

Surface Verification

using surface observations to verify global aerosols models: how hard can it be?

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thanks to Angela Benedetti and Jean-Jacques Morcrette

ICAP Ensemble Workshop, Boulder, 11. 5. – 13. 5. 2011

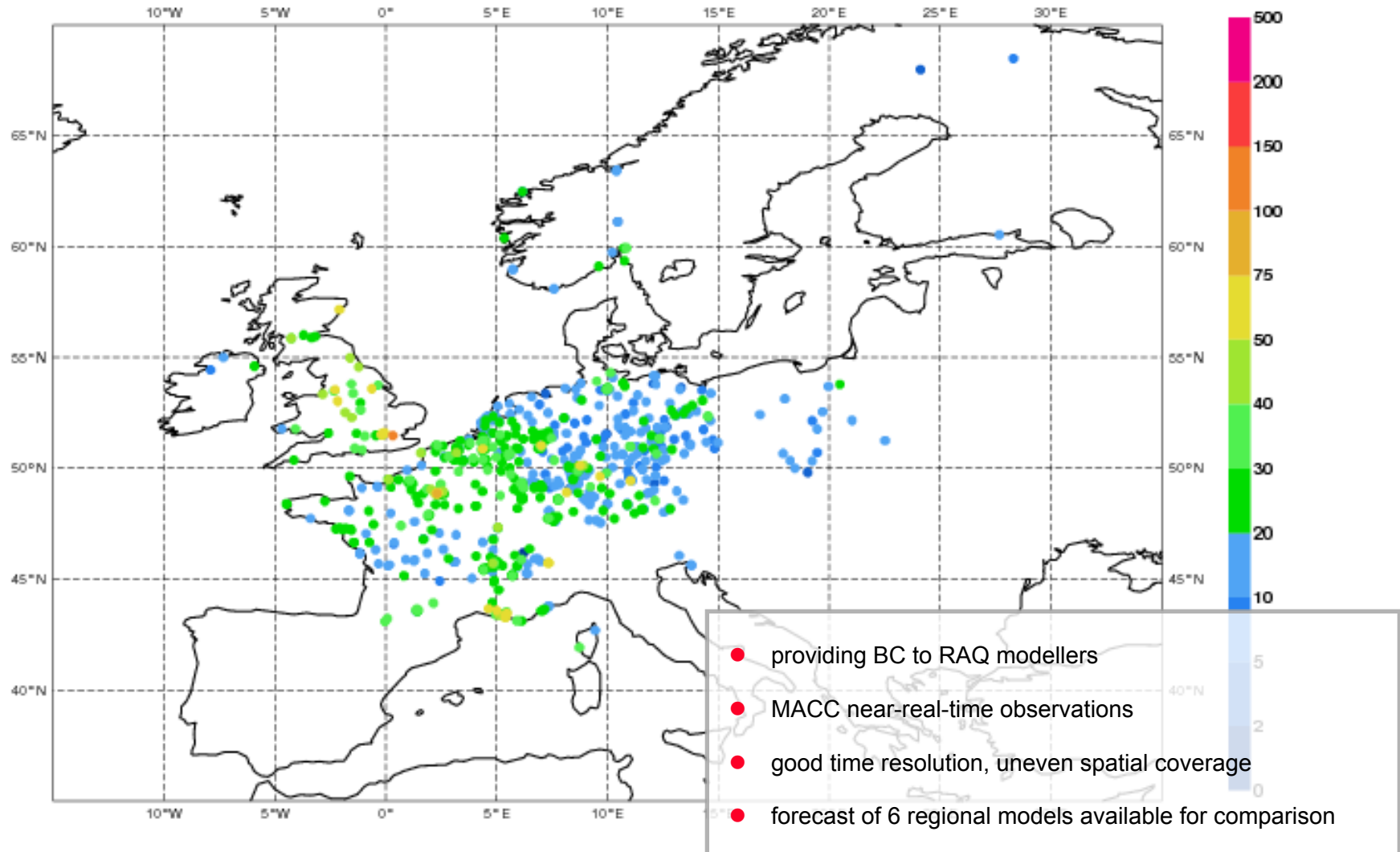


Introduction

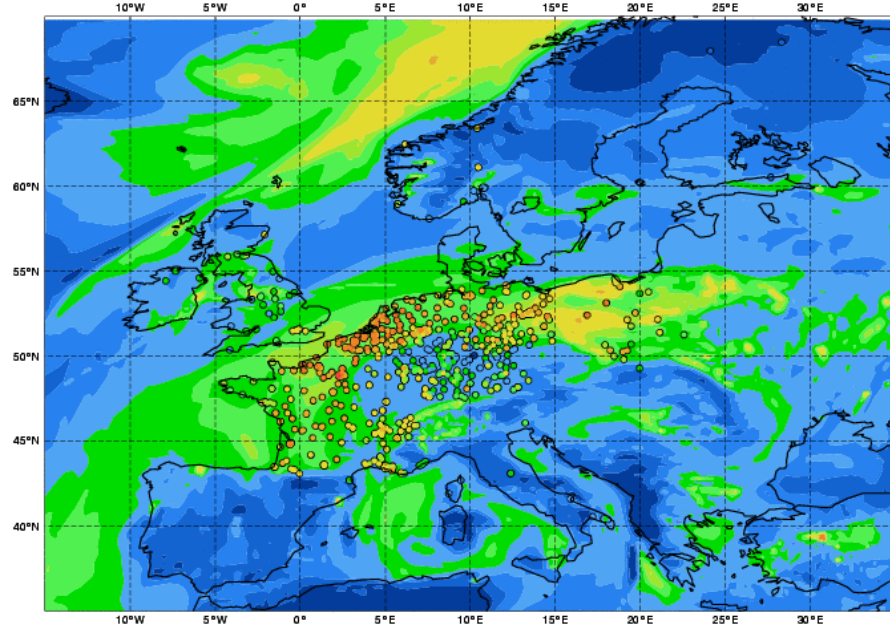
- A quick look at the value of surface PM10 observations for assessing the skill of aerosol models
- MACC near-real-time observation and EMEP datasets used
- preliminary results based on two spring periods

Motivation #1 - Regional air quality activities in MACC

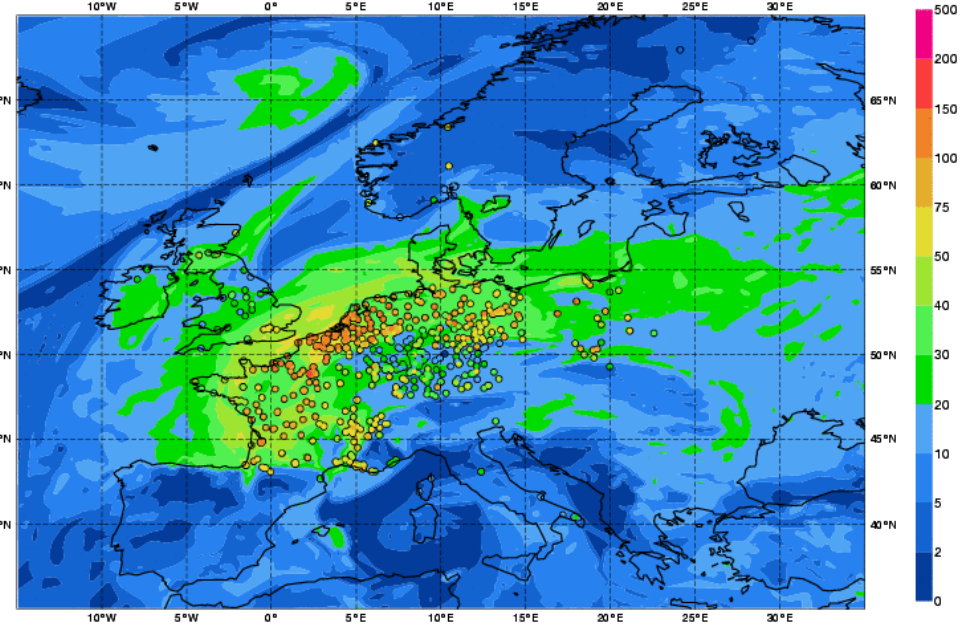
MACC-RAQ Observations VT: Thursday 5 May 2011 12UTC
Surface PM10 Aerosol [$\mu\text{g}/\text{m}^3$] N: 686 mean: 22.2 max: 106.0



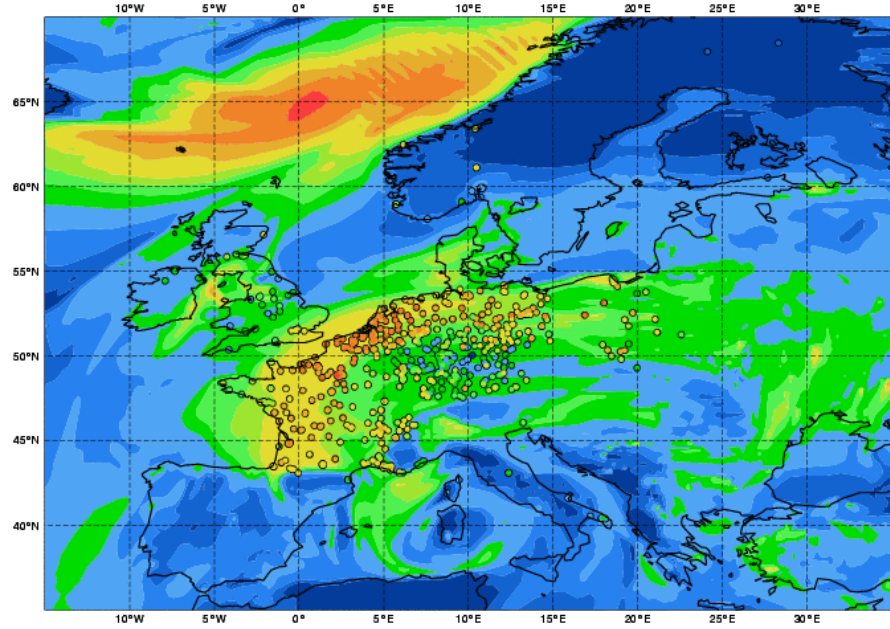
Wednesday 2 March 2011 00UTC GEMS-RAQ Verification t+012 VT: Wednesday 2 March 2011 12UTC Observations + SILAM Forecast Surface PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: -30.18 RMSE: 39.98



