MACC-III

Towards the Copernicus Atmosphere Services (CAMS)

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On behalf of the MACC-III consortium

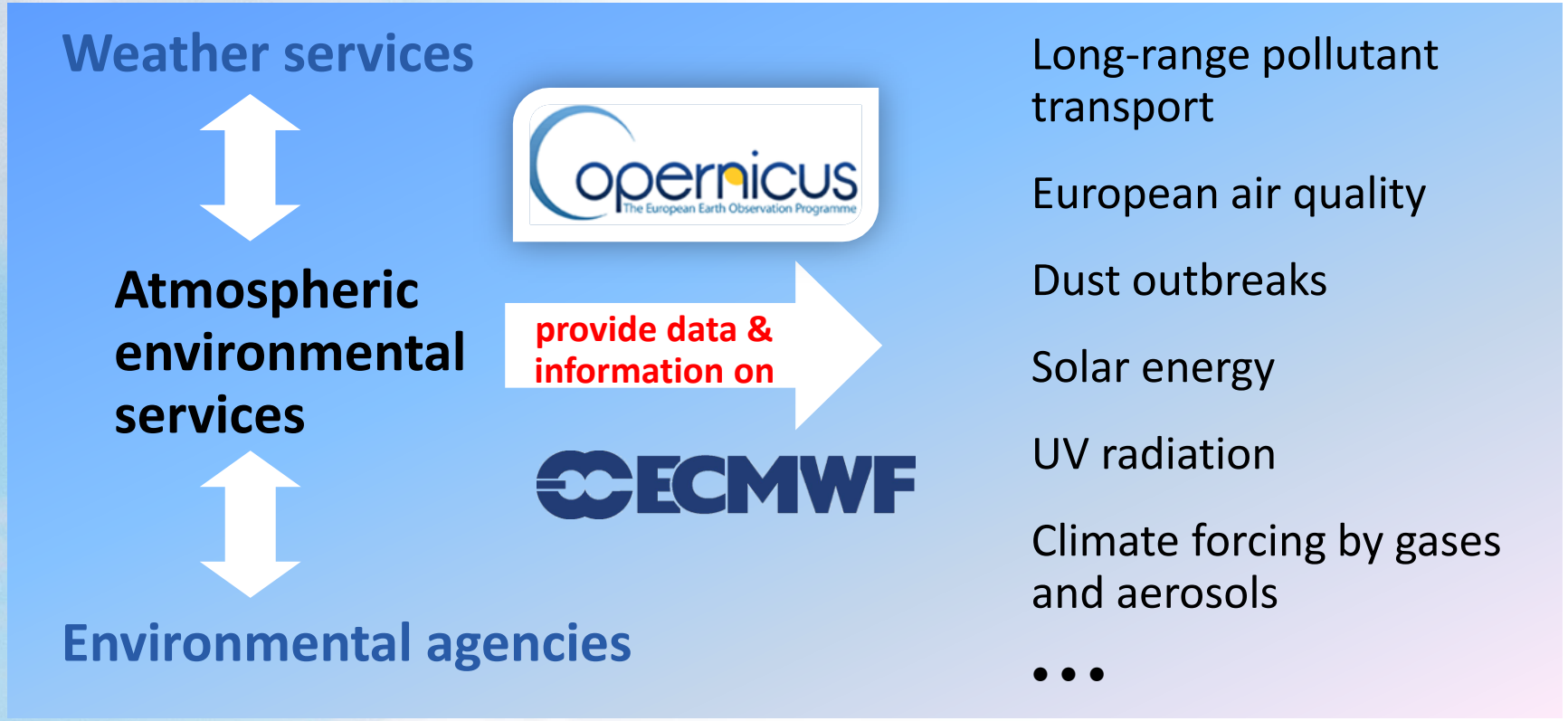
HORIZON 2020

opernicus
The European Earth Observation Programme

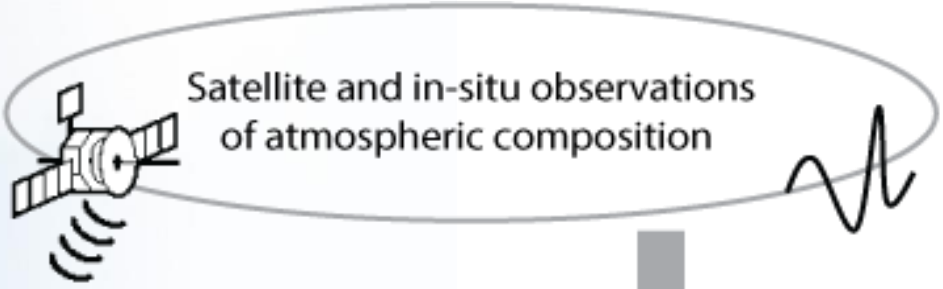
Monitoring Atmospheric Composition and Climate – Interim Implementation achieved

http://www.copernicus-atmosphere.eu

Final stage before the implementation of operational services coordinated by ECMWF (fall 2015)



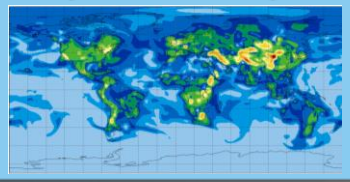
The core production system of systems in a nutshell



Observations Acquisition & Processing, Forest Fire Emissions Estimation

Observations & Emissions

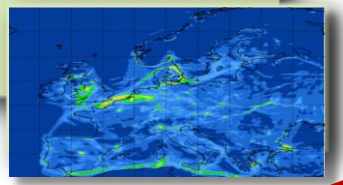
Global Data Assimilation and Forecasting System for Atmospheric Composition



Global Forecasts and Analyses

Chemical Boundary Conditions & Meteorology

European Air Quality models



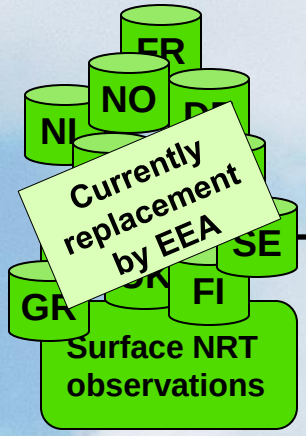
Regional Ensemble Forecasts and Analysis

Verification, Dissemination, Users Support and Interaction

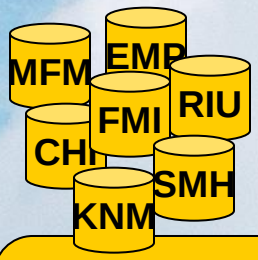
Products & Feedback

Users

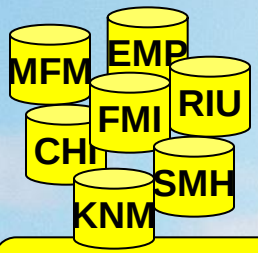
Daily production of forecasts and analyses : current status



