EURODELTA III

Bertrand BESSAGNET (INERIS) on behalf of the **EURODELTA team**

INERIS

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The Eurodelta III exercise

- **Two phases**:
  1. Simulation of intensive measurement campaigns
     - 1 Jun - 30 Jun 2006 (Summer)
     - 8 Jan - 4 Feb 2007 (winter)
     - 17 Sep - 15 Oct 2008 (fall)
     - 25 Feb - 26 Mar 2009 (winter)
     - **Evaluation & clues to improve models**
  2. Retrospective analysis (2008, 1999, 1990)
     - Ability of models to reproduce the difference of concentrations for the three key years, how models work under different chemical regimes
     - Starting point of the « Trend analysis » exercise
- Common inputs for models : meteorology (IFS), emissions (EC4MACS dataset), boundary conditions (MACC), domain (except CMAQ)
- CAMx (**PSI/RSE**), CHIMERE (**INERIS**), CMAQ (**HZG**), EMEP (**Met.no**), LOTOS-EUROS (**TNO**), MINNI (**ENEA**), RCG (**FUB**)
- Others participants:
  - **DG JRC**, **CIEMAT**, **BSC**, **IPSL-CNRS**, **UNBS**, **NILU, ARIANET**
  - **TOTAL, CONCAWE, LWA**

Status of the exercise

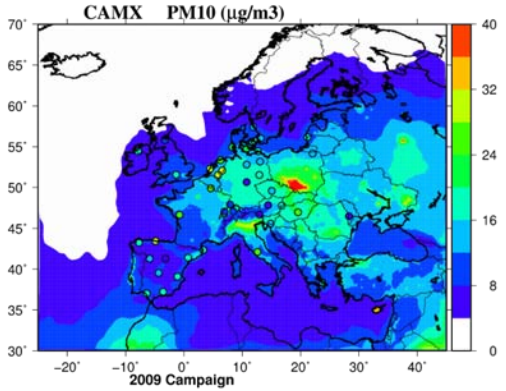
- Start of the exercize in April 2012
- April ⇨ June 2012: work on input data
- June ⇨ October 2012 : work on models
- Year 2013 : production of runs (2006, 2007, 2008, 2009) and first discussions on results
- Mid-2013 ⇨ Begin 2014 : draft of the report for the 2009 campaign

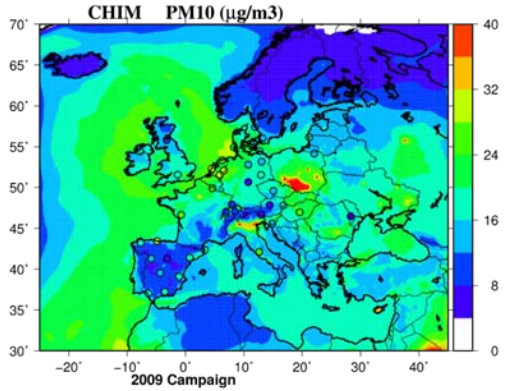
- *Mid- 2014* ⇨ Mid 2015
  - *start of retrospective analysis on 3 key years coupled to Trend analysis (1990-2010)*
  - *Publication phase for the campaigns*