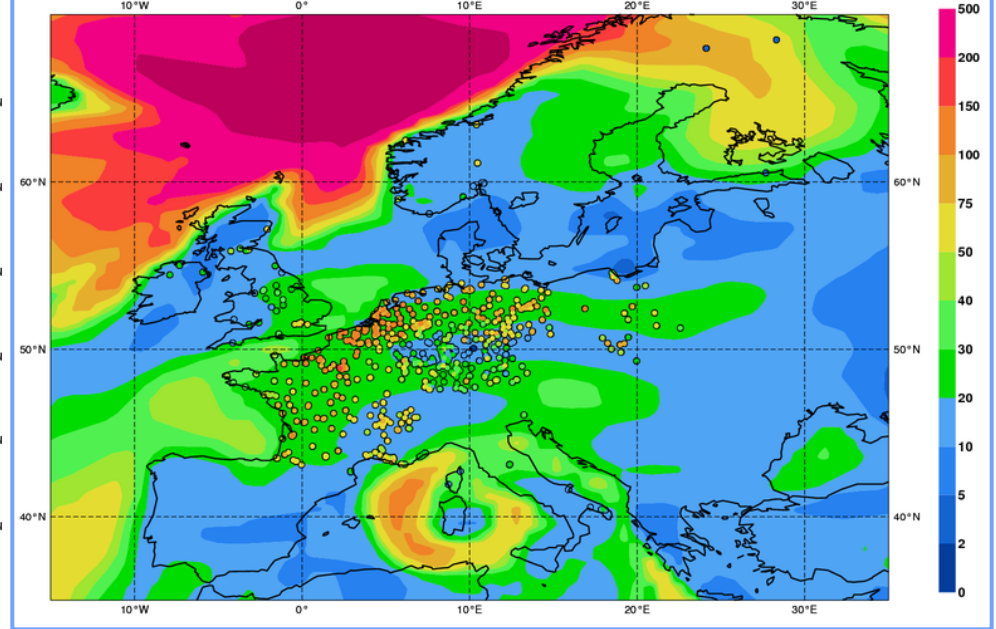
Wednesday 2 March 2011 00UTC GEMS-RAQ Verification t+012 VT: Wednesday 2 March 2011 12UTC Observations + EURAD-IM Forecast Surface PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: -28.25 RMSE: 38.41



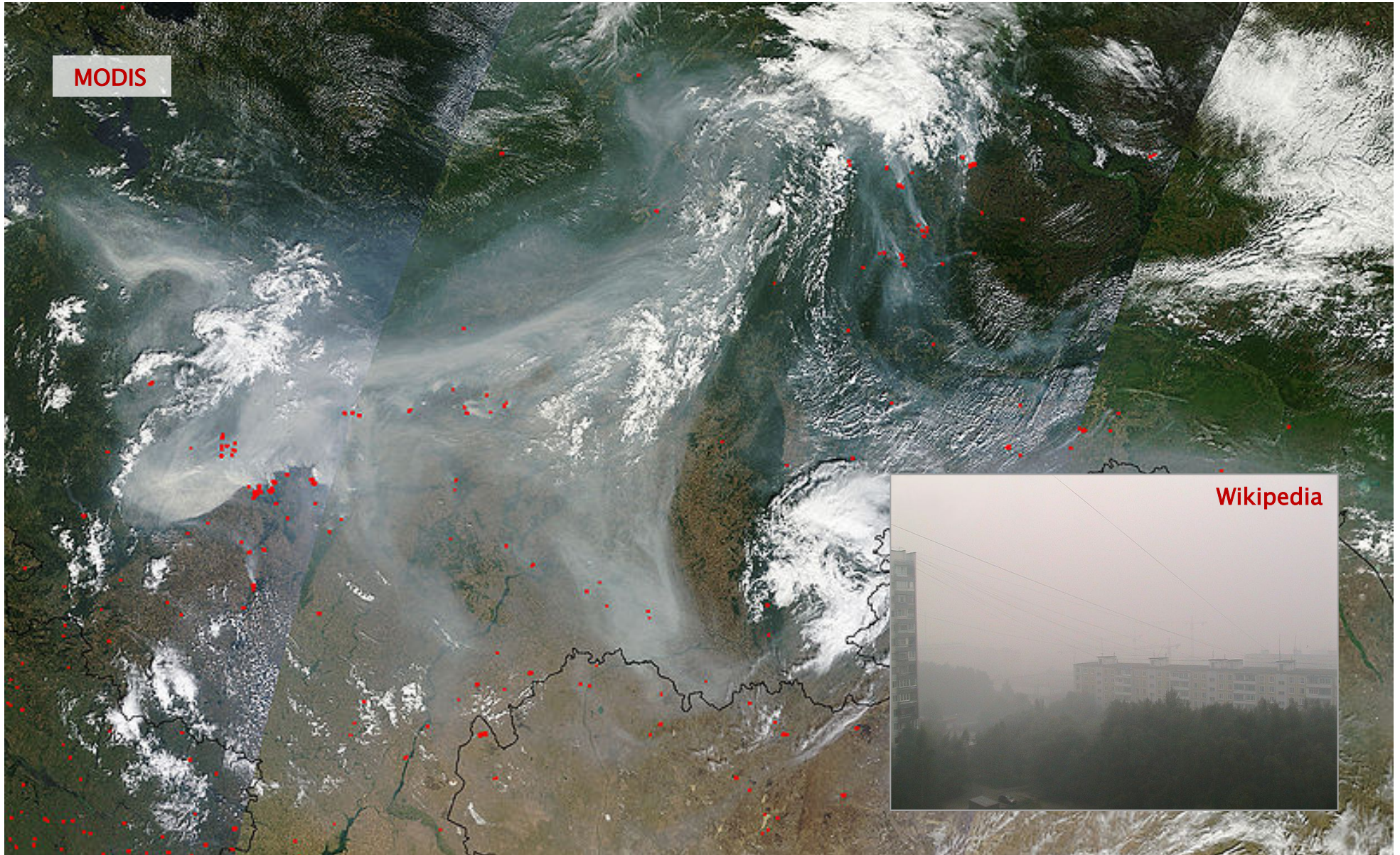
Wednesday 2 March 2011 00UTC GEMS-RAQ Verification t+012 VT: Wednesday 2 March 2011 12UTC Observations + MATCH Forecast Surface PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: -21.41 RMSE: 32.10



Wednesday 2 March 2011 00UTC MACC Verification t+012 VT: Wednesday 2 March 2011 12UTC Observations + fh9z level 60 PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: -36.89, RMSE: 47.96