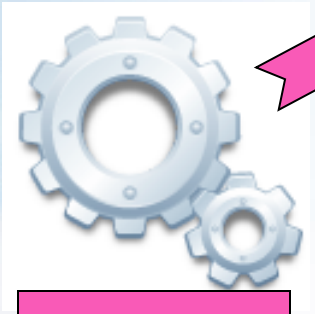
Surface NRT observations



96 h forecasts
O_3 NO_2 SO_2,CO
PM_{10} $PM_{2.5}$ pollen
NO NH_3 PAN
NMVOC



24 h analyses
O_3 NO_2 SO_2 CO
PM10 PM2.5



Ensemble production

Numerical data Server *(Grib2+Netcdf)*

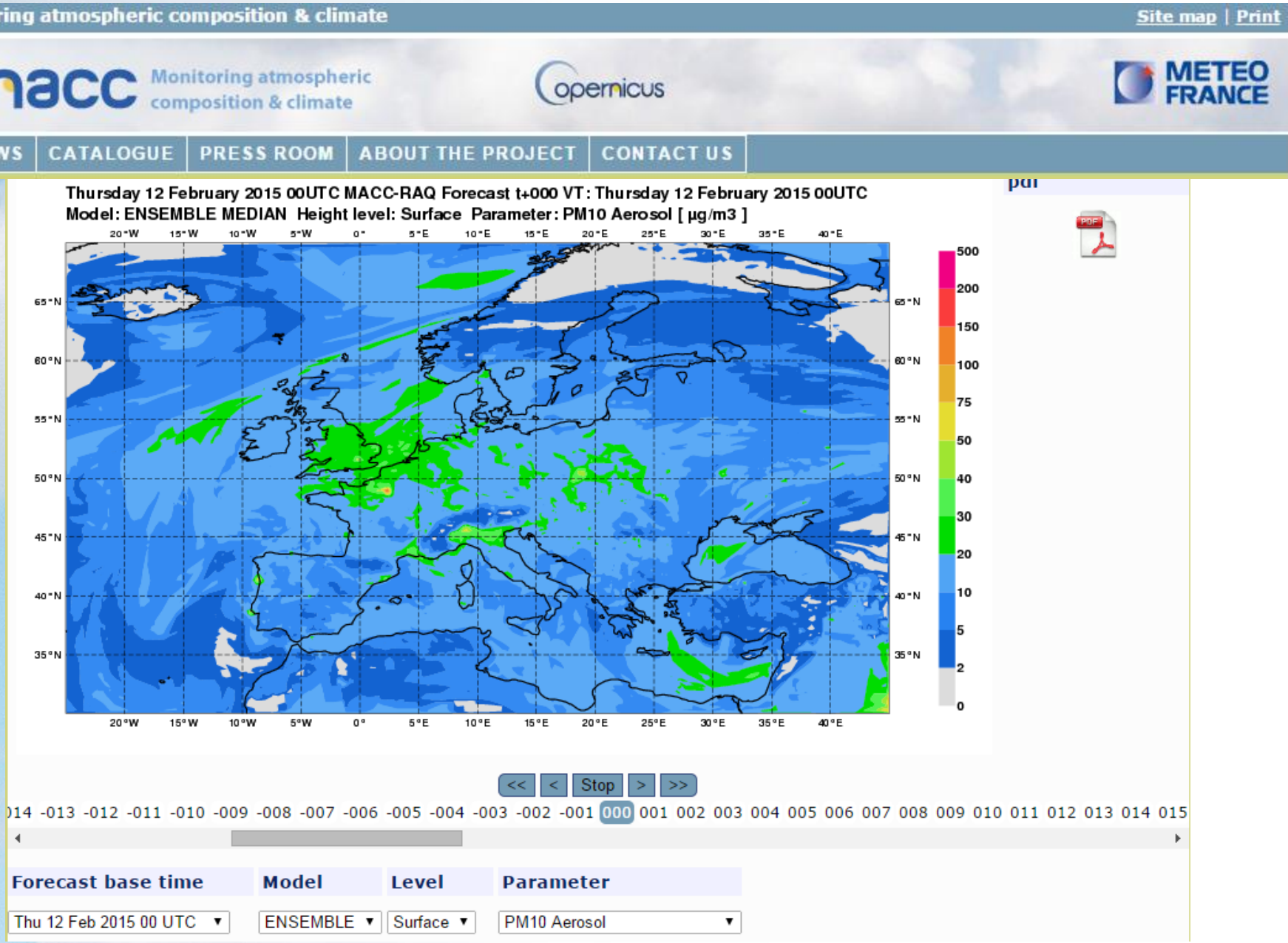
Individual + Ensemble
96 h forecasts
O_3 NO_2 SO_2,CO
PM10 PM2.5 pollen
NO NH_3 PAN NMVOC

Individual
24 h analyses +
Ensemble
24 h analyses (O_3)

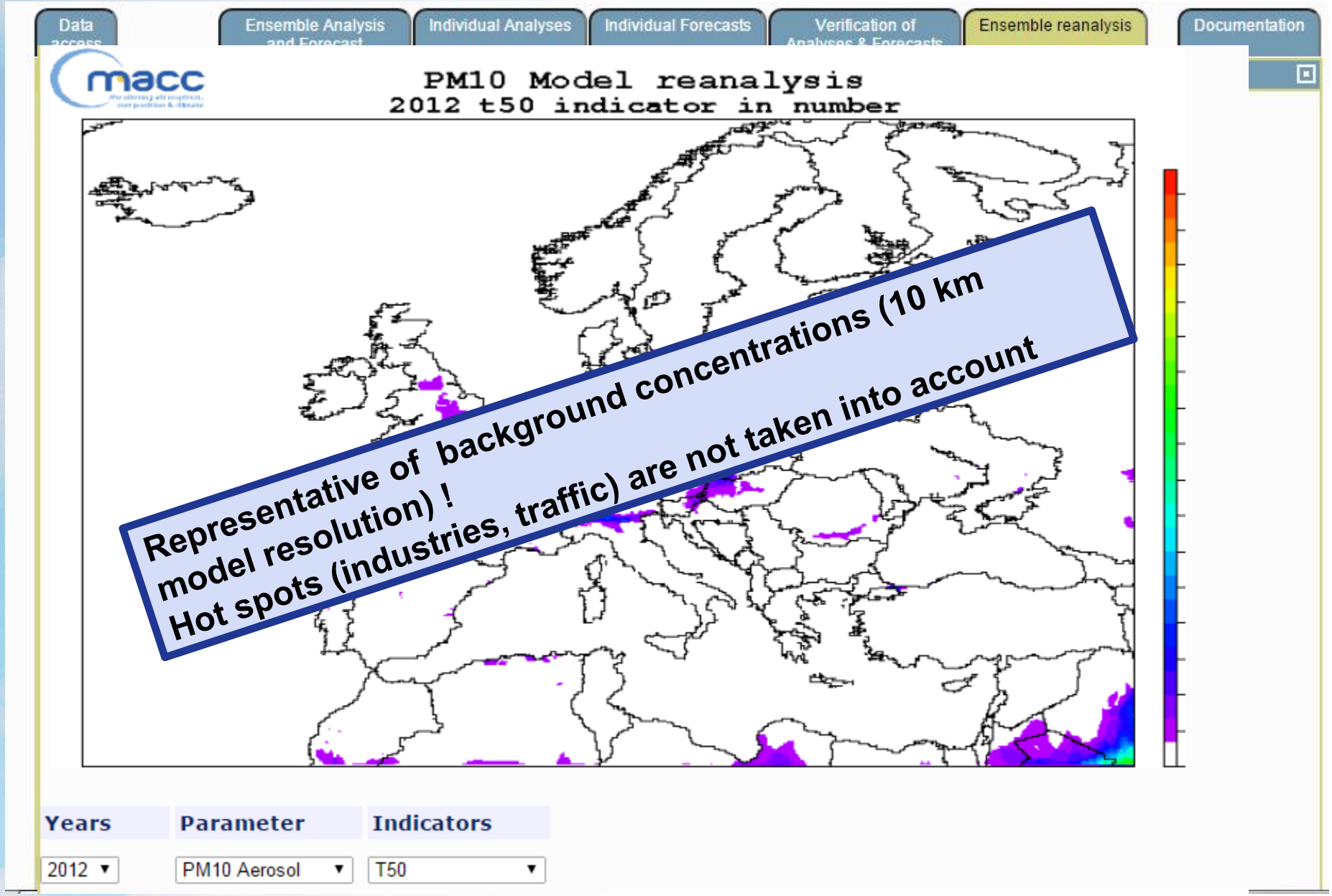
Website
Plots of
Model
Observations
Verification

users

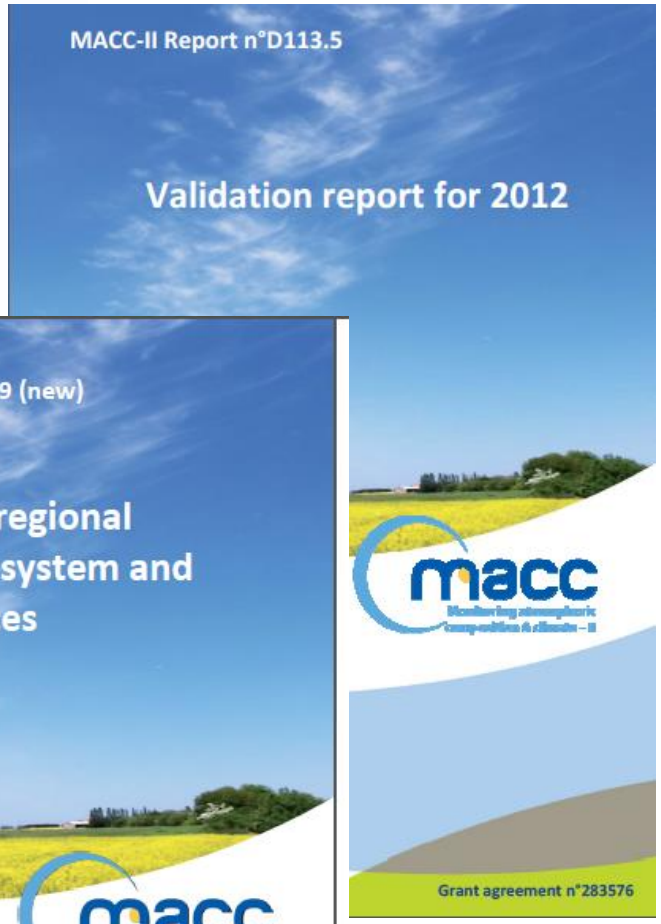
European Air quality forecasts and analyses

