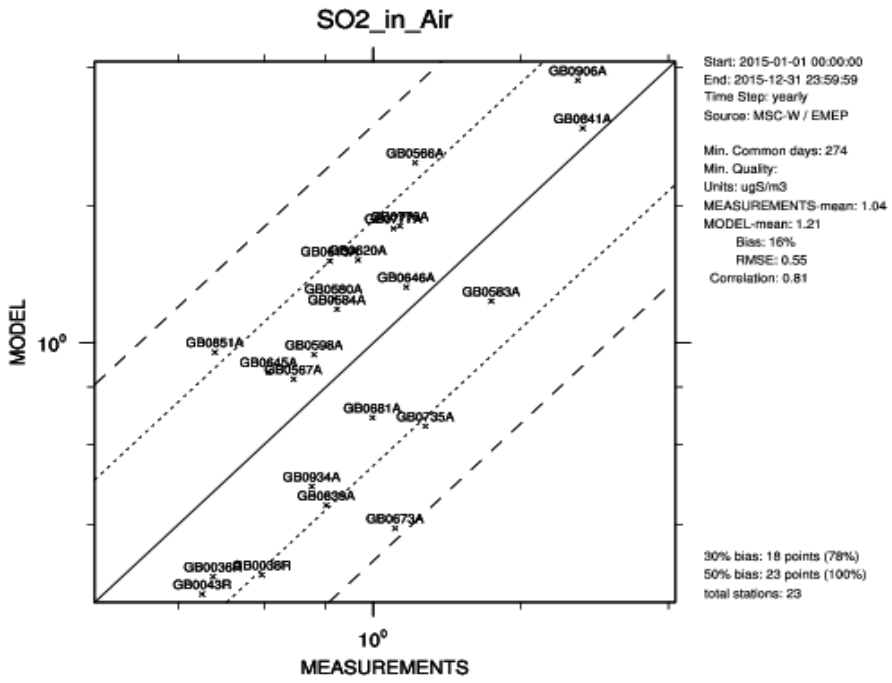
United Kingdom

Significant improvement





Old emissions (50km x 50km)

New emissions (0.1° x 0.1°)

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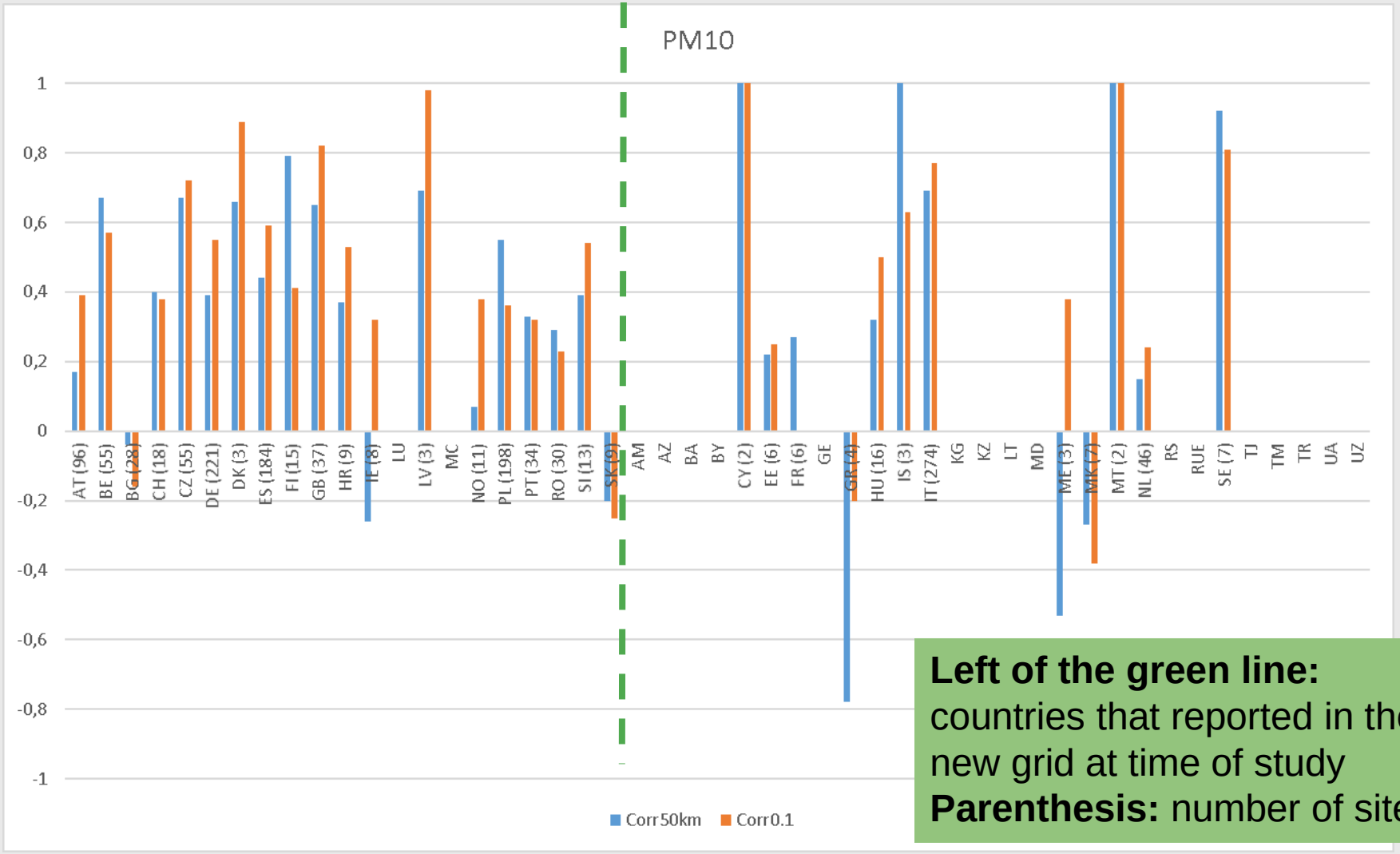
PM_{10}– spatial correlation within each country