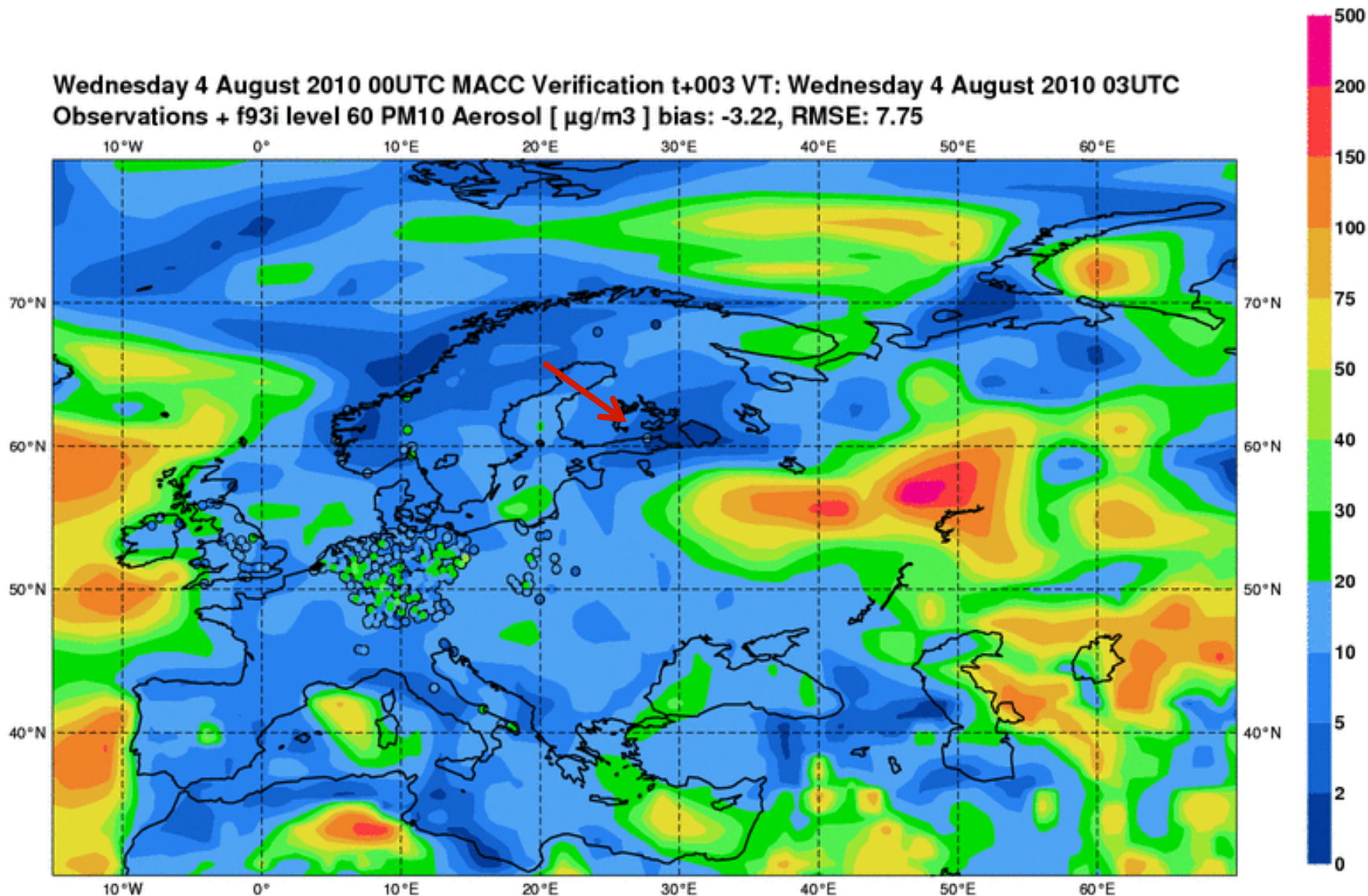


Motivation #2 - Russian fires in 2010

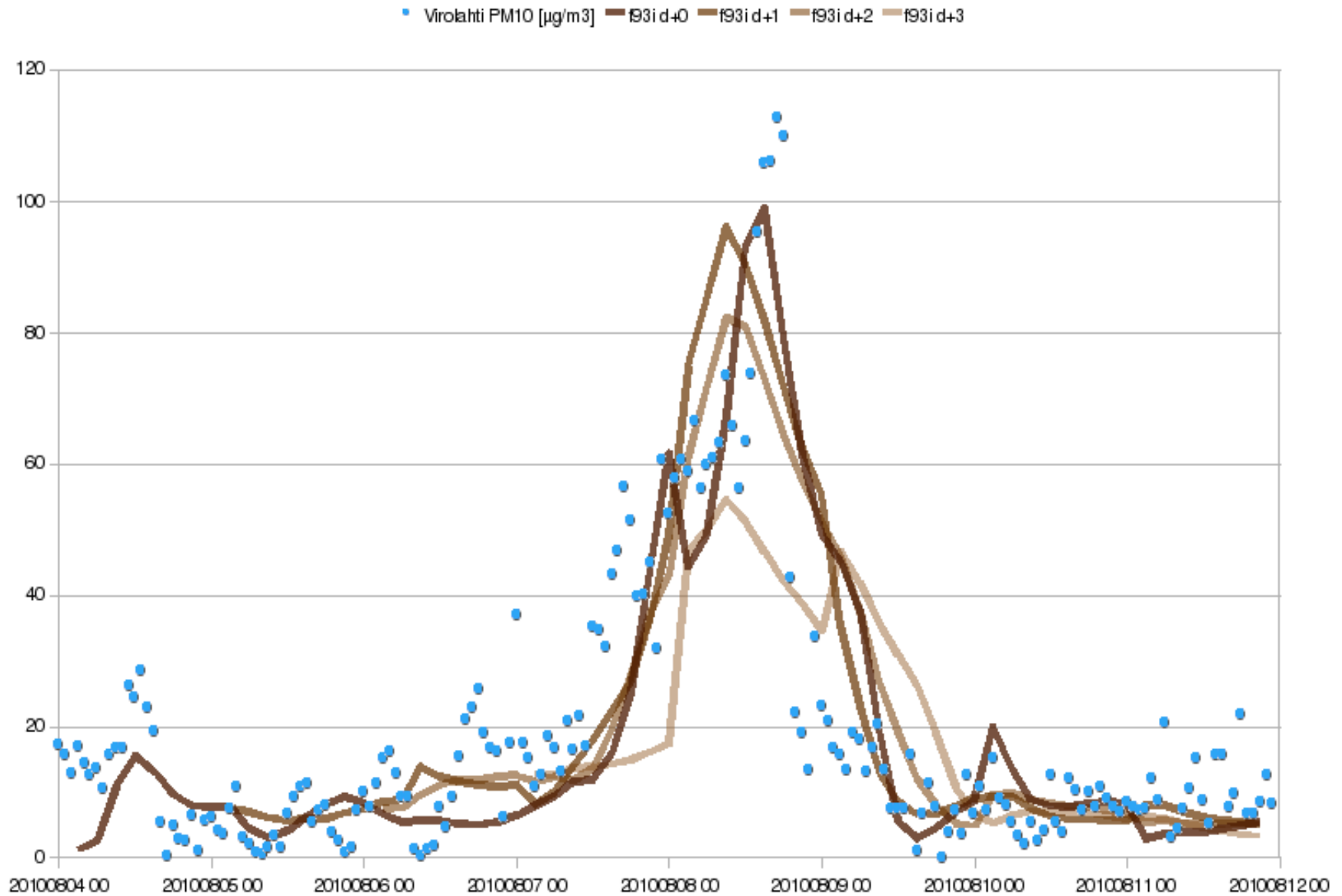


Russian fires in 2010 – MACC forecast

Wednesday 4 August 2010 00UTC MACC Verification t+003 VT: Wednesday 4 August 2010 03UTC
Observations + f93i level 60 PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: -3.22, RMSE: 7.75

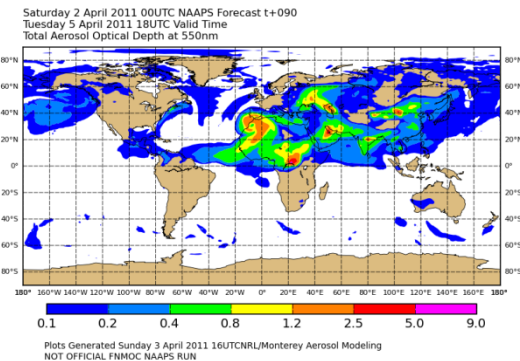
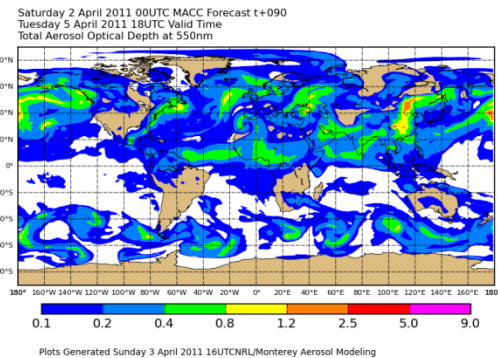
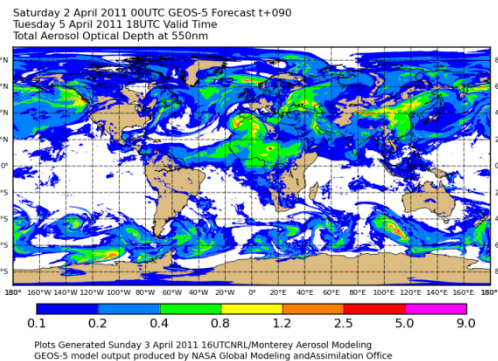


MACC PM10 forecasts for Virolahti, Finland



Motivation #3 – ICAP Ensemble

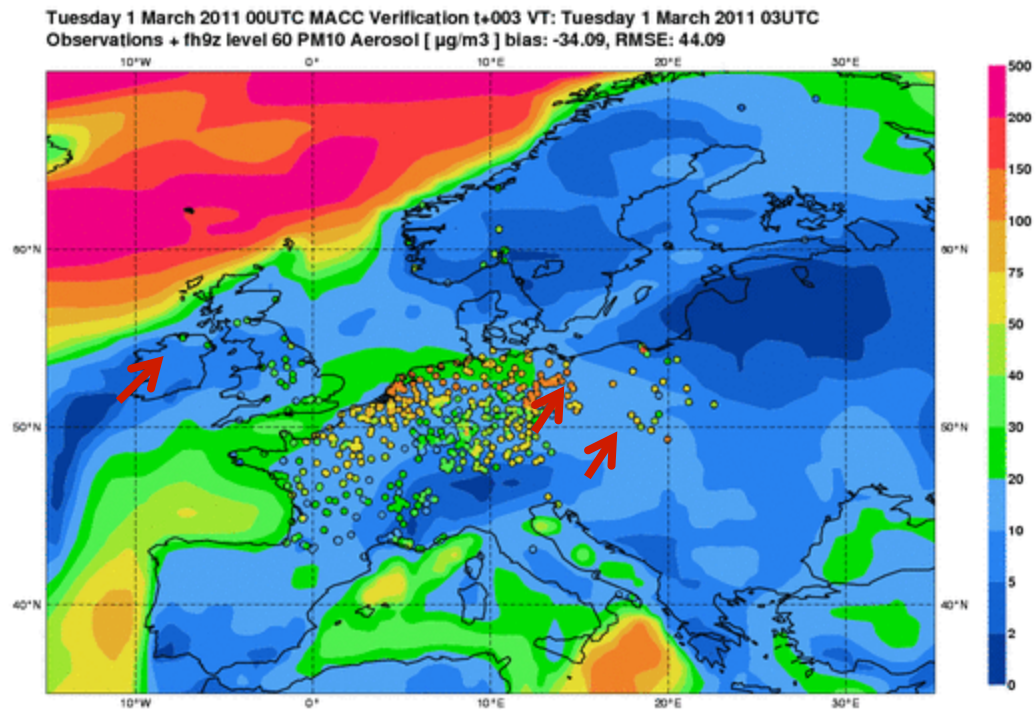
- ICAP ensemble data exchange has started
- Initial AOD forecast exchange: NRL NAAPS, NASA GEOS-5, MACC/IFS
- study and understand differences between models
- exchange of surface parameters would be great



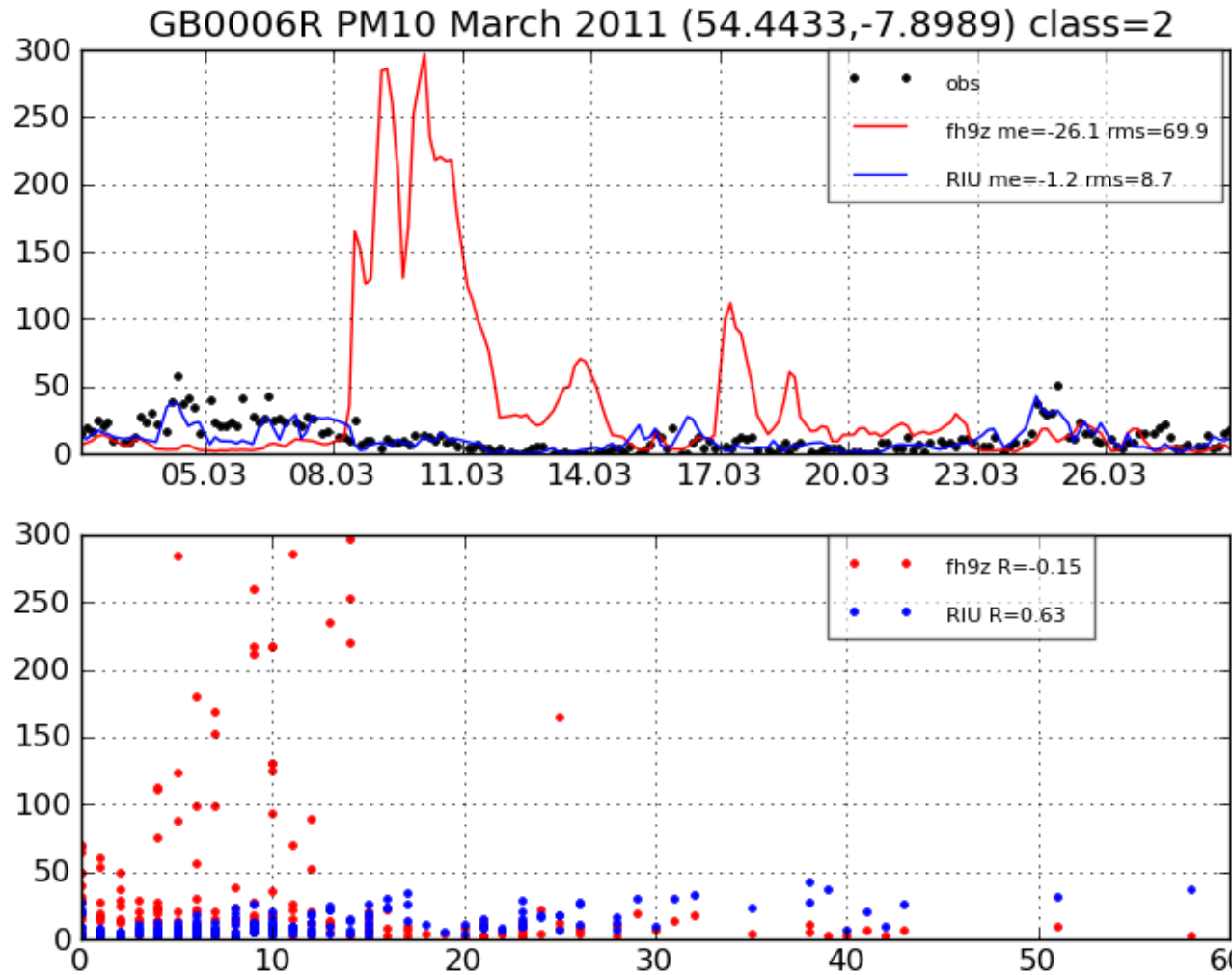
Experiment 1 – MACC NRT observations

- Spring 2011
- MACC/NRT PM10 observations
- all ~750 stations, no thinning
- unvalidated hourly values