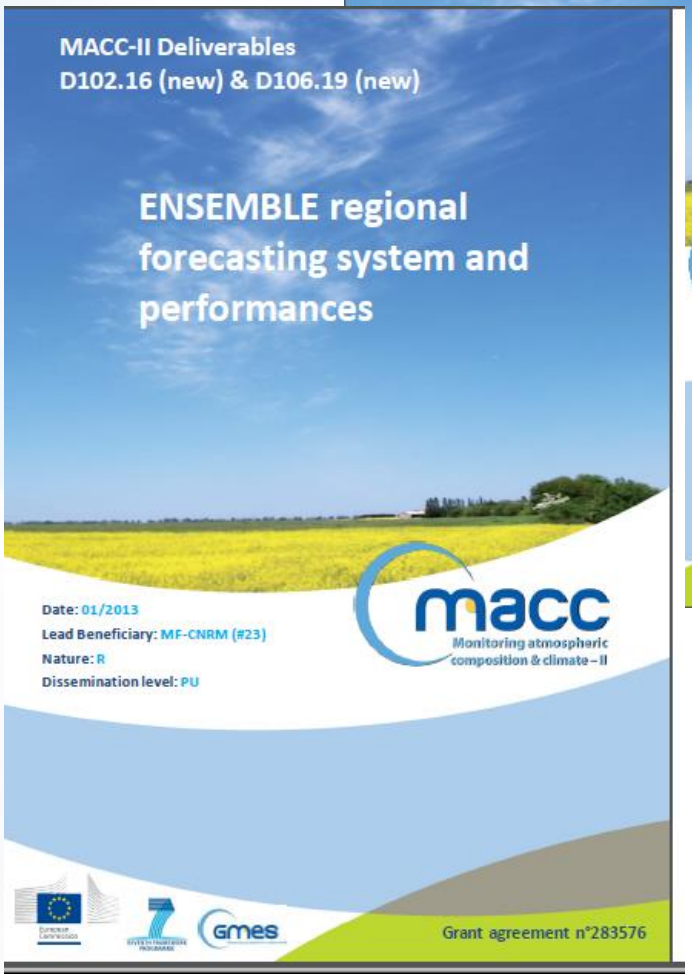


European air quality re-analyses (assessment)

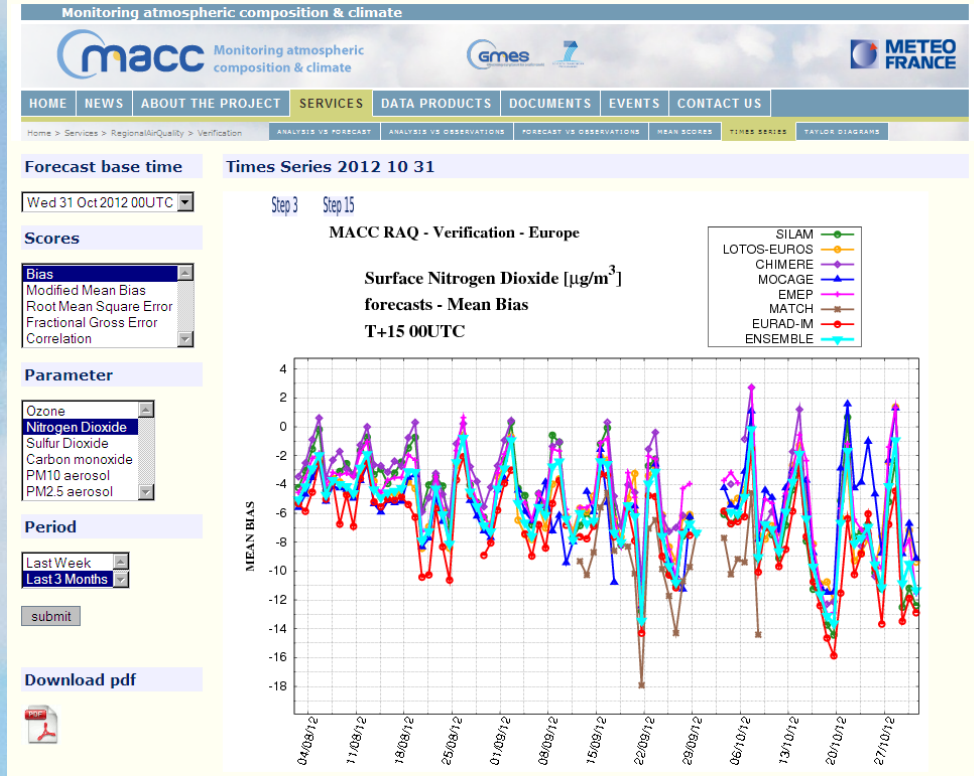


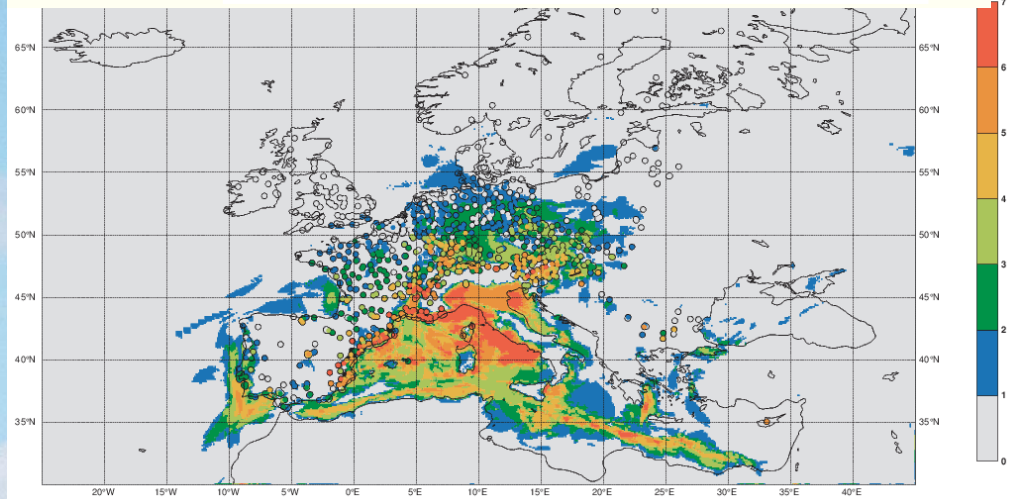
Yearly assessment and validation reports