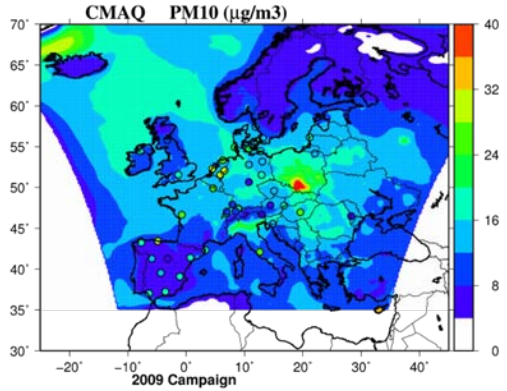
Part I : Intercomparison exercises

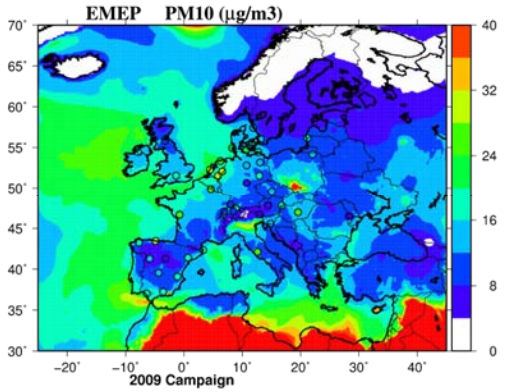
- **Chemistry**:
  - usual regulatory pollutants (PM10, PM2.5, O3, NO2, SO2)
  - PM compounds on daily and hourly bases
  - Depositions (wet S, N)
  - O3 profile
- **Meteorology**:
  - PBL
  - Temperature
  - Wind speed