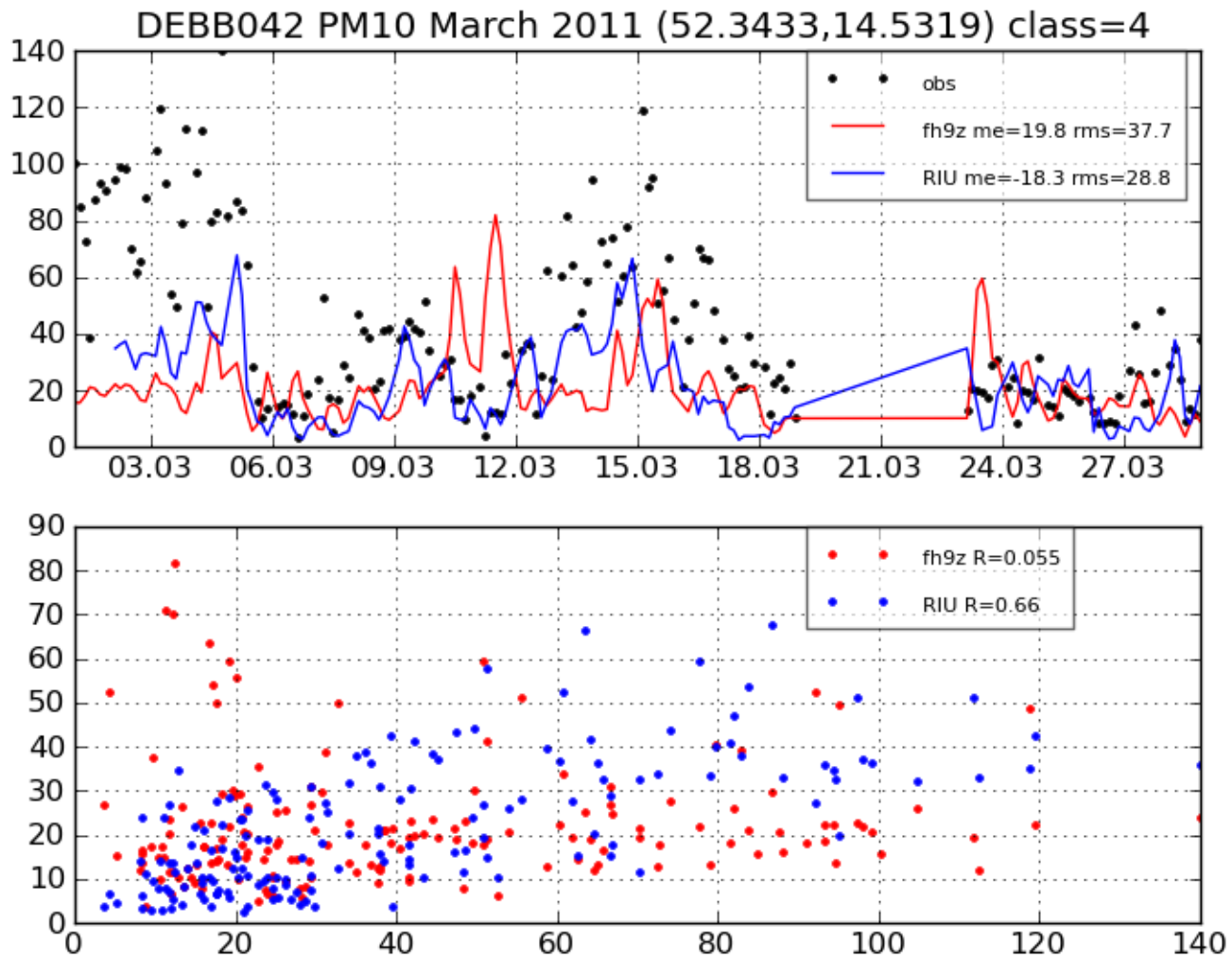
MACC NRT observations - March 2011



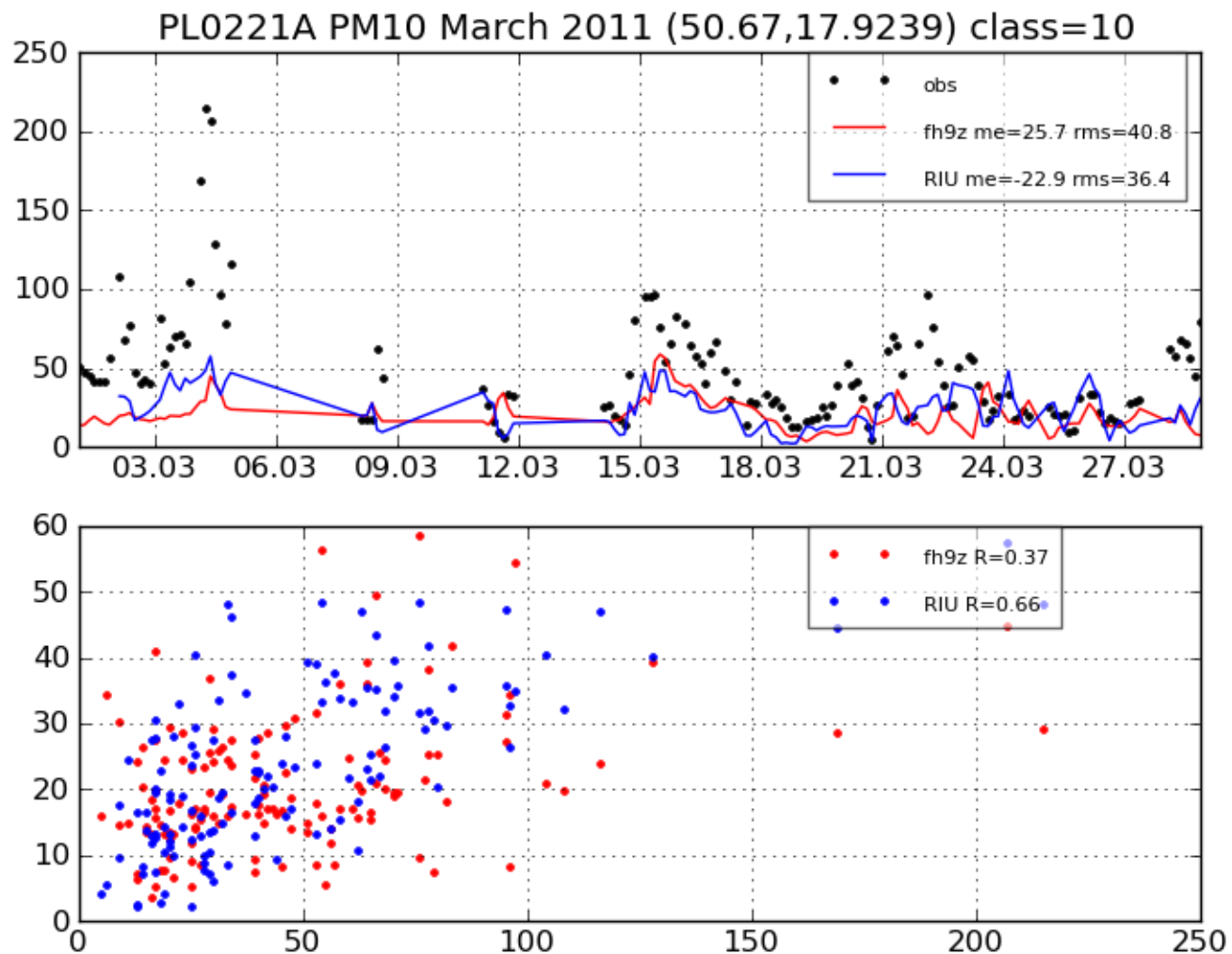
Lough Navar, N Ireland



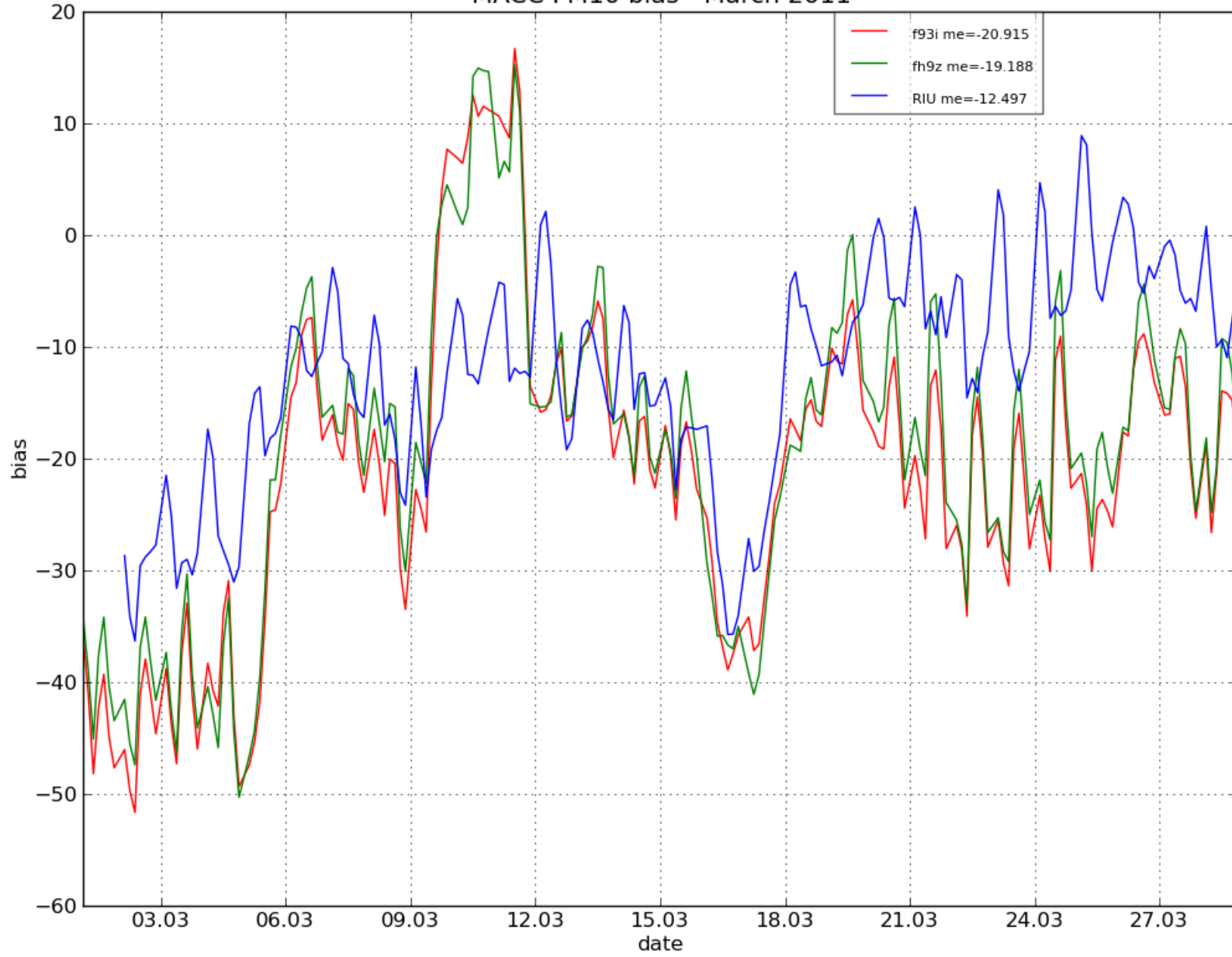
Frankfurt (Oder), Germany



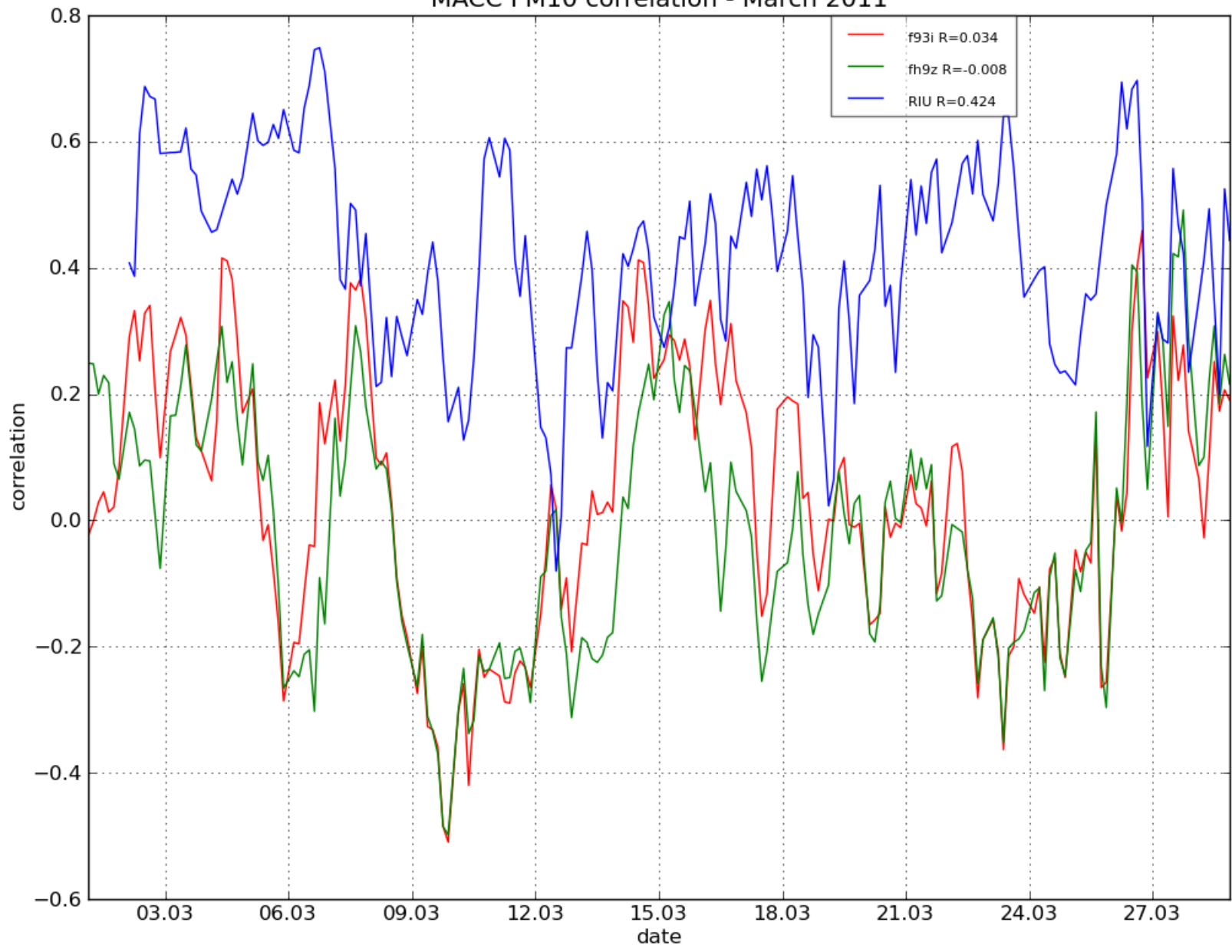