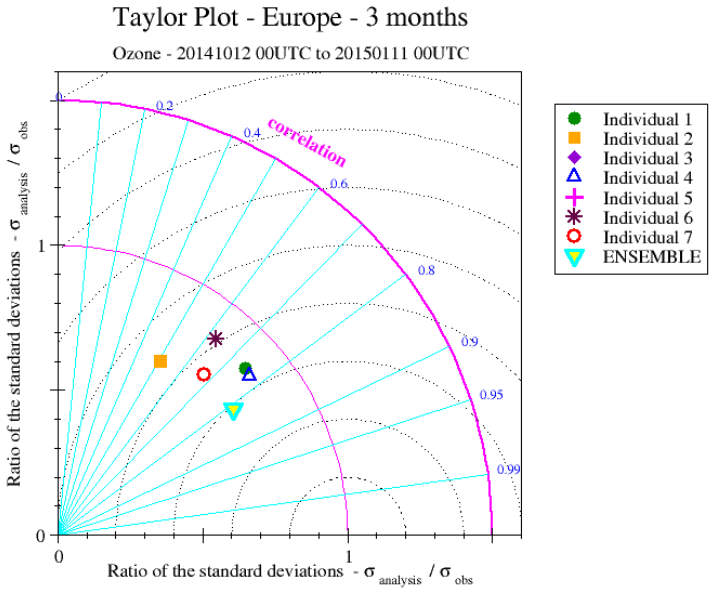


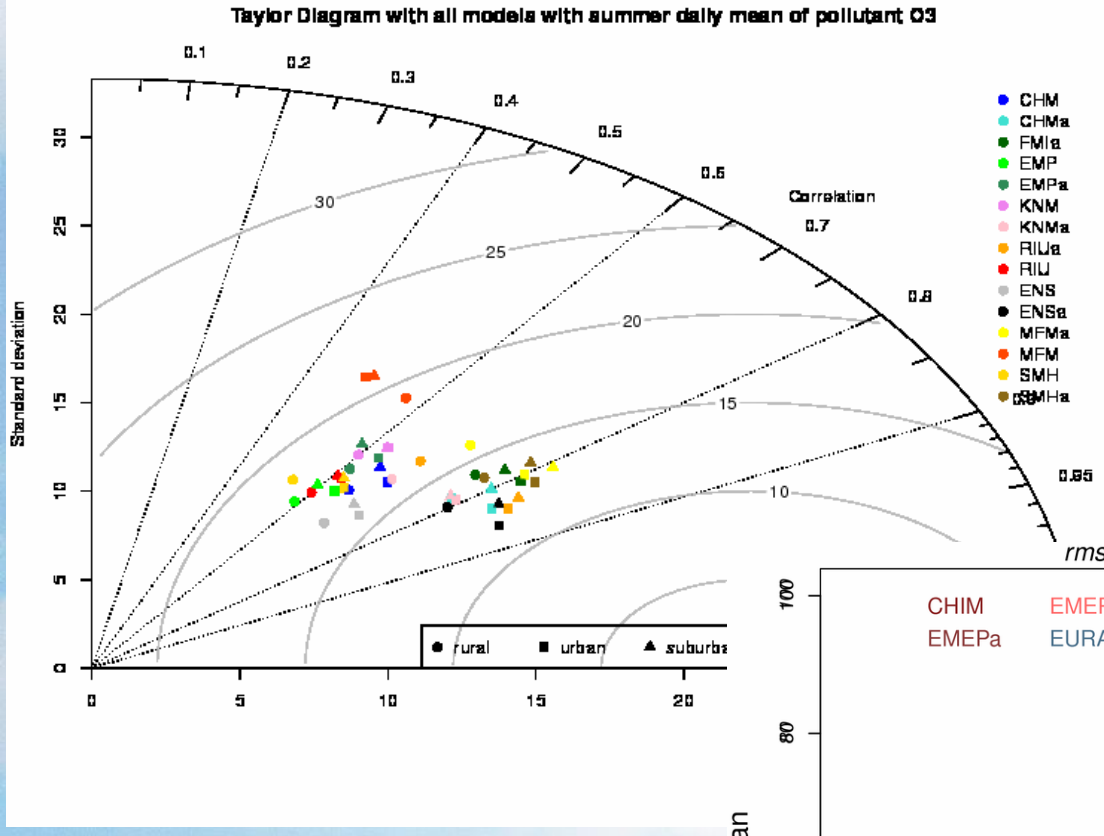
Evaluation/verification : a key issue …..



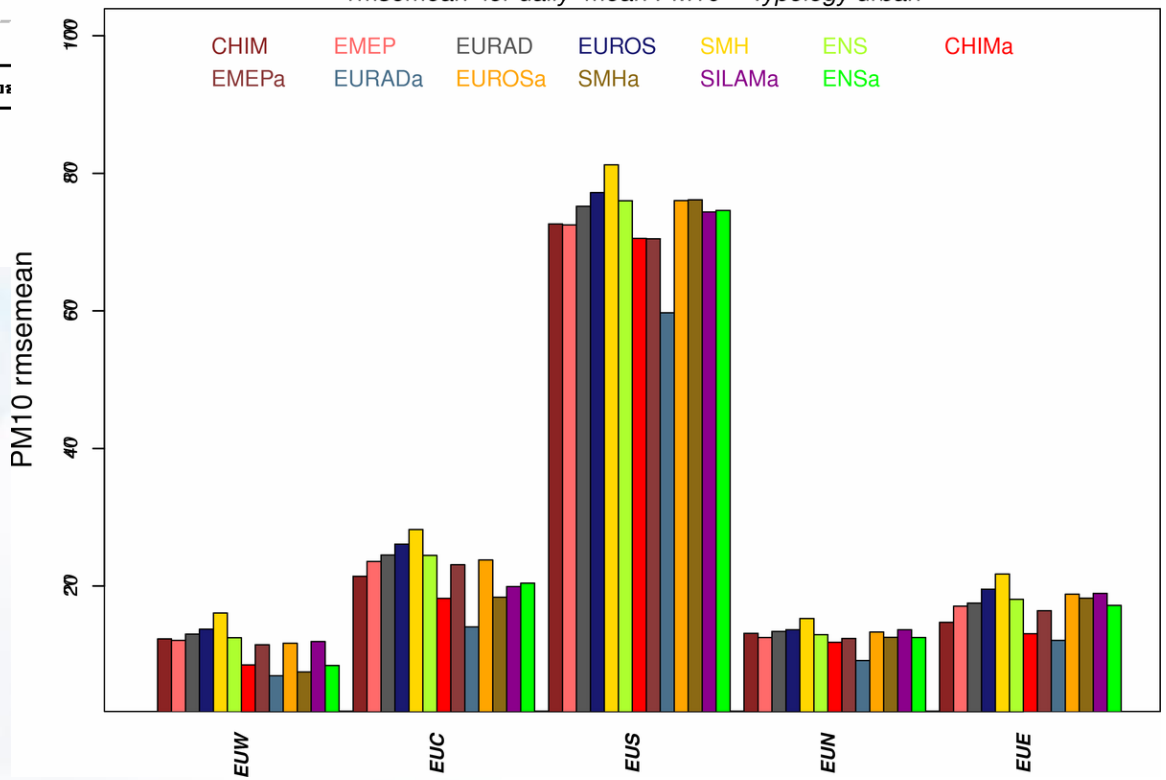


or both daily and yearly roduction !





rmsemean for daily mean PM10 – Typology urban



Links with FAIRMODE

- **Experience in air quality forecasting + ensemble**
- **Air quality assessments based on data assimilated fields**
- **Verification**

- Evaluation of the MACC/CAMS model results against the FAIRMODE quality criteria
- Evaluation of forecasts and re-analyses (cross-cutting in Fairmode)

- Work on modeled « composite » air quality maps should take into account European-wide approaches : EEA maps, EMEP maps and Copernicus maps