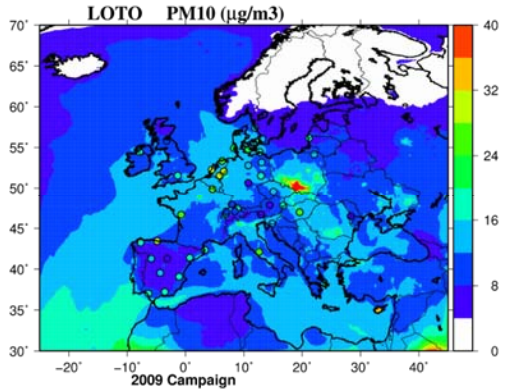
Mean PM10 - 2009

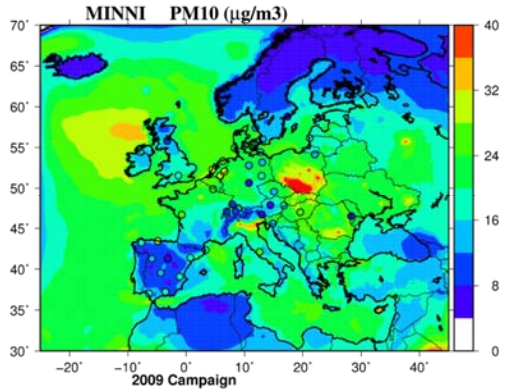


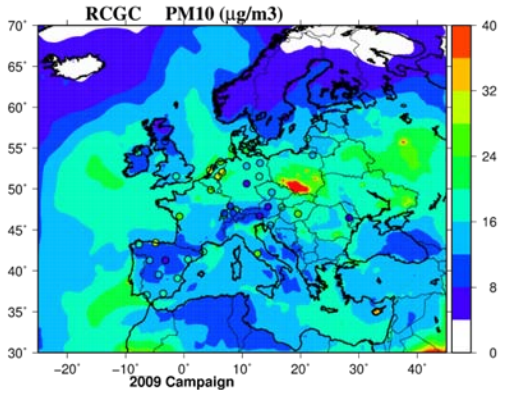




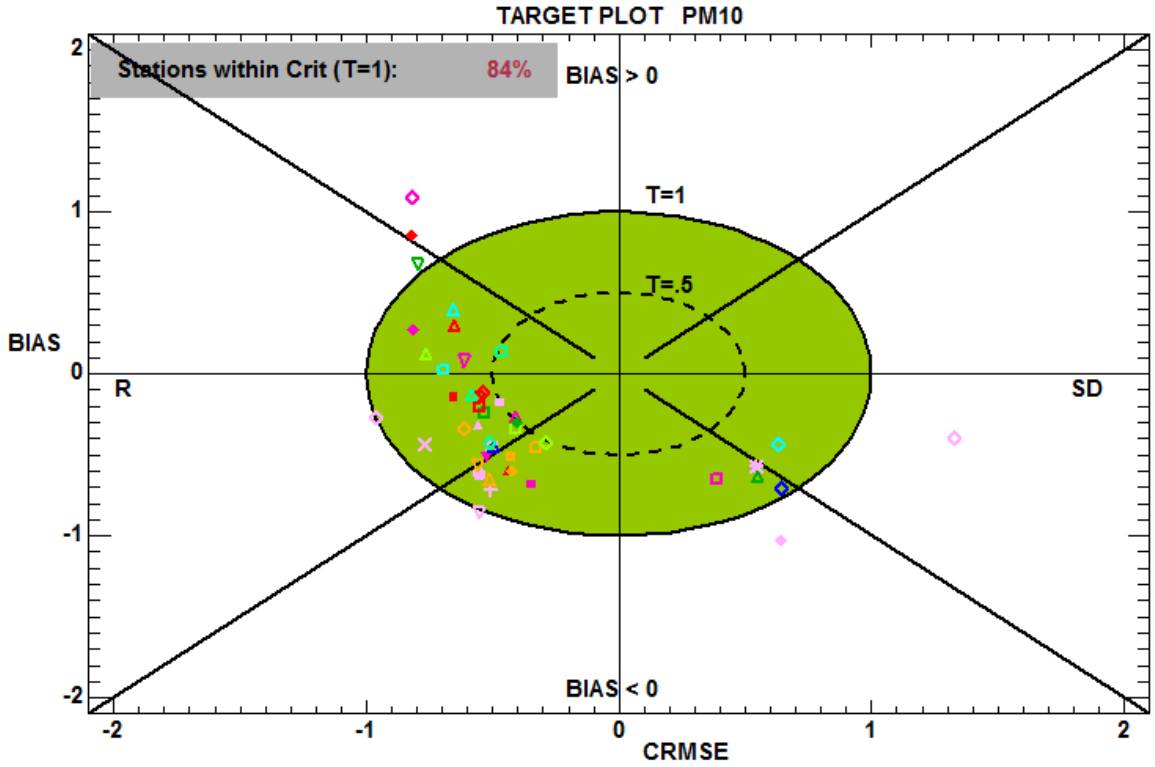








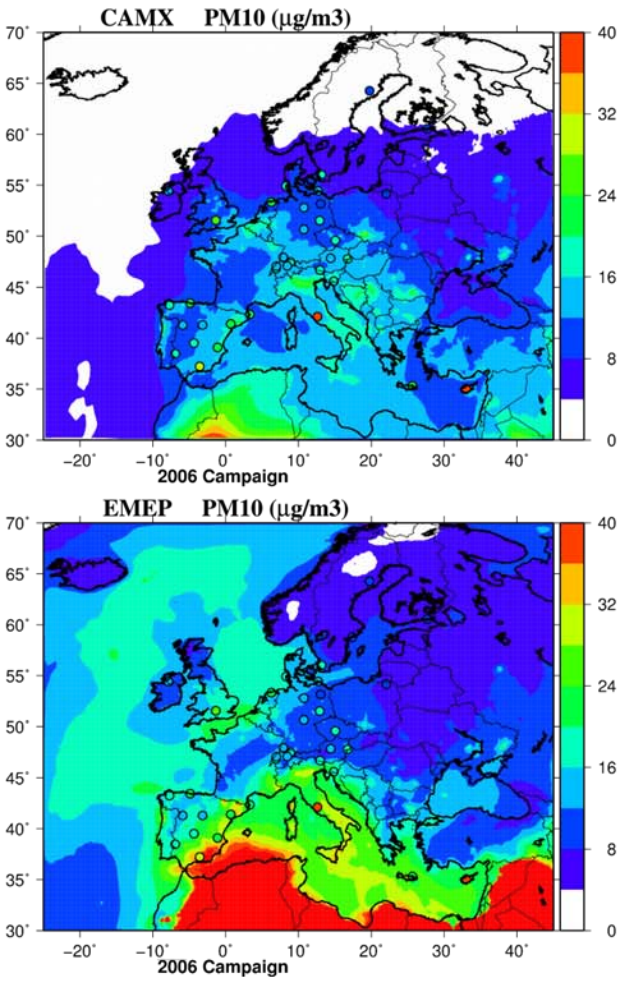
Target plot for PM10 in 2009 (EMEP) with delta tool