Left of the green line: countries that reported in the new grid at time of study
Parenthesis: number of sites

Improved spatial correlation in the majority of countries

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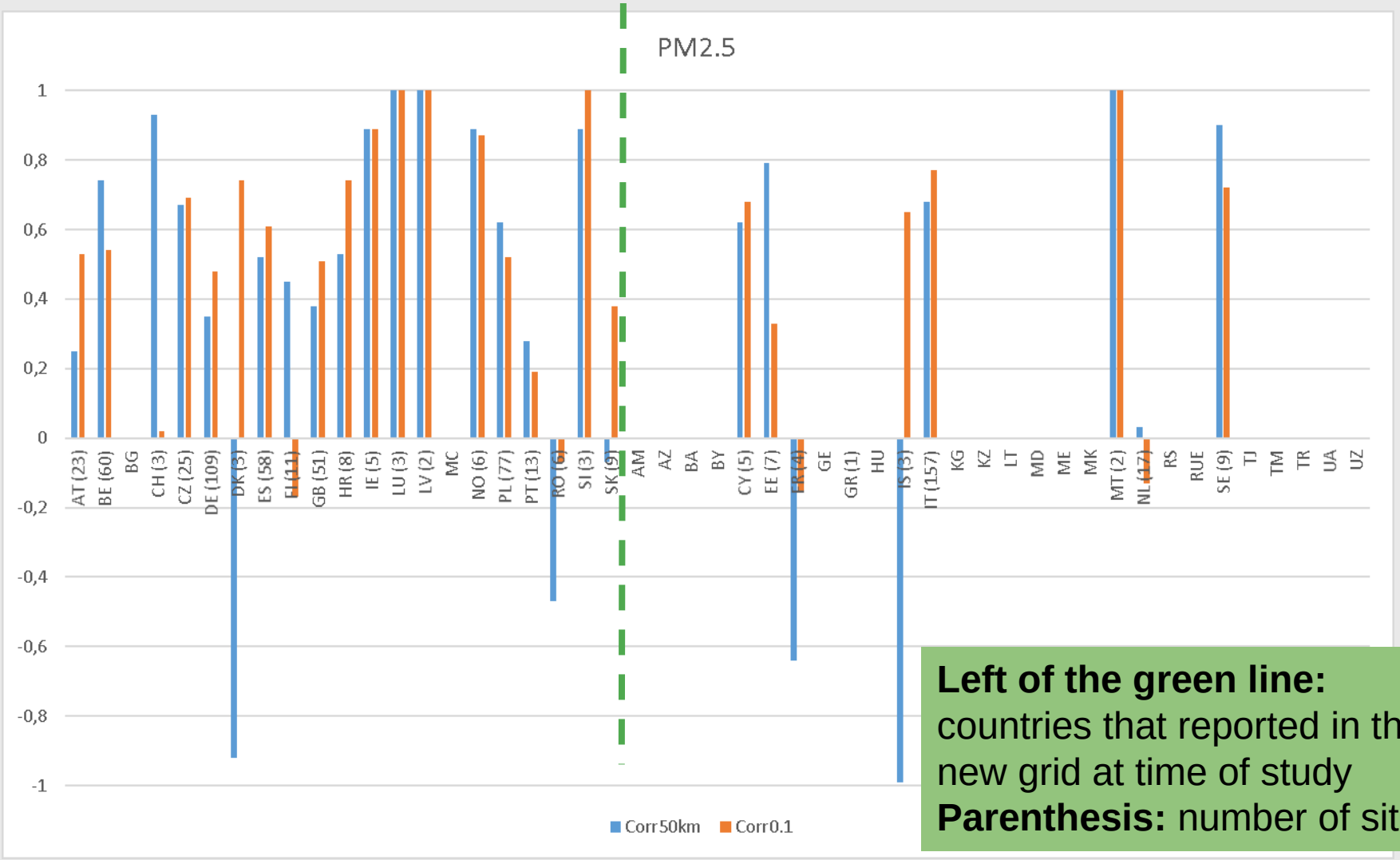
PM_{25}– spatial correlation (mod-Airbase) within each country