Opole, Poland



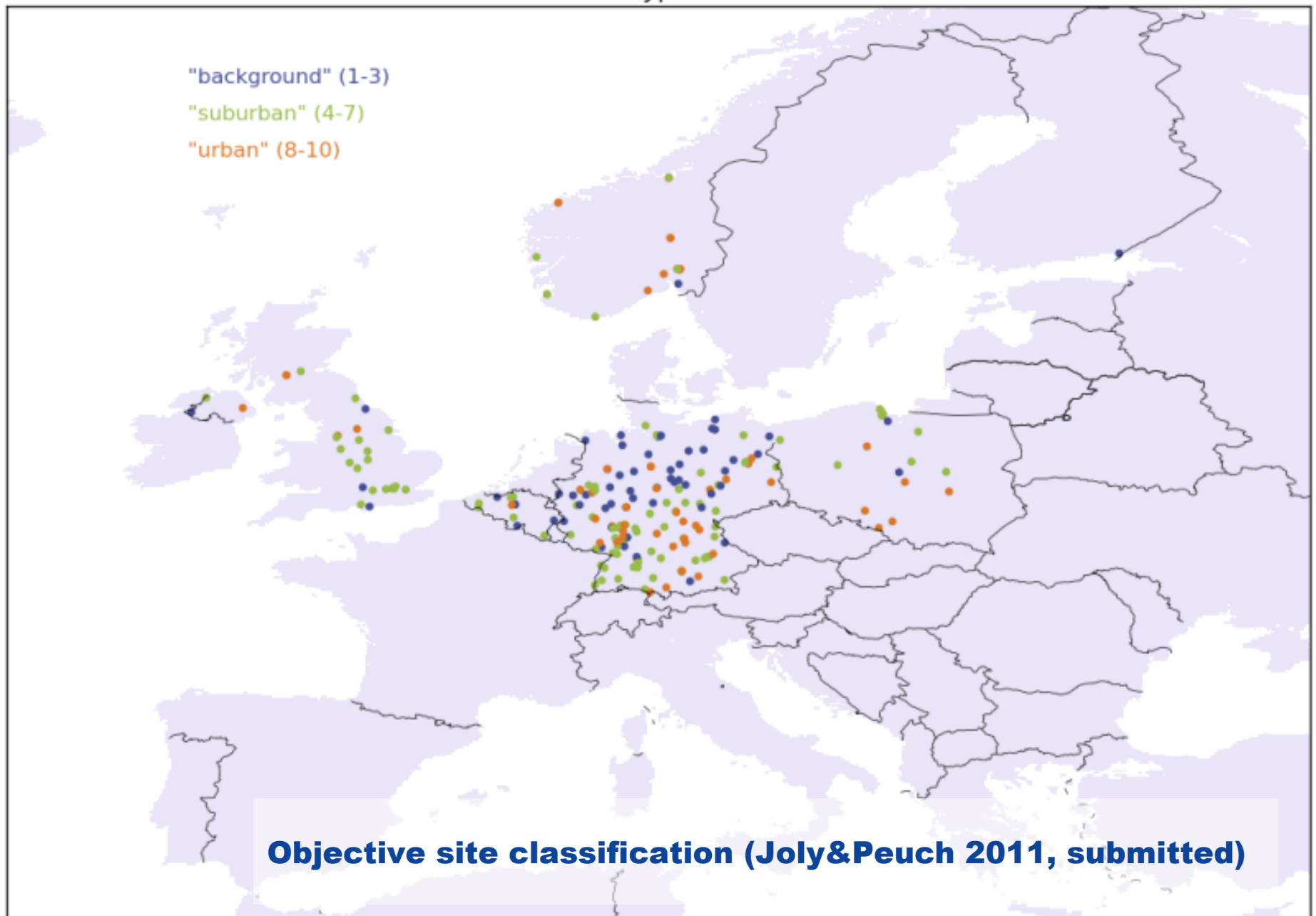
MACC PM10 bias - March 2011



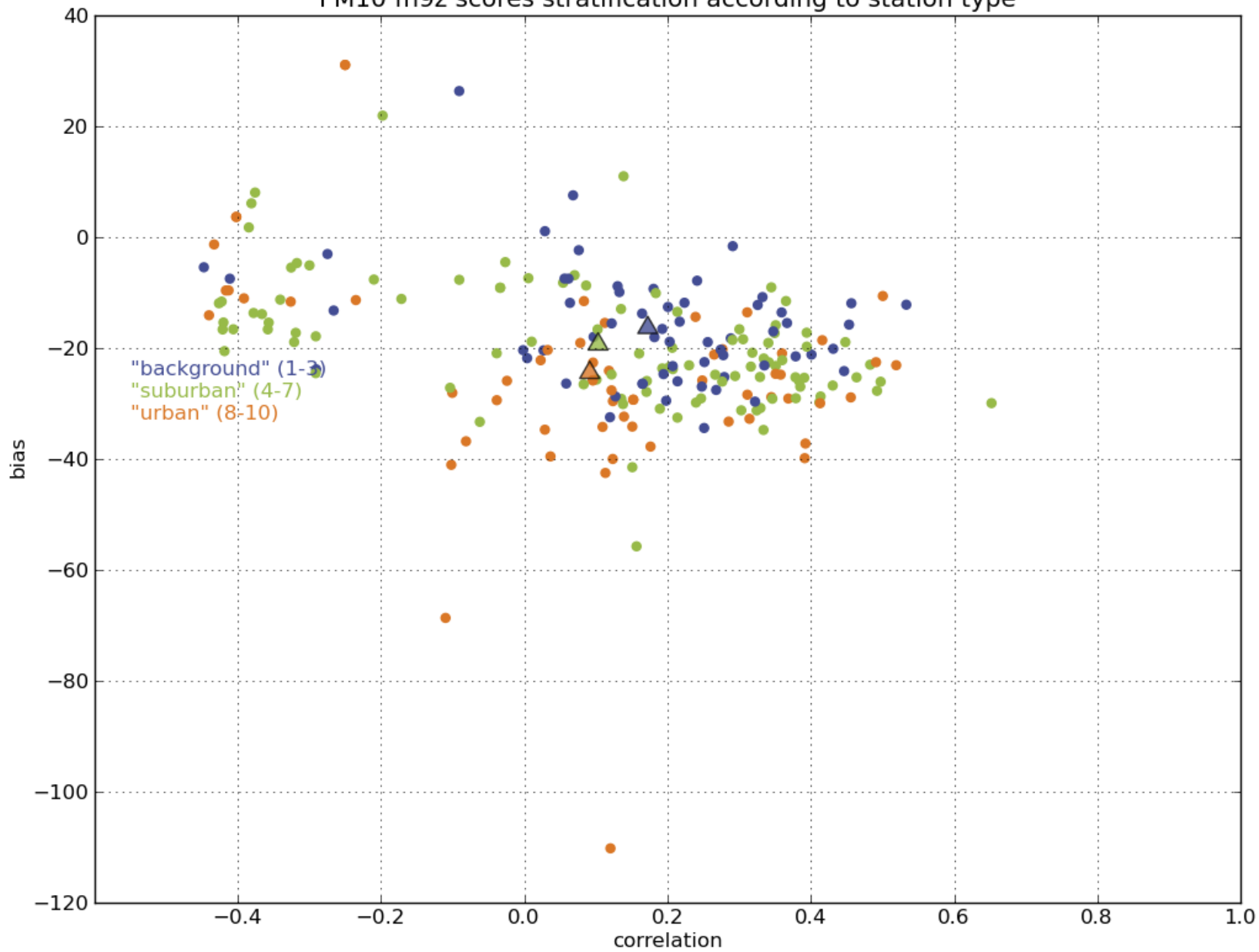
MACC PM10 correlation - March 2011



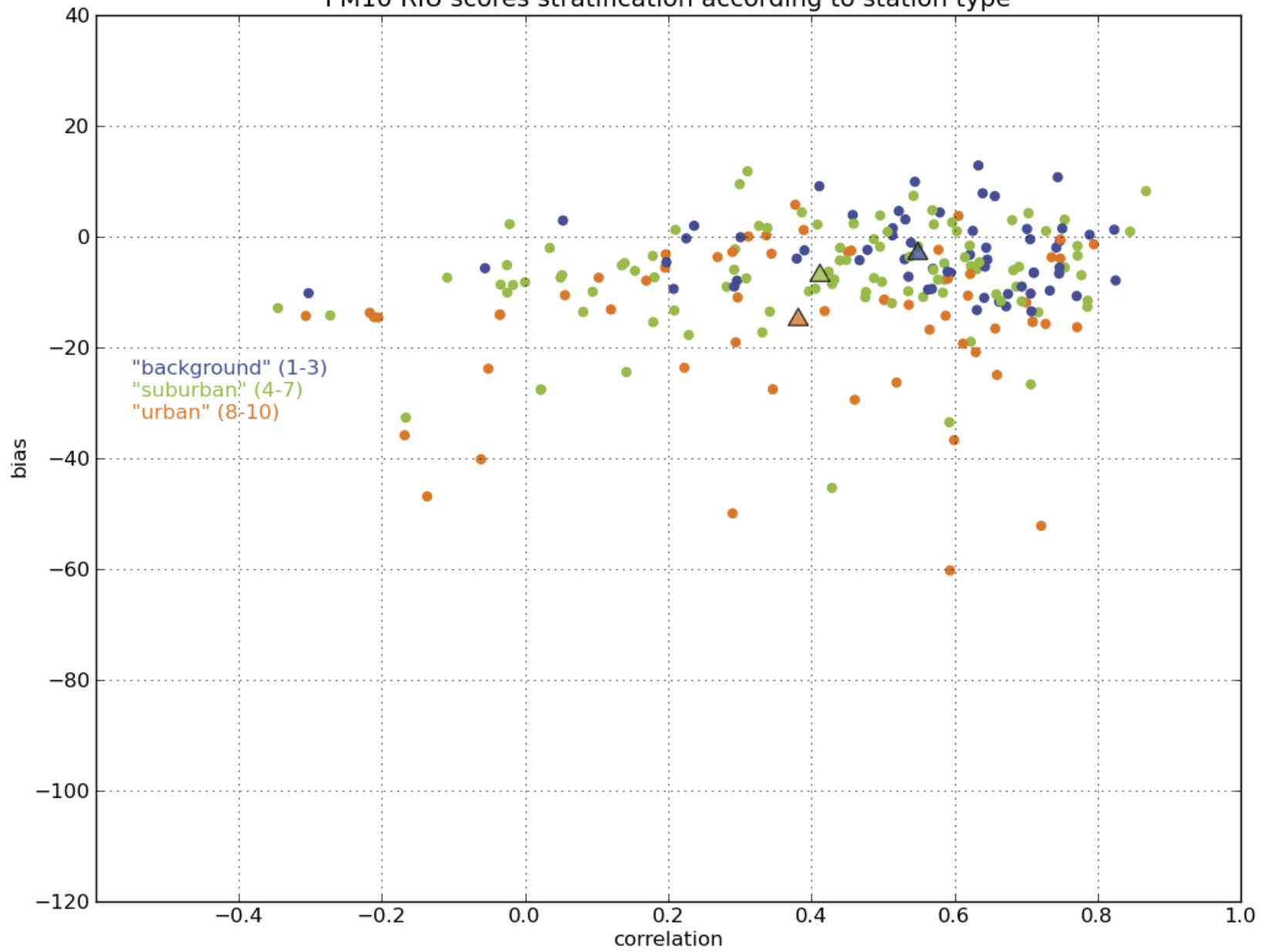