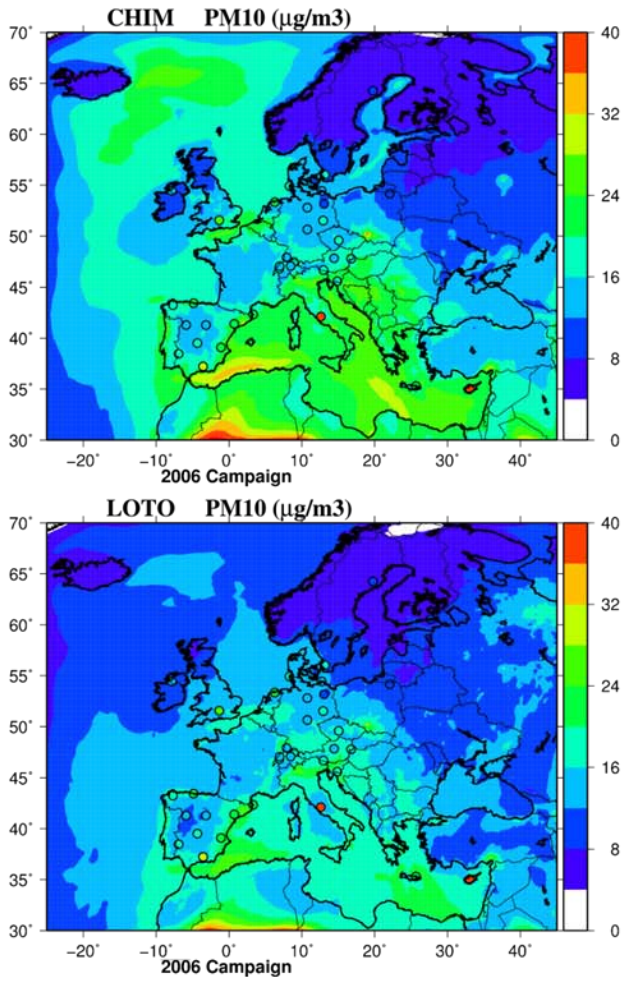


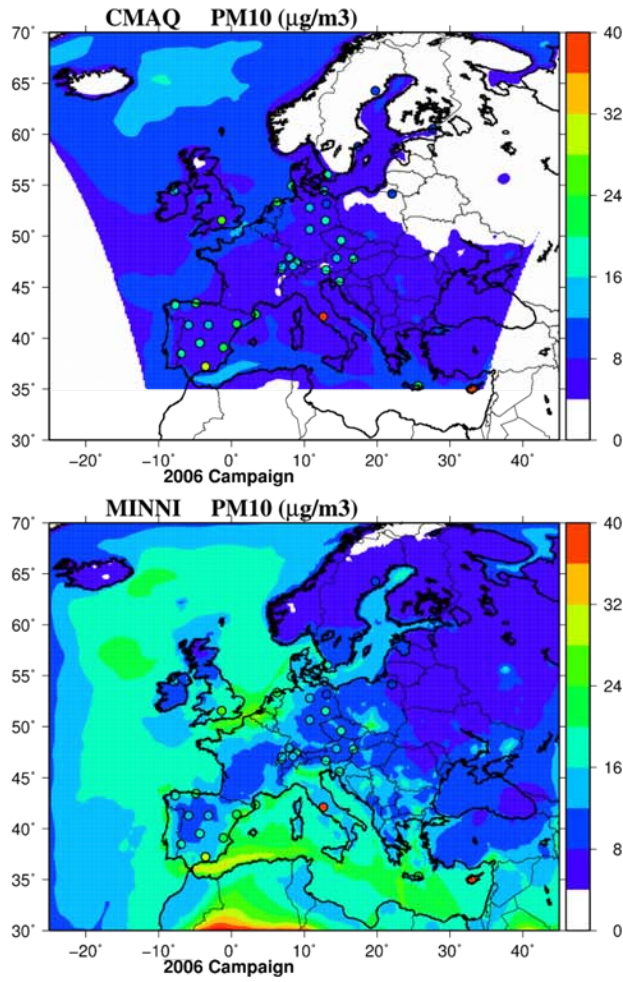
% of station that fulfil the criteria:

EMEP 84%, CHIMERE 73 %, LOTOS-EUROS 78 %, RCG 78%, CAMX 60%, MINNI 69%, CMAQ 69%

Mean PM10 - 2006



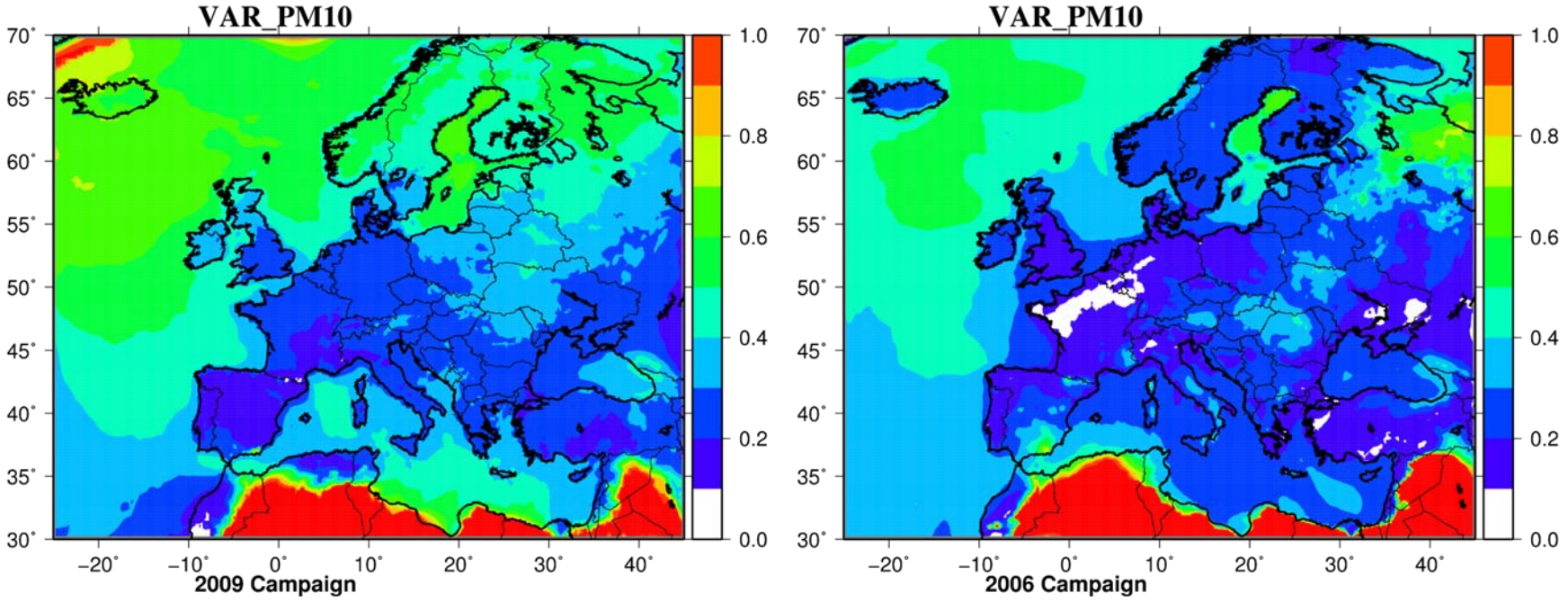




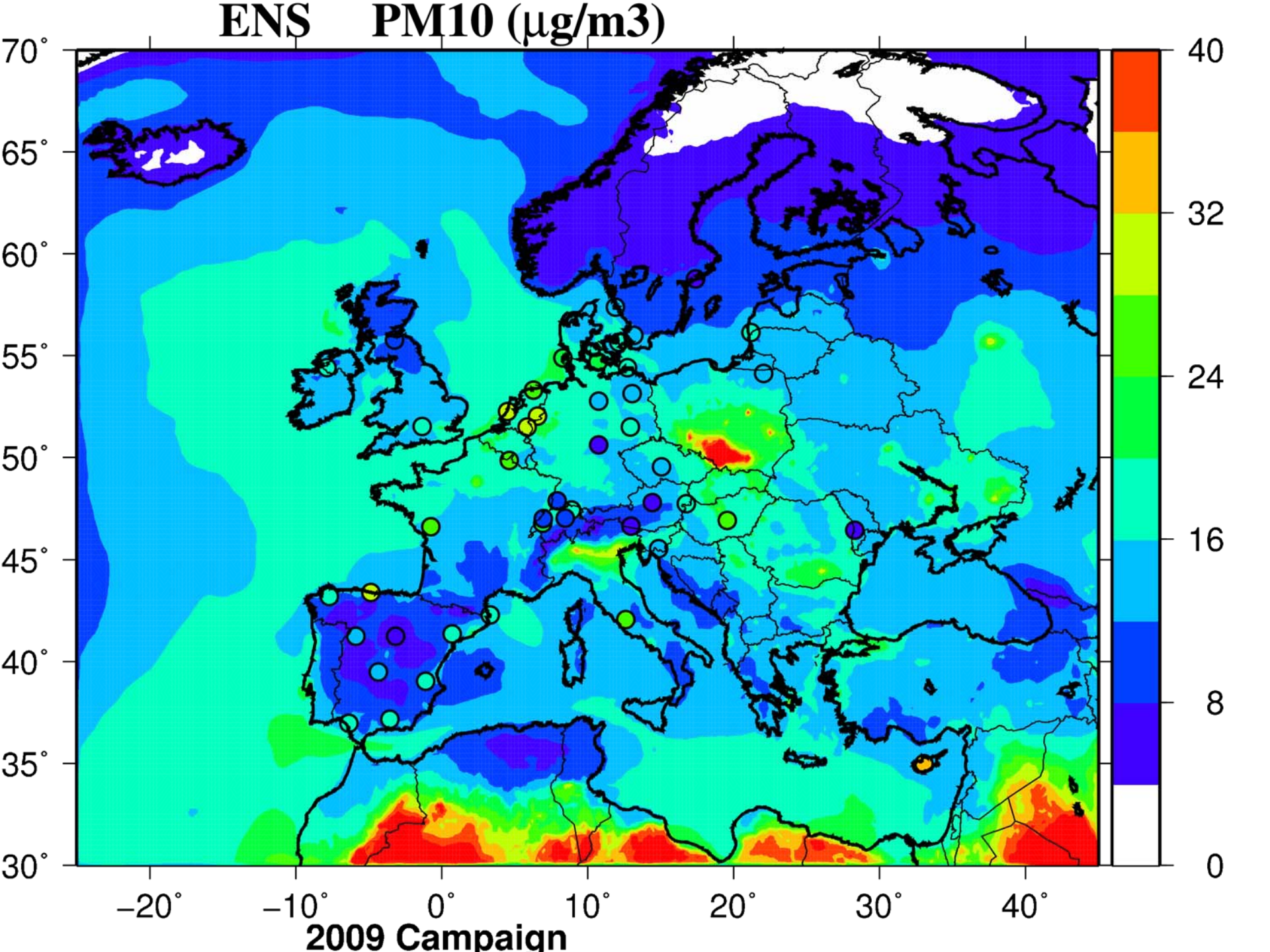