Left of the green line: countries that reported in the new grid at time of study
Parenthesis: number of sites

Improved spatial correlation in the majority of countries, but more mixed results (and less measurements)

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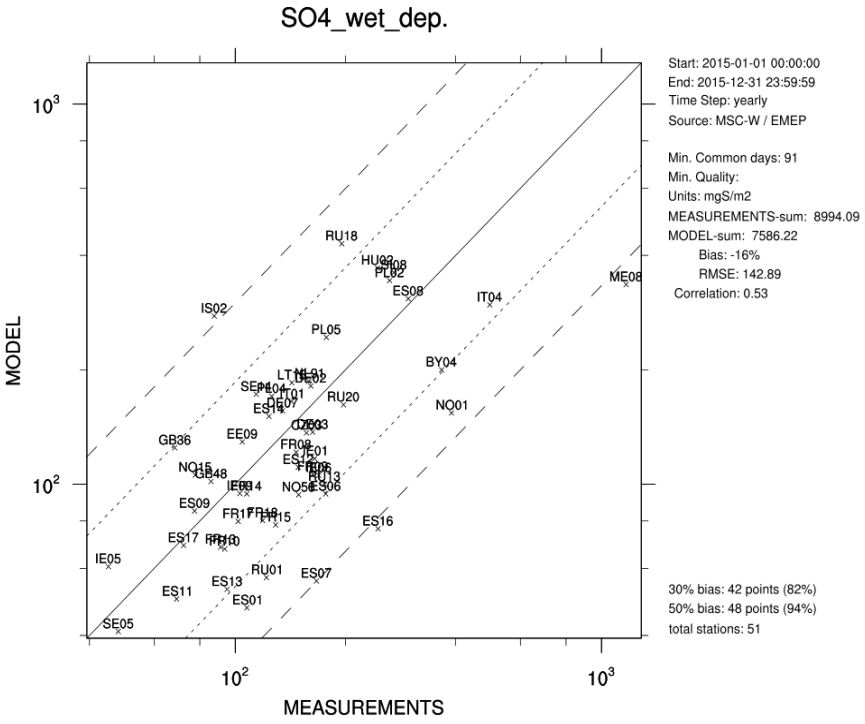
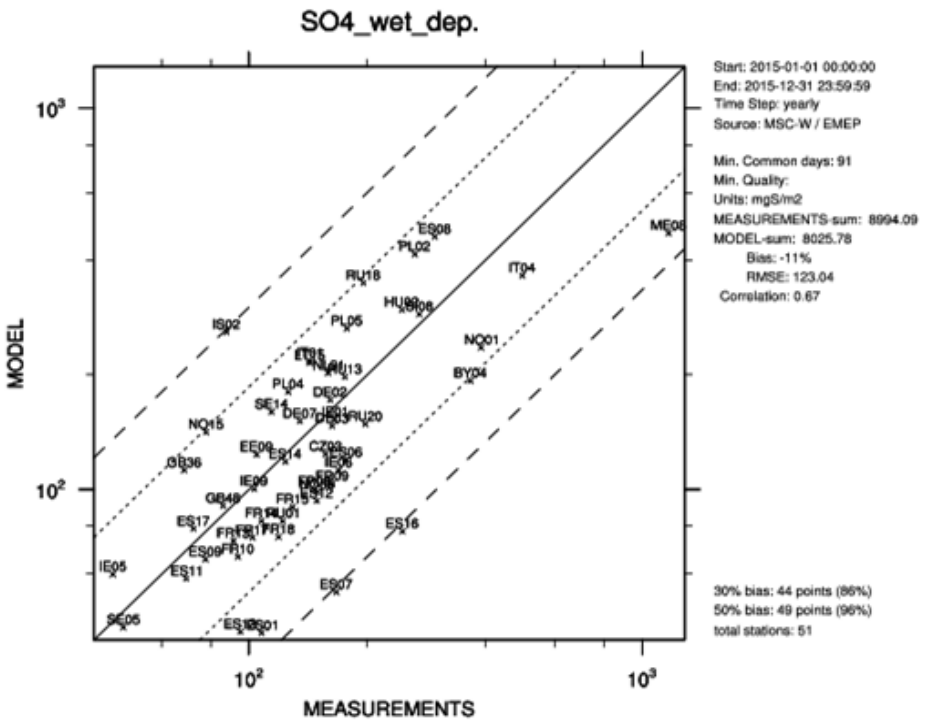
Wet deposition of SO_4