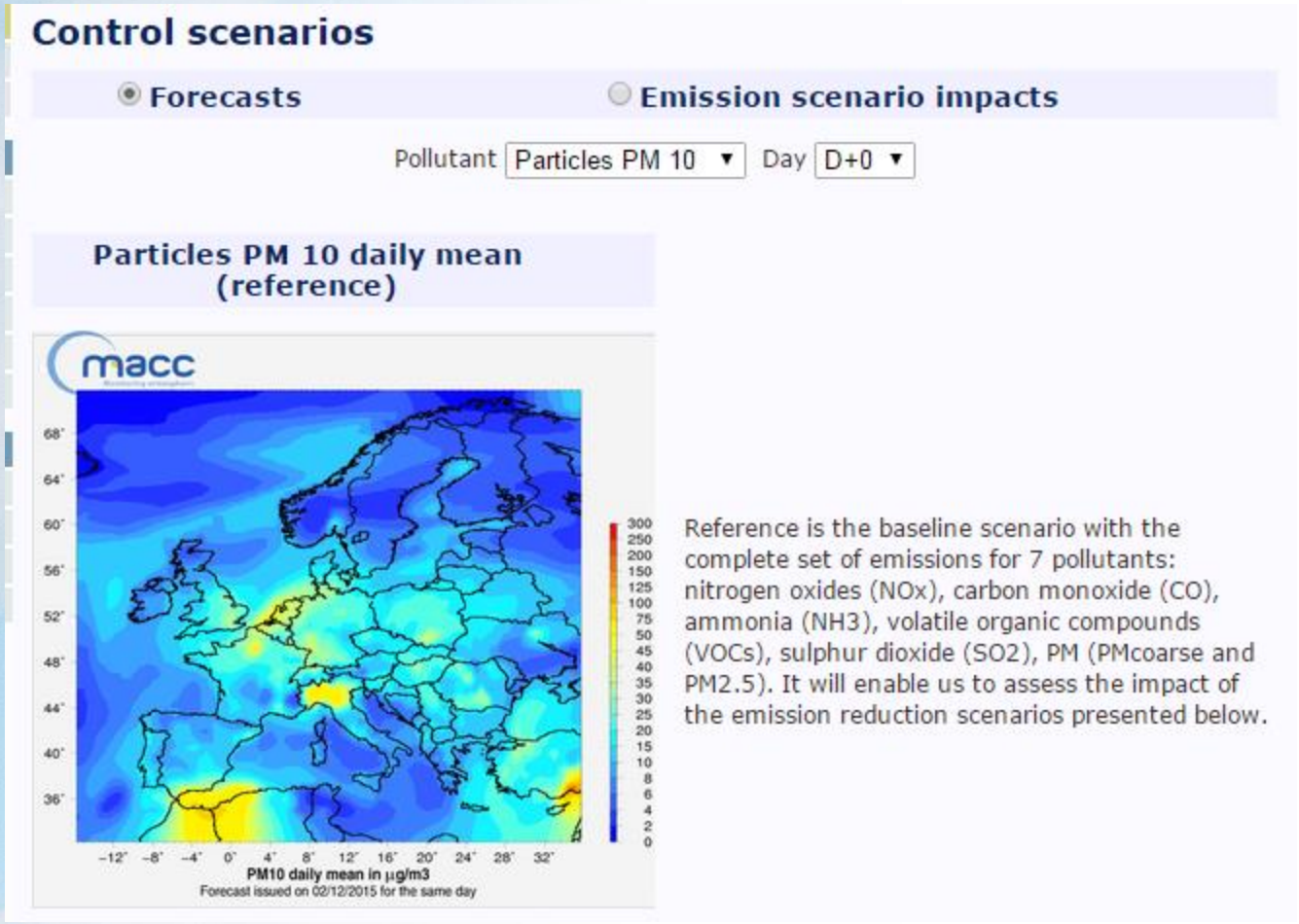
- Use of the TNO/MACC emission inventory for comparison of top/down and bottom-up approaches

Other policy-oriented services : short term scenarios and source receptor analyses

- To help policy users in the design of policy responses to prevent severe air pollution episodes.
- Using the Copernicus forecasting capacities to provide daily regular information on the expected effect that short term measures
- Assessing the relevance of implantation of short term action plans **in advance** to manage the predicted episodes

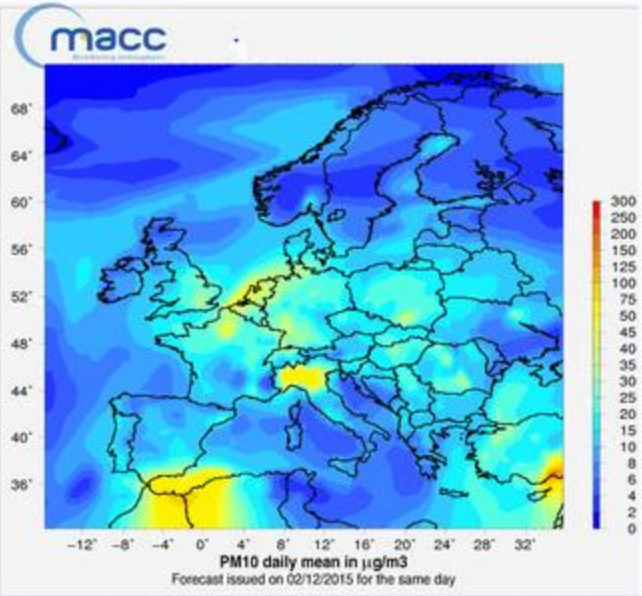
- **S1 - Combustion in energy and transformation industries – 10 %**
- **S2 - Non-industrial combustion plants – 30 %**
- **S3 - Combustion in manufacturing industry -10%**
- **S4 - Production processes -10%**
- **S7 - Road transport – 30 %**
- **S10 – Agriculture – 30%**

http://www.copernicus-atmosphere.eu/services/aqac/policy_interface/green_scenarios/control_scenarios/



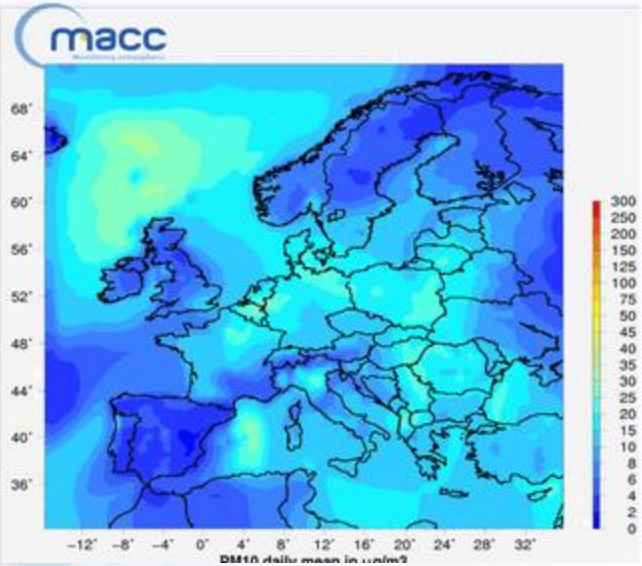
Based on the CHIMERE model (INERIS) run with coarse resolution (0.5°) to reduce computing times

Particles PM 10 daily mean (stra)



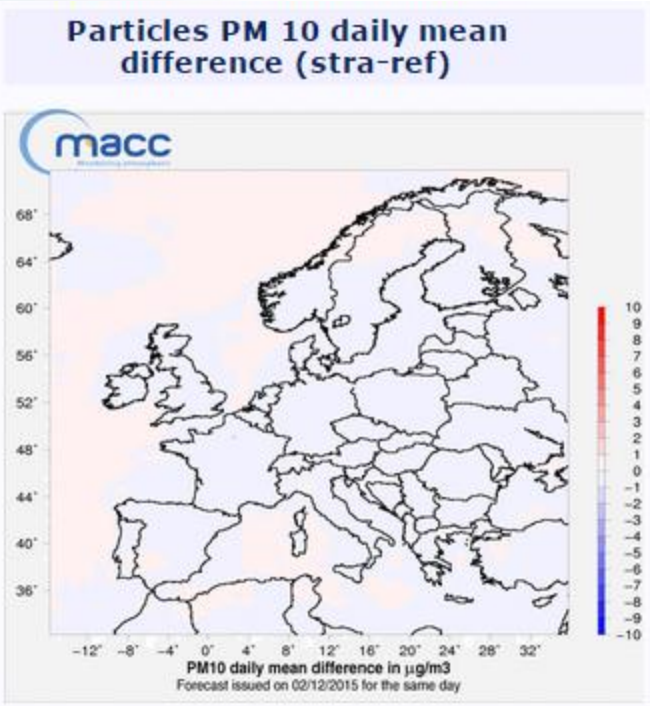
The traffic oriented scenario is based on an hypothetic reduction of road traffic emissions throughout Europe by 30%. This reduction targets the following pollutants: nitrogen oxides (NOx), carbon monoxide (CO), ammonia (NH3), volatile organic compounds (VOCs), sulphur dioxide (SO2), PM. The 30% reduction assumption is fully theoretical but can be seen as representative of reducing by a half the number of vehicles used in Europe. The objective is to assess the impact of this "extreme" scenario. It should be noted that because of non linearities in atmospheric chemistry and complex ozone formation processes, increasing ozone levels can occur.