Coefficient of variation for PM10

ENSEMBLE=*AVERAGE(*EMEP, CHIMERE, CAMX, LOTOS-EUROS, MINNI*)*

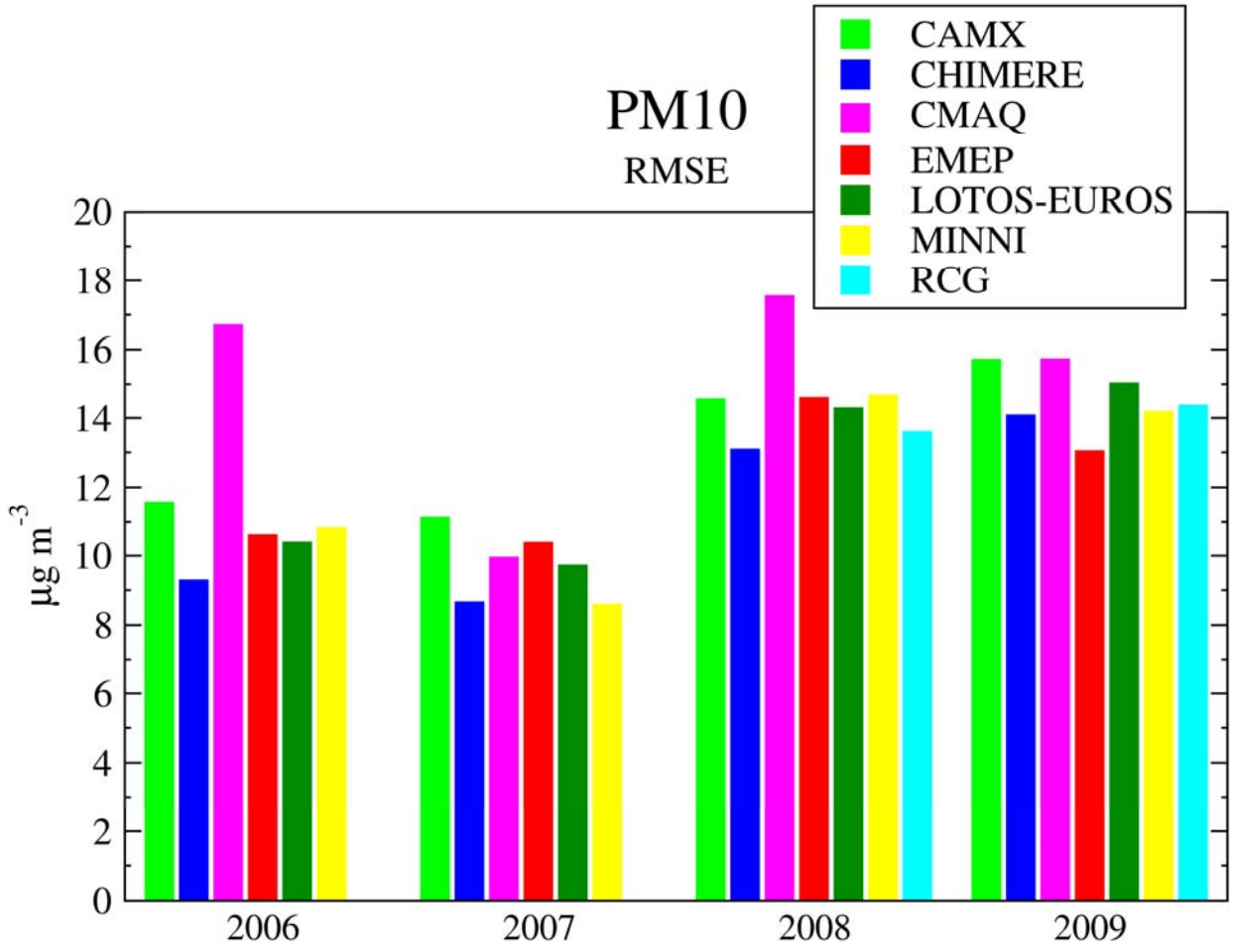
2009 **2006**