PM10 station type stratification



PM10 fh9z scores stratification according to station type

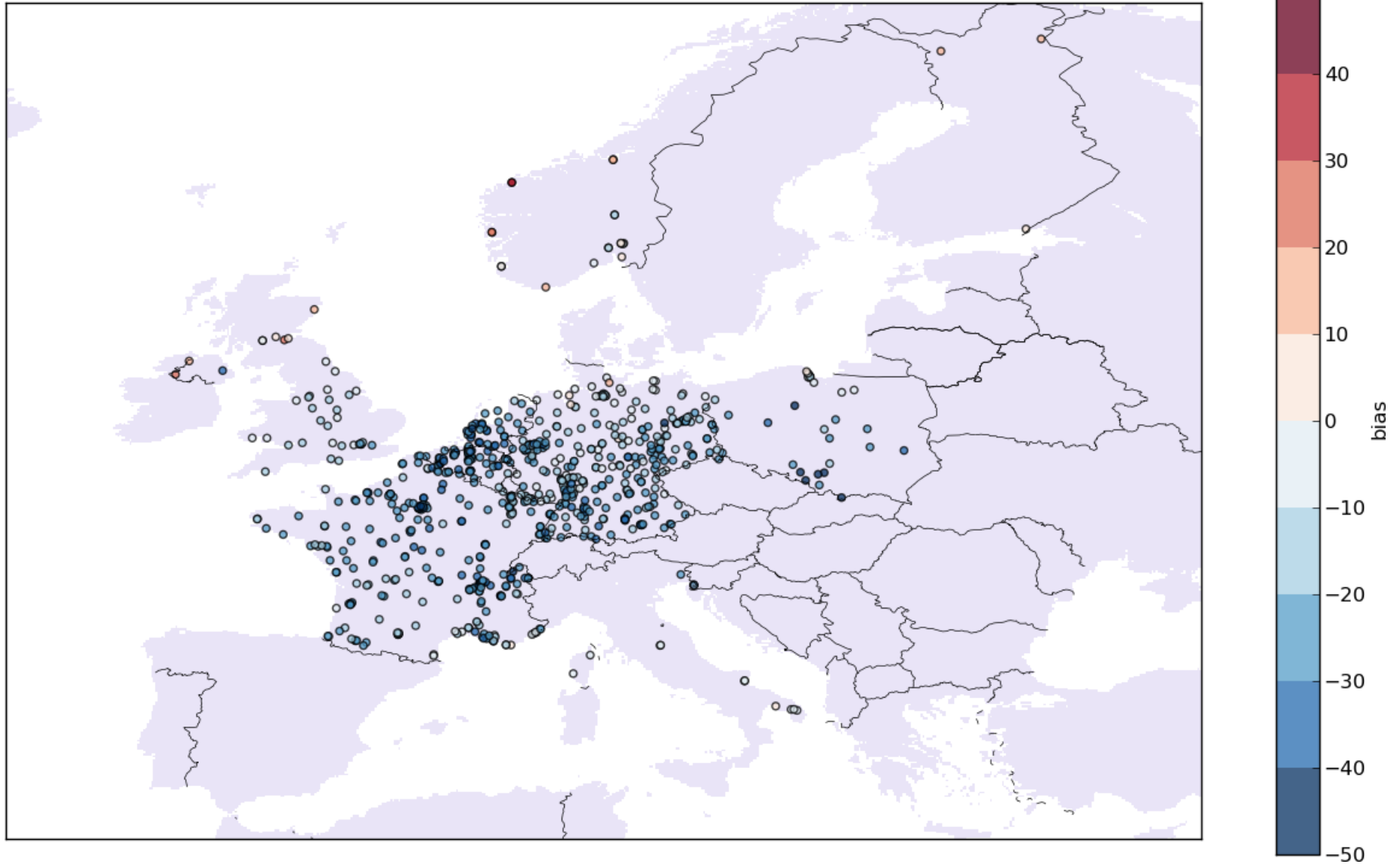


PM10 RIU scores stratification according to station type



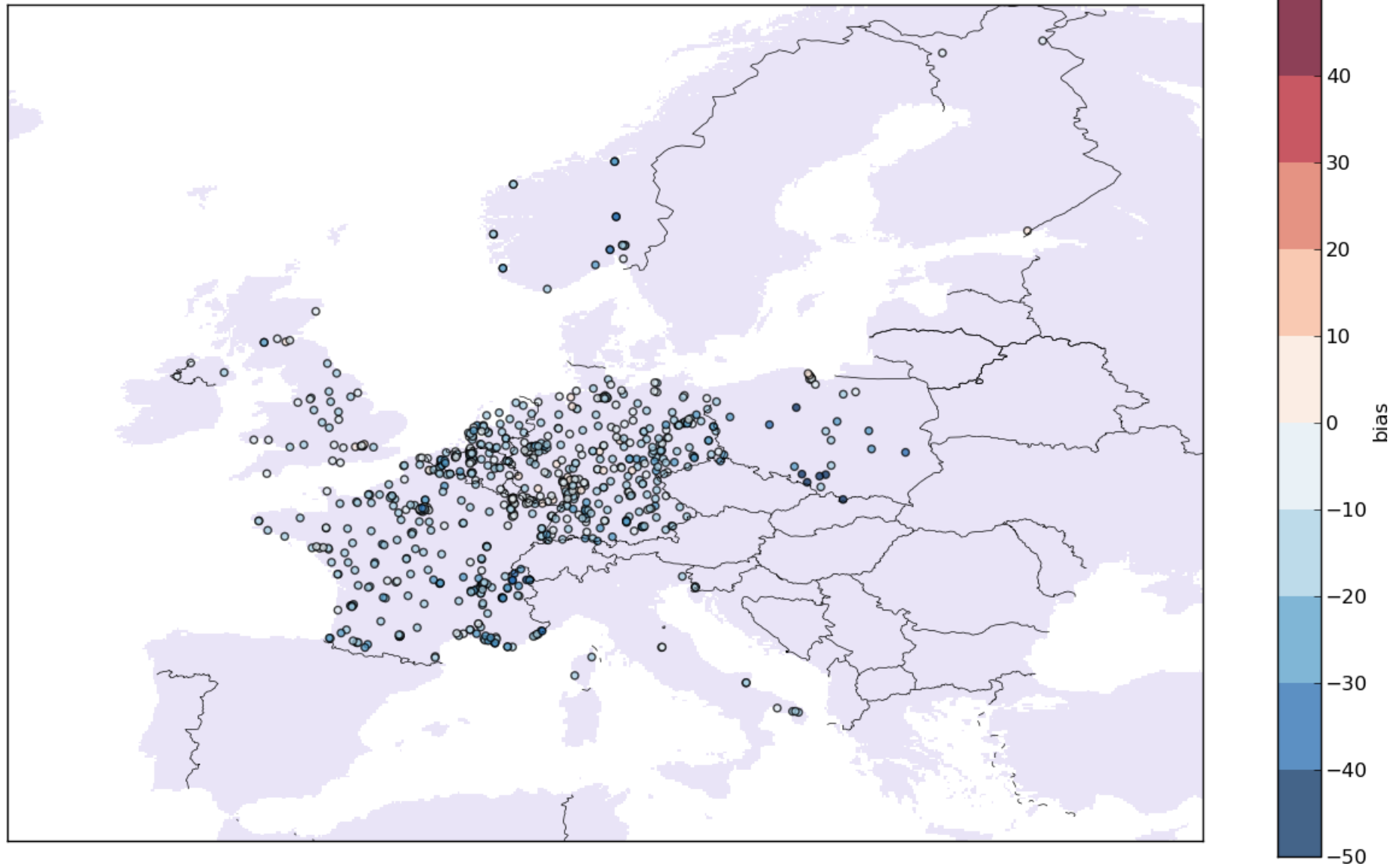
Average bias MACC/IFS - March 2011