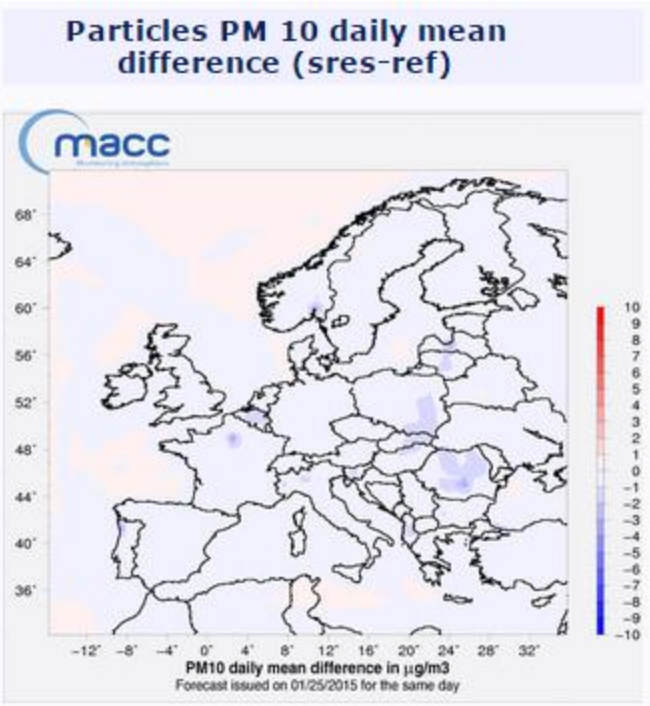
Particles PM 10 daily mean (sres)

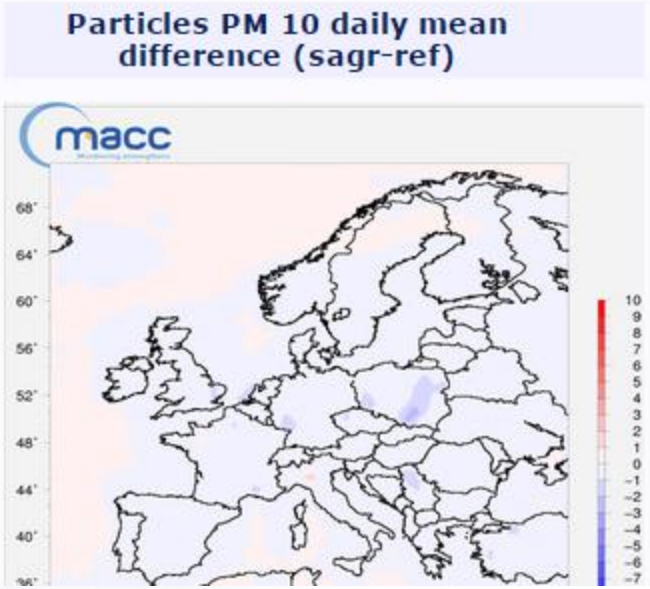


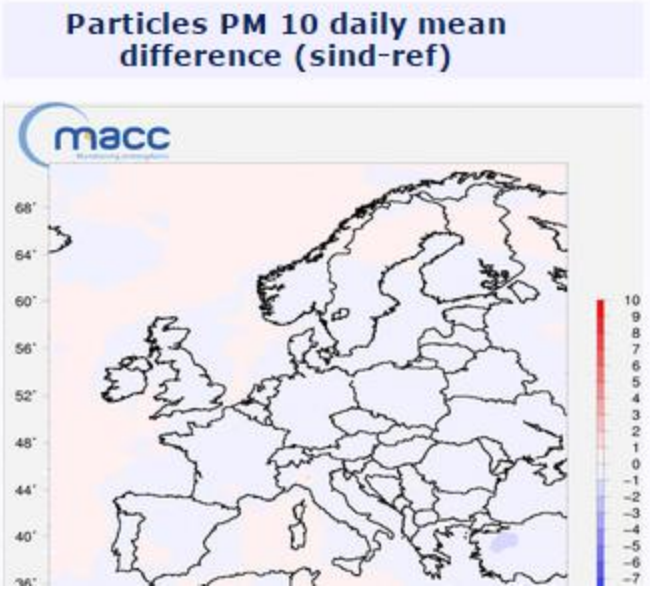
The residential oriented scenario is based on an hypothetic reduction of residential heating emissions throughout Europe by 30%. Clearly it concerns rather winter periods and PM episodes likely to occur. This reduction targets the following pollutants: nitrogen oxides (NOx), carbon monoxide (CO), ammonia (NH3), volatile organic compounds (VOCs), sulphur dioxide (SO2), PM. The 30% reduction assumption is fully theoretical the objective is to assess the maximum feasible ambient concentration reductions under this "extreme" scenario.

Impact of reductions for D+0



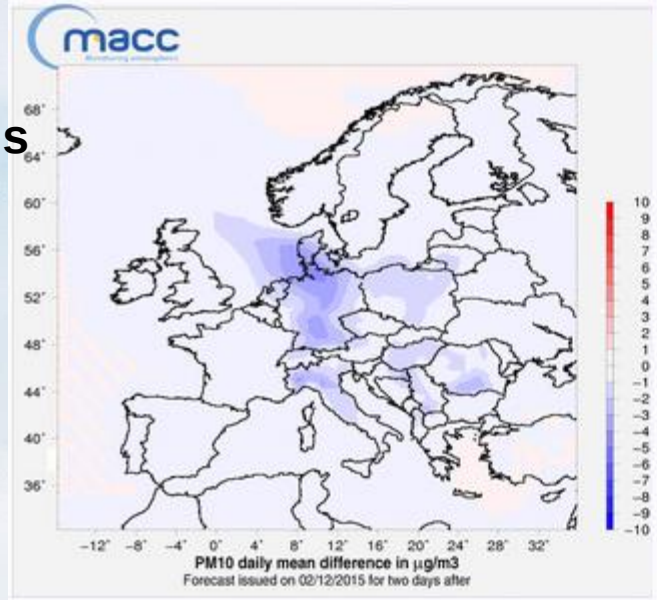




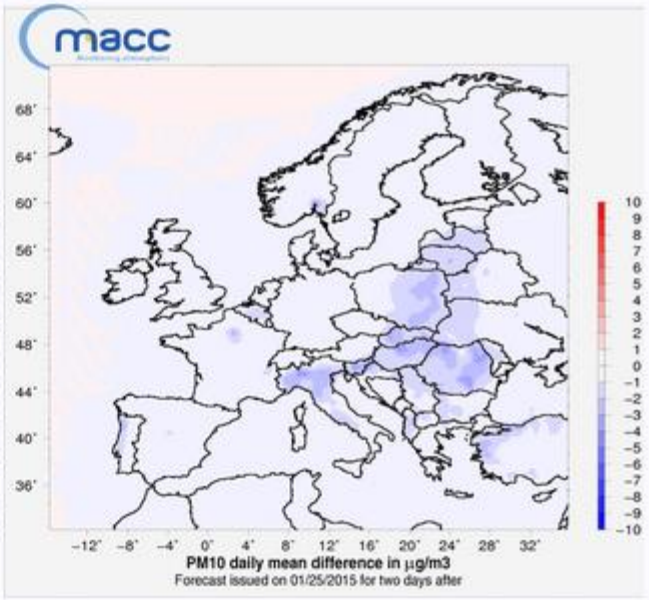


Impact of reductions for D+2

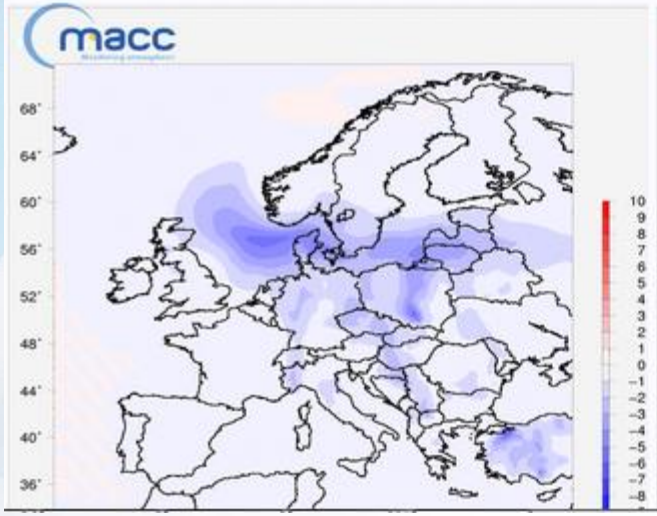
Particles PM 10 daily mean difference (stra-ref)