Some improvement, similar for NO_3



Old emissions (50km x 50km)



New emissions (0.1° x 0.1°)

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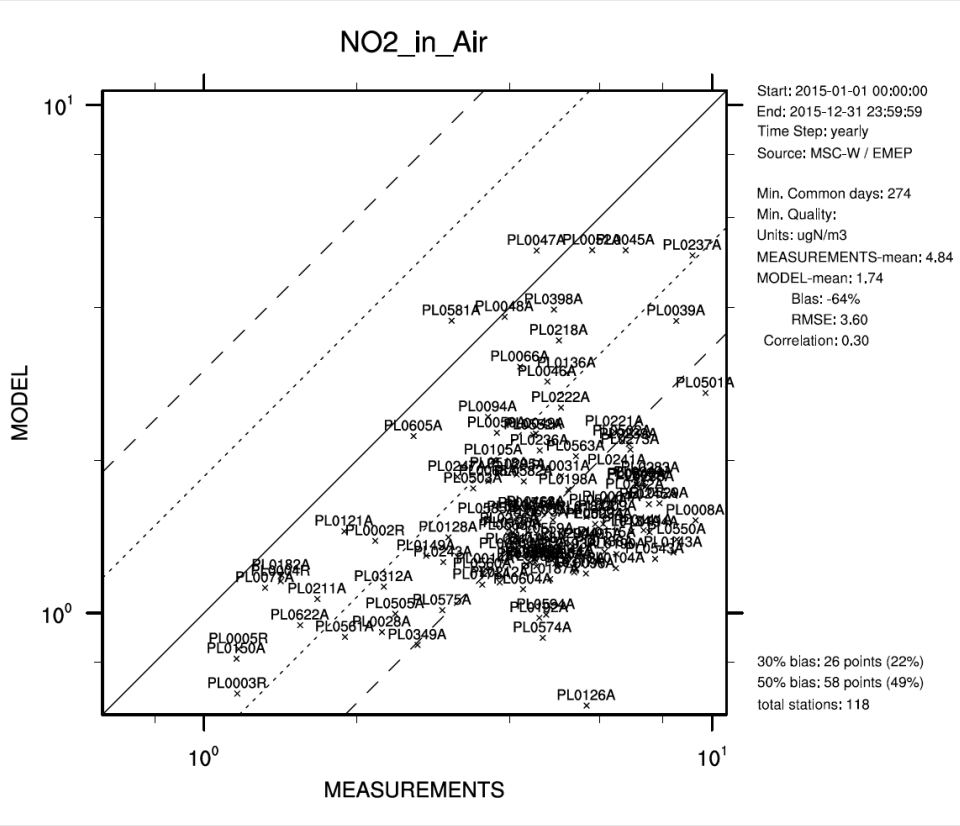
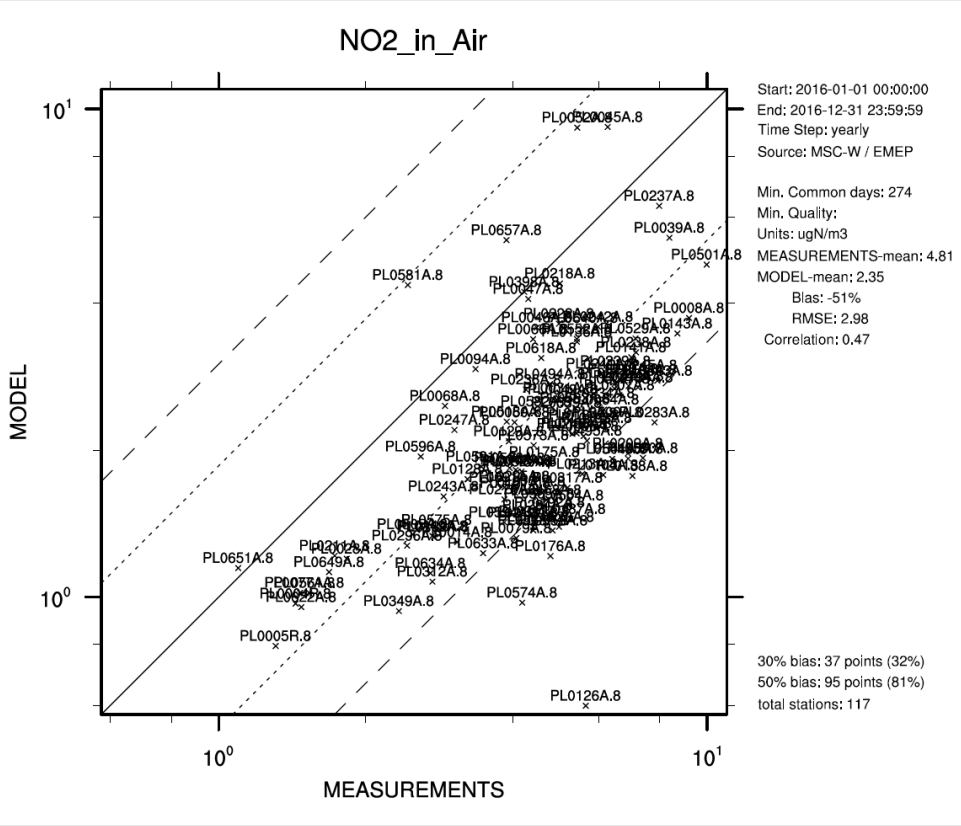
PL 2017(2015) vs 2018(2016)





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Summary

- Regridding, done by the countries or by CEIP, provides NO_x emissions that improve the model results for NO_2 (and ozone)
- For SO_2 the results are more mixed, as expected
- Smaller improvements for PM, as expected
- Improved correlation for wet deposition (especially for SO_x and NO_x)

- For countries that have few observations it is difficult to interpret whether the new gridding is better than the old

- More knowledge about the national observation networks is necessary to judge the performance
- Some countries might benefit from revising their gridding, others should submit gridded data - feedback is very welcome (with respect to observations, emissions, local modelling, local scientific expertise)

Conclusions

- Emissions in the new 0.1°x0.1°long-lat grid improve the model performance
- Further improvement is expected when more countries report gridded emissions in the new grid and/or revise their gridding
- More up-to-date temporal distribution of emissions should be developed (Copernicus, national expertise, dedicated projects)