MACC fh9z average PM10 score



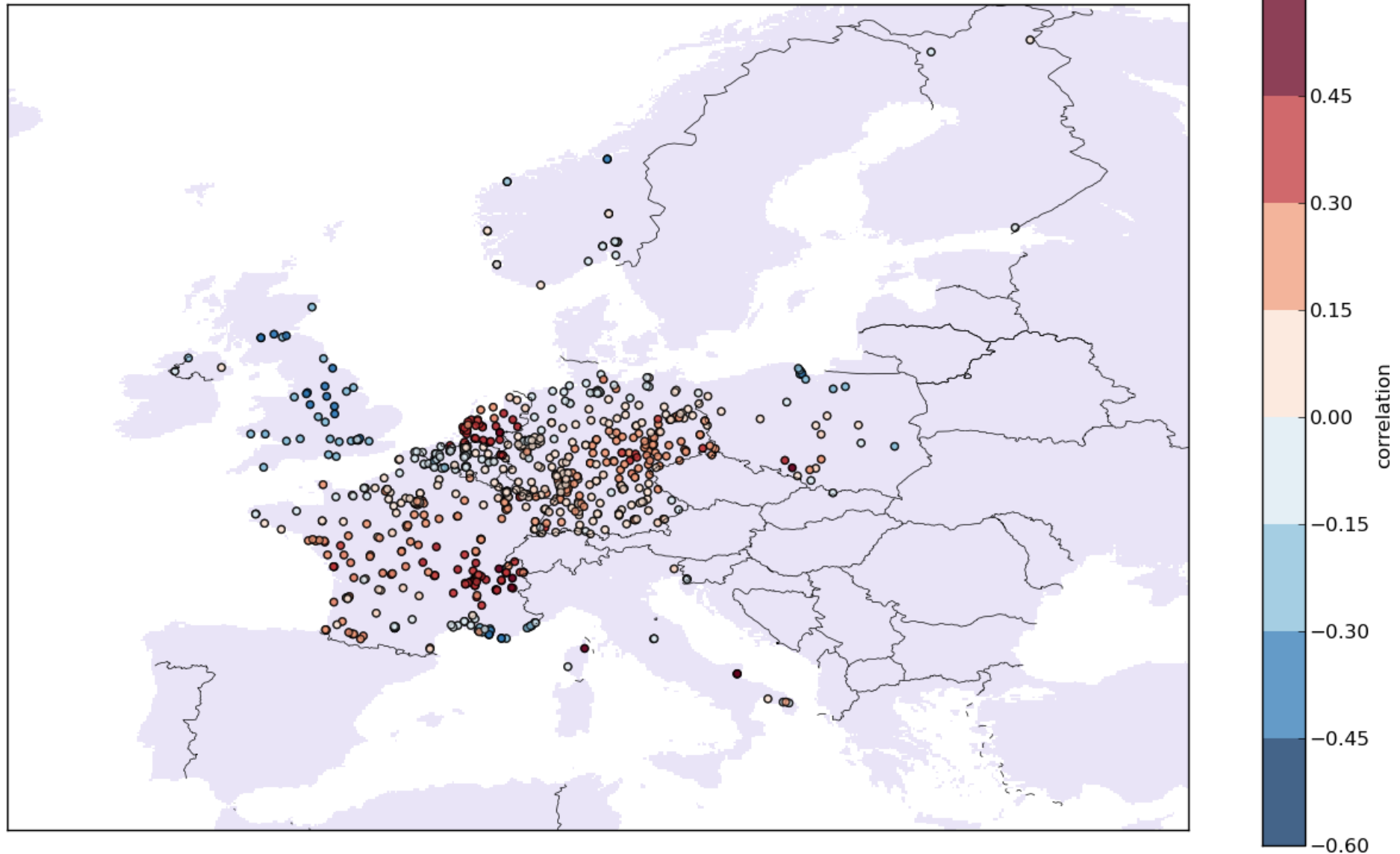
Average bias EURAD-IM - March 2011

MACC RIU average PM10 score



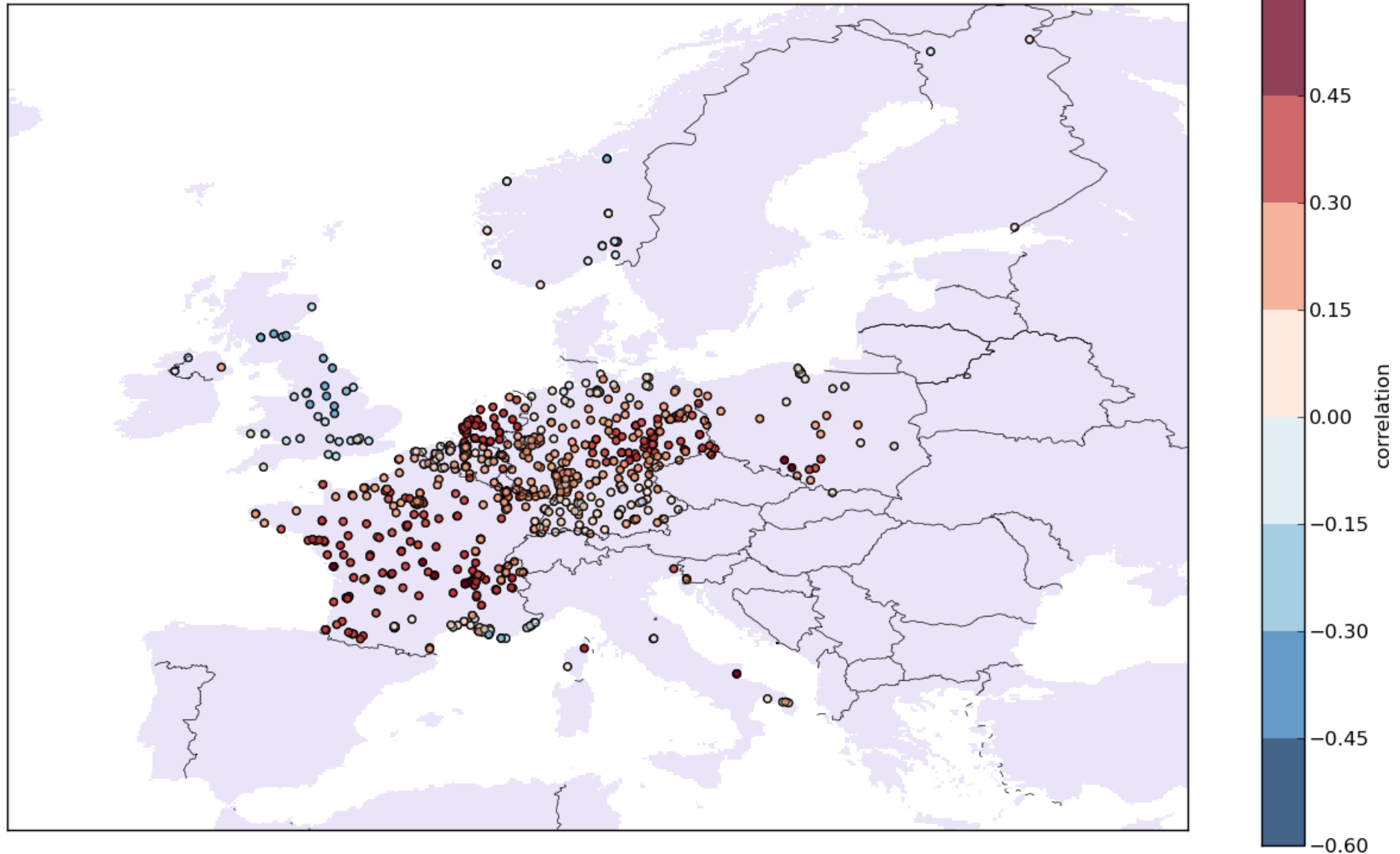
Average correlation MACC/IFS - March 2011