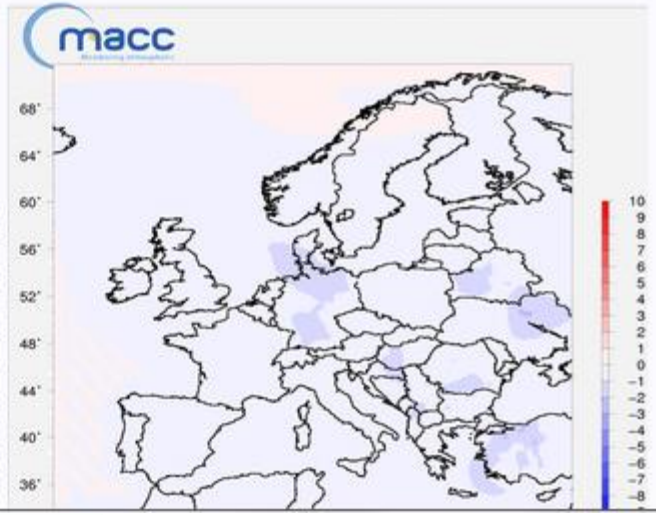
Particles PM 10 daily mean difference (sres-ref)



Particles PM 10 daily mean difference (sagr-ref)

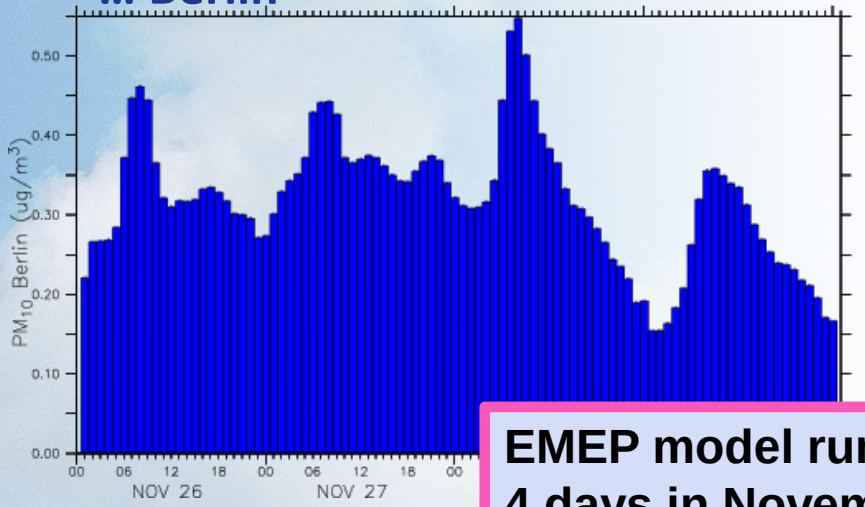


Particles PM 10 daily mean difference (sind-ref)

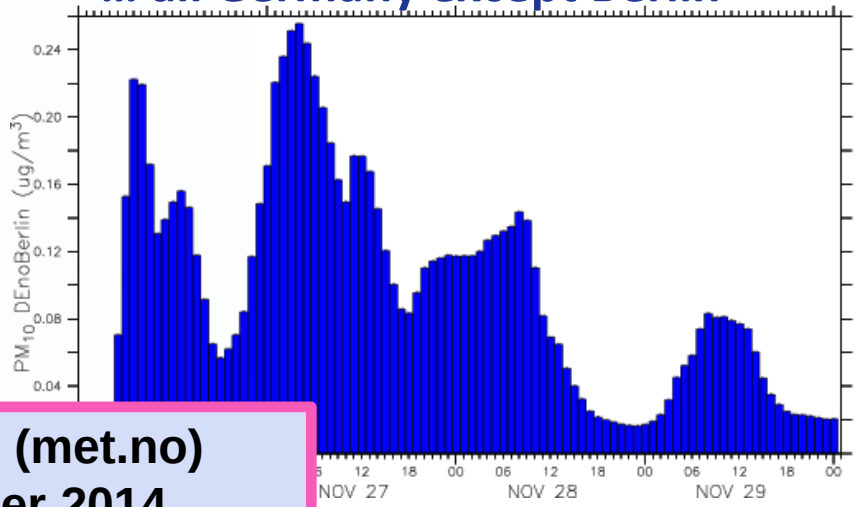


PM_{10} reductions in Berlin that can be achieved by a 15% reduction of all anthropogenic emissions in …

… Berlin

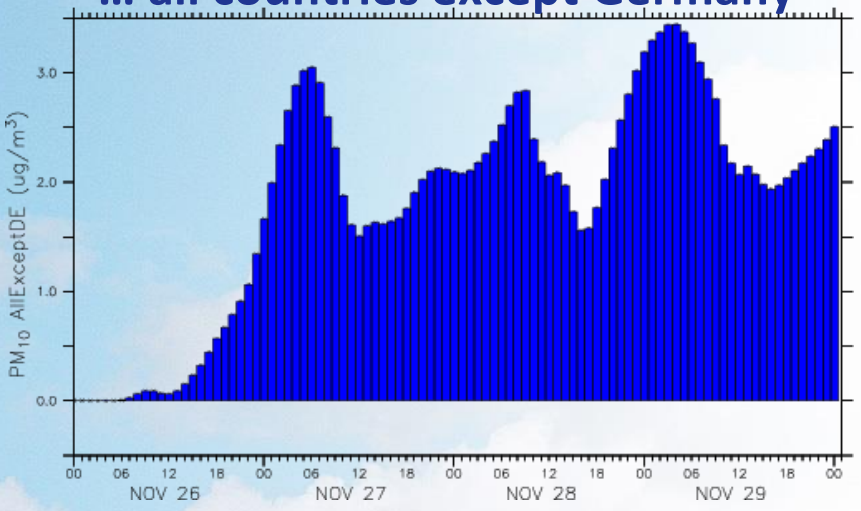


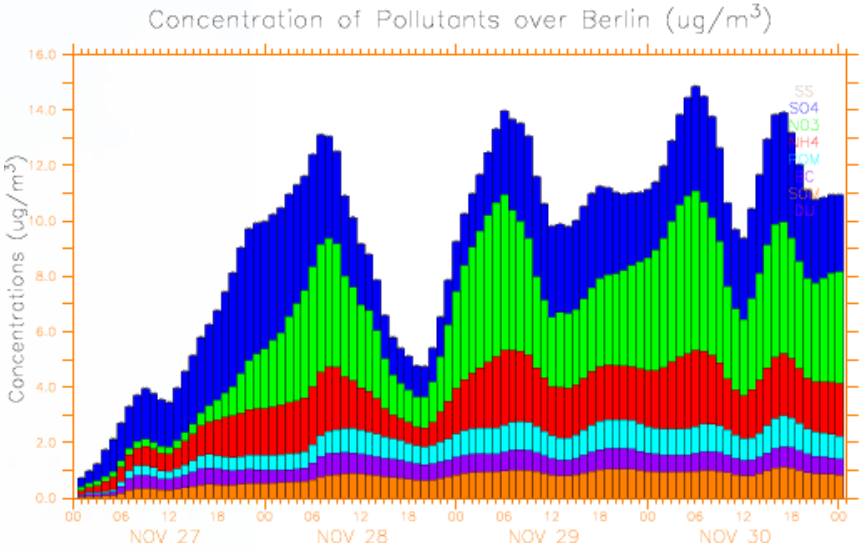
… all Germany except Berlin

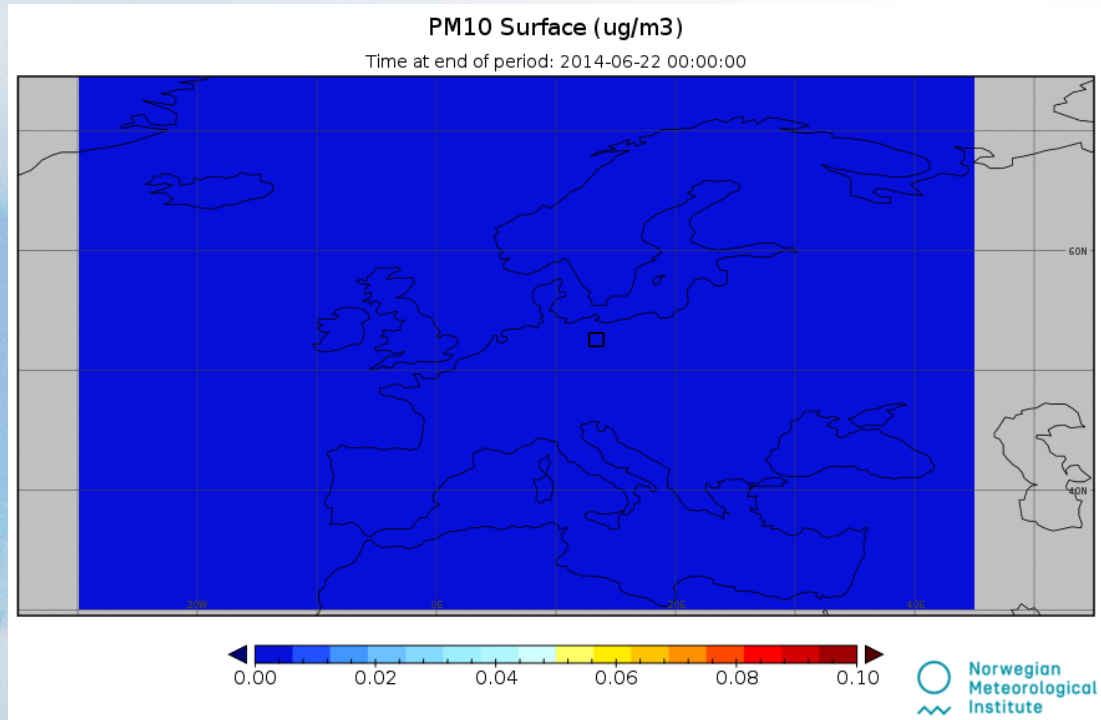


EMEP model runs (met.no)
4 days in November 2014

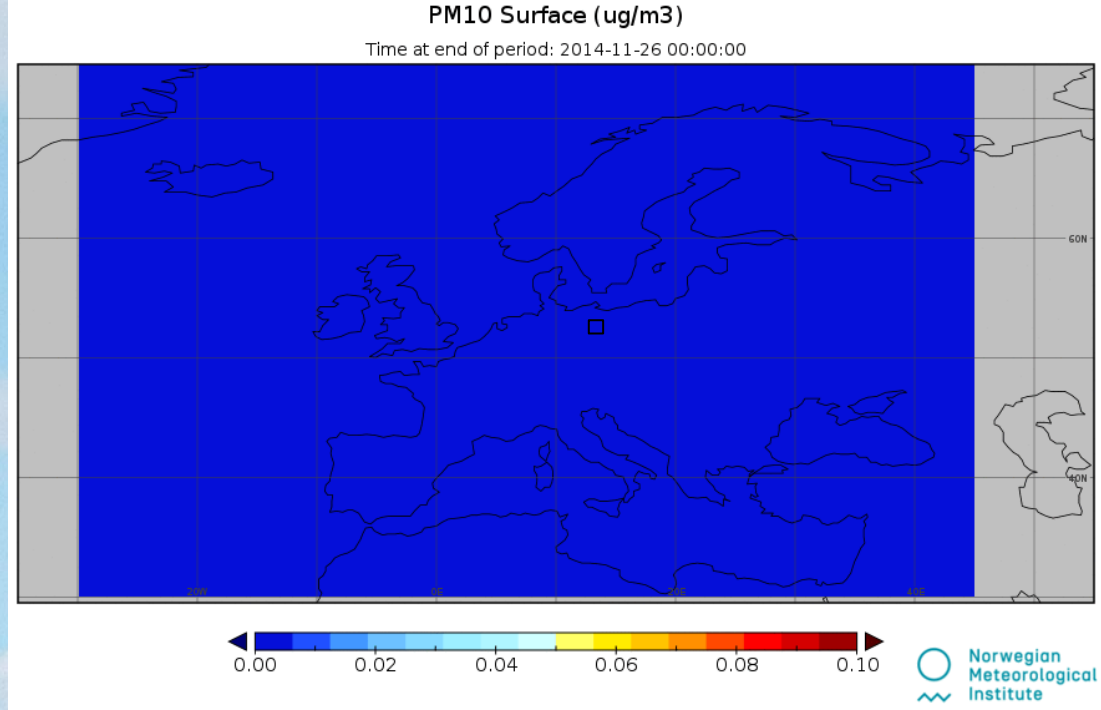
… all countries except Germany







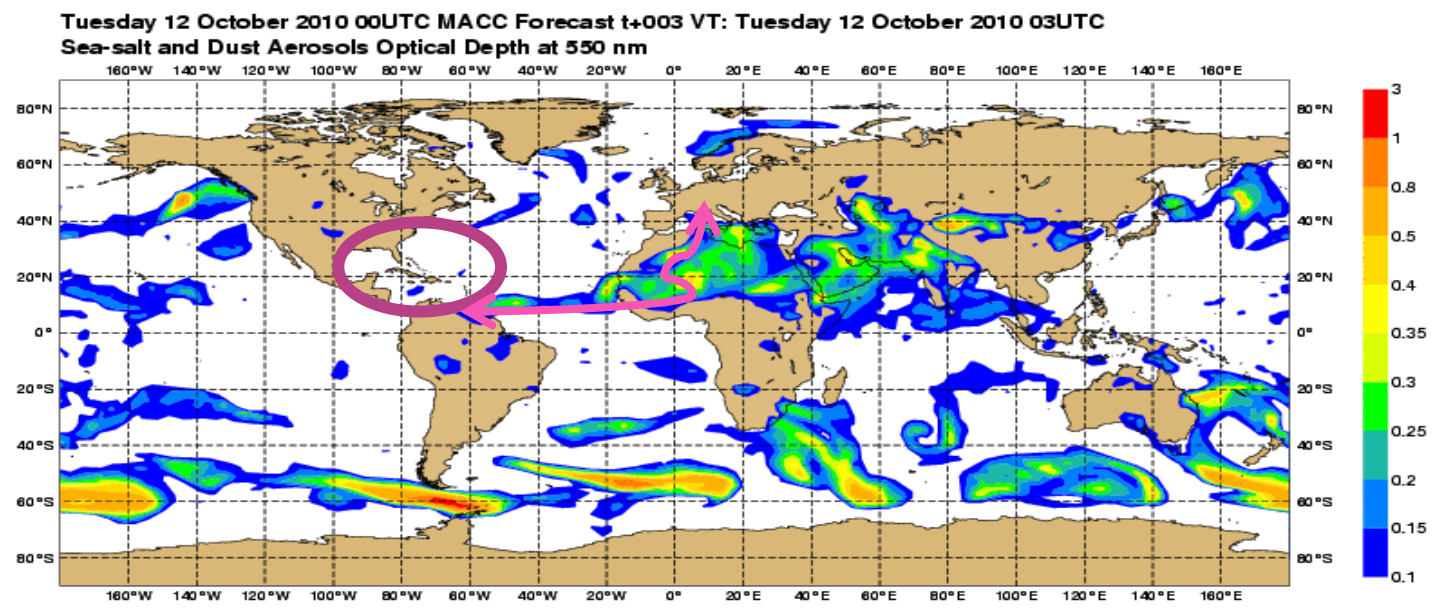
June 2014



November 2014

Links with FAIRMODE

- Source-receptor analysis performed at various scale (city, country) could contribute to work on SA (Fairmode WG3)
- As forecasts and maps of natural PM (dust, sea salt)



- Daily forecasts of scenarios results could be valuable inputs for planning evaluation (Fairmode WG4)

macc
Monitoring atmospheric composition & climate – II

Website:
http://atmosphere.copernicus.eu
Contact:
info@atmosphere.copernicus.eu

YouTube **Copernicus Atmosphere**

opernicus
The European Earth Observation Programme

MACC-III Policy support user Workskop

Where? Wien, Austria

When? 3 March 12:00 - 4 March 14:00

Why? The workshop is addresed to the FAIRMODE community

Learn more on how to use MACC products for policy support applications – Experience Sharing

Workshop webpage:
http://copernicus-atmosphere.eu/services/aqac/policy_interface/secon