MACC fh9z average PM10 score



Average correlation EURAD-IM - March 2011

MACC RIU average PM10 score

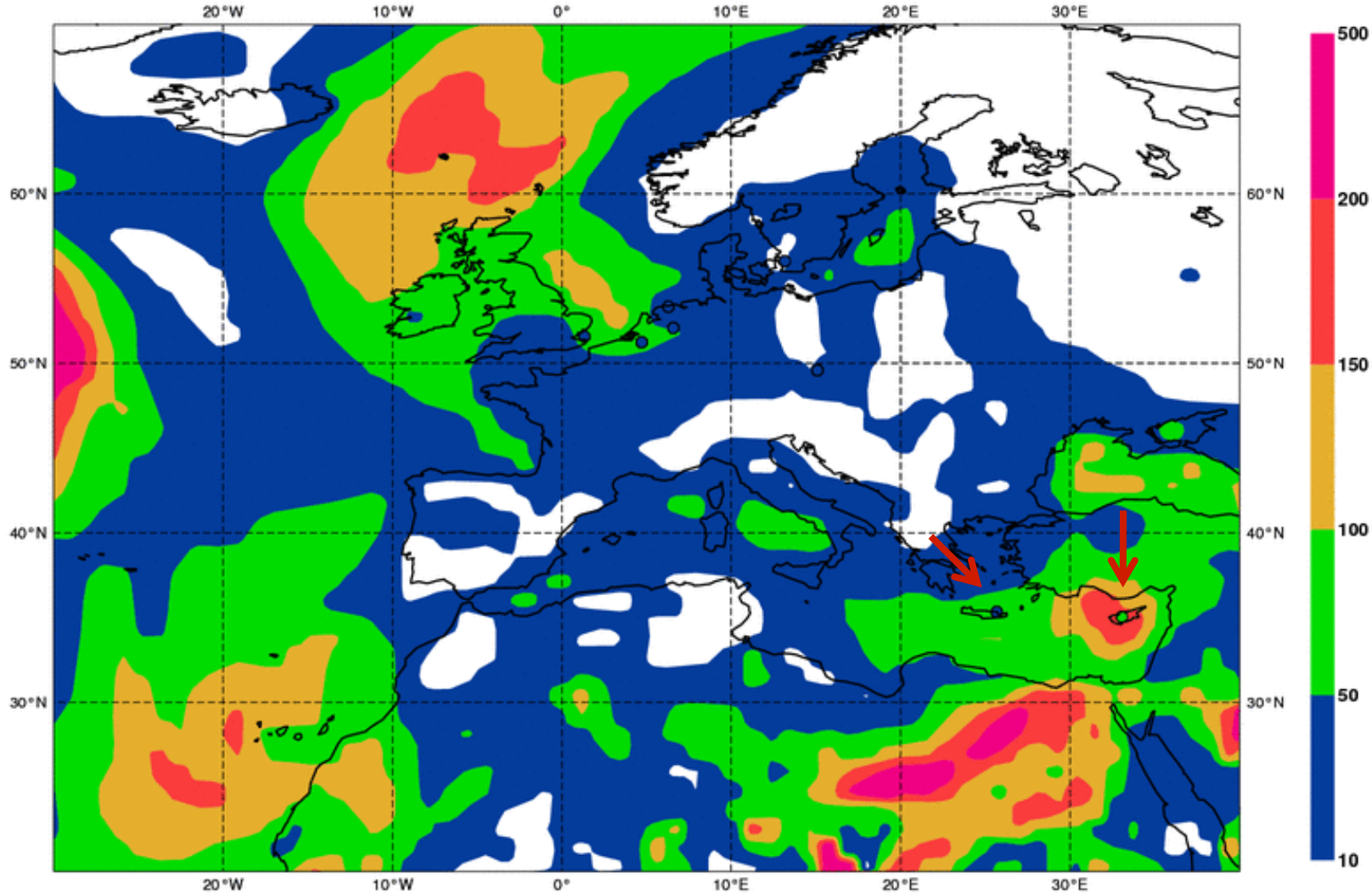


Experiment 2 - EMEP

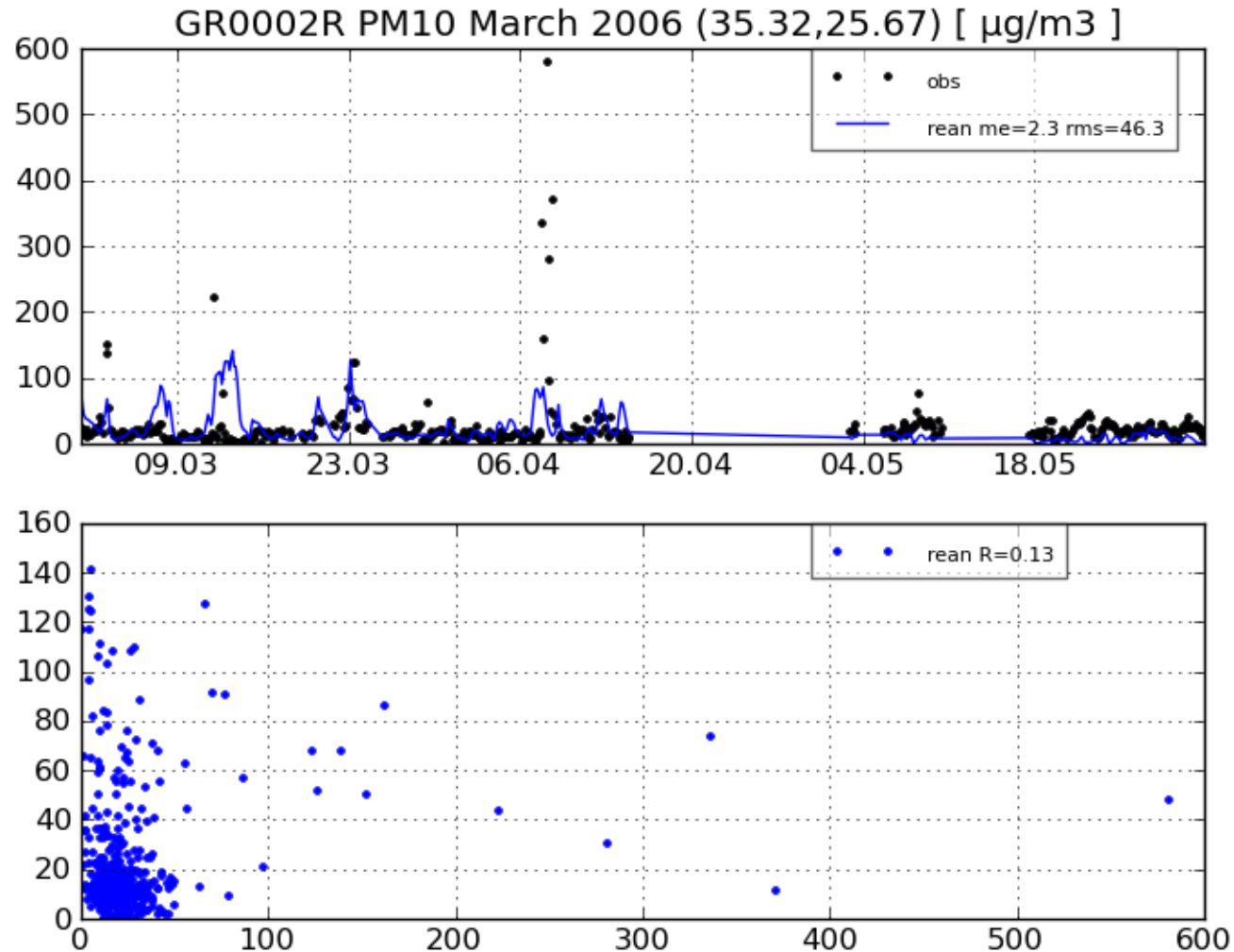
- main purpose of the dataset is model validation 11 EMEP observations
- March – May 2006
- MACC reanalysis experiment
- validated hourly data
- good quality background stations only

EMEP observations - March 2006

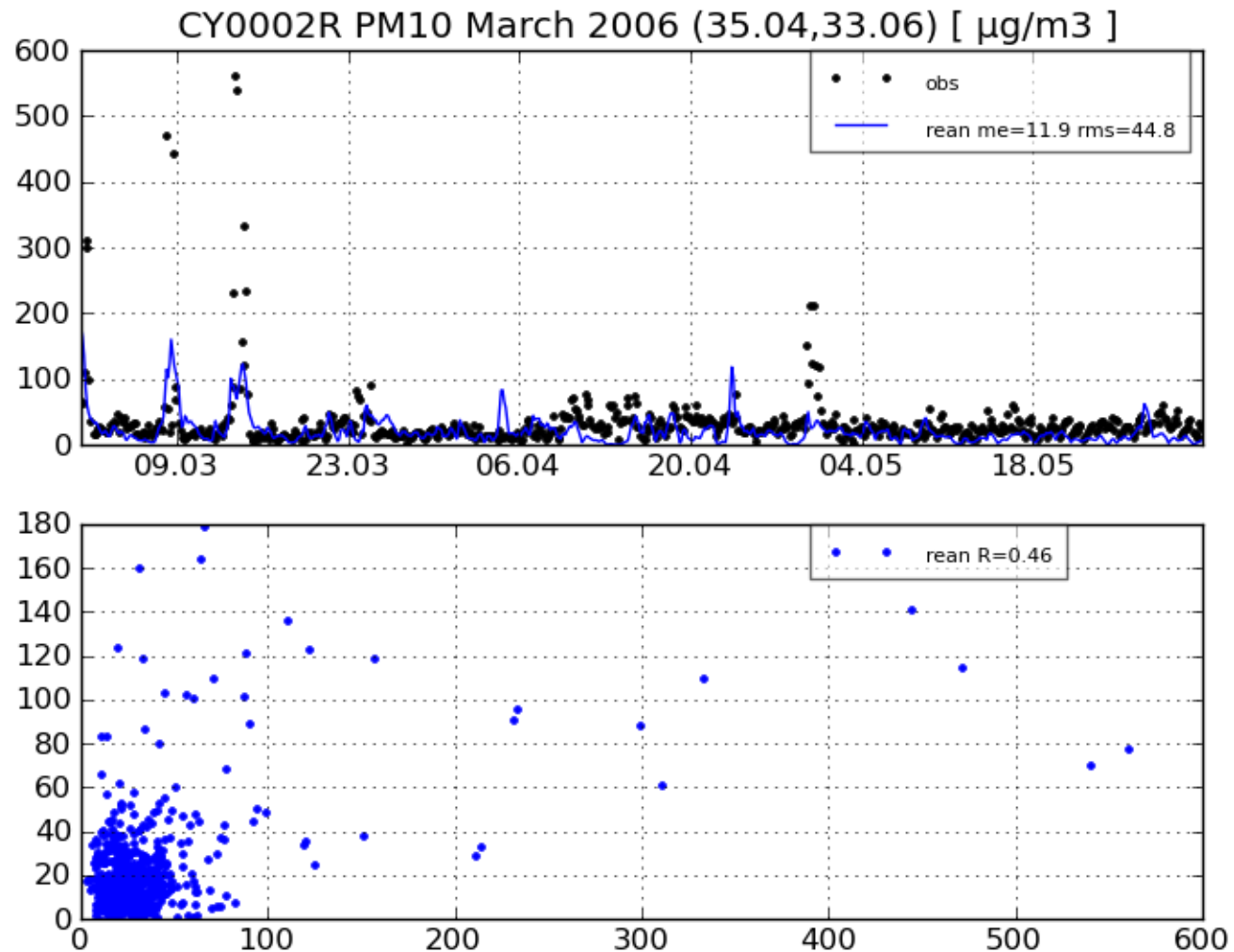
Wednesday 1 March 2006 00UTC MACC Verification t+003 VT: Wednesday 1 March 2006 03UTC
EMEP Observations + rean level 60 PM10 Aerosol [$\mu\text{g}/\text{m}^3$] bias: 33.20, RMSE: 49.30, corr: 0.71



Finokalia, Greece, March - May 2006



Ayia Marina, Cyprus, March - May 2006



Finishing remarks

- some skill for large scale dust and biomass burning events
- large overestimations of surface sea salt aerosols in MACC
- underestimation of anthropogenic aerosols
- look at daily cycles

Observation data issues

- data thinning of high density networks
- stronger criteria for background station class needed?
- use of PM2.5 (and PM1) to diagnose the problems further
- use of daily EMEP data (~65 sites)
- AirNow, Airbase, HTAP, other datasets?

Thank you

MACC website

<http://www.gmes-atmosphere.eu/>