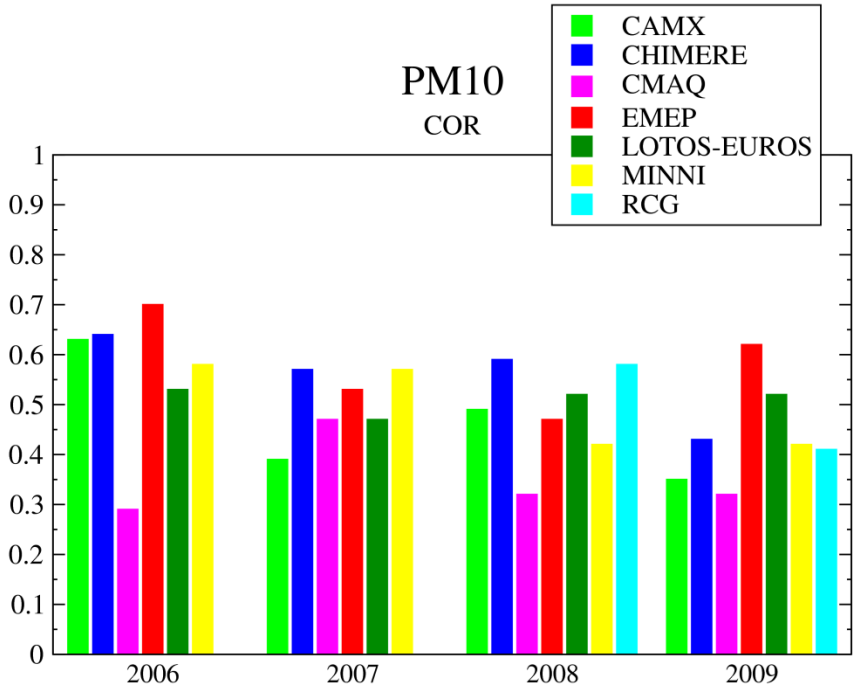
Cv = Sd/M

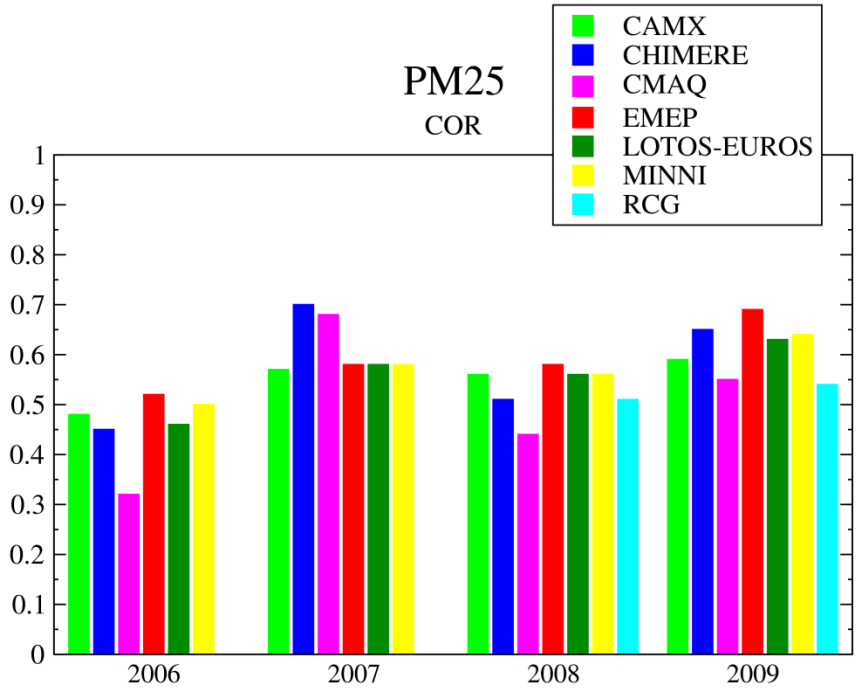

ENS PM10 (µg/m3)
70°
65°
60°
55°
50°
45°
40°
35°
30°
−20°
−10°
0°
10°
20°
30°
40°
40
32
24
16
8
0
2009 Campaign

Error : PM10


PM10
RMSE
CAMX
CHIMERE
CMAQ
EMEP
LOTOS-EUROS
MINNI
RCG
μg m-3
0
2
4
6
8
10
12
14
16
18
20
2006
2007
2008
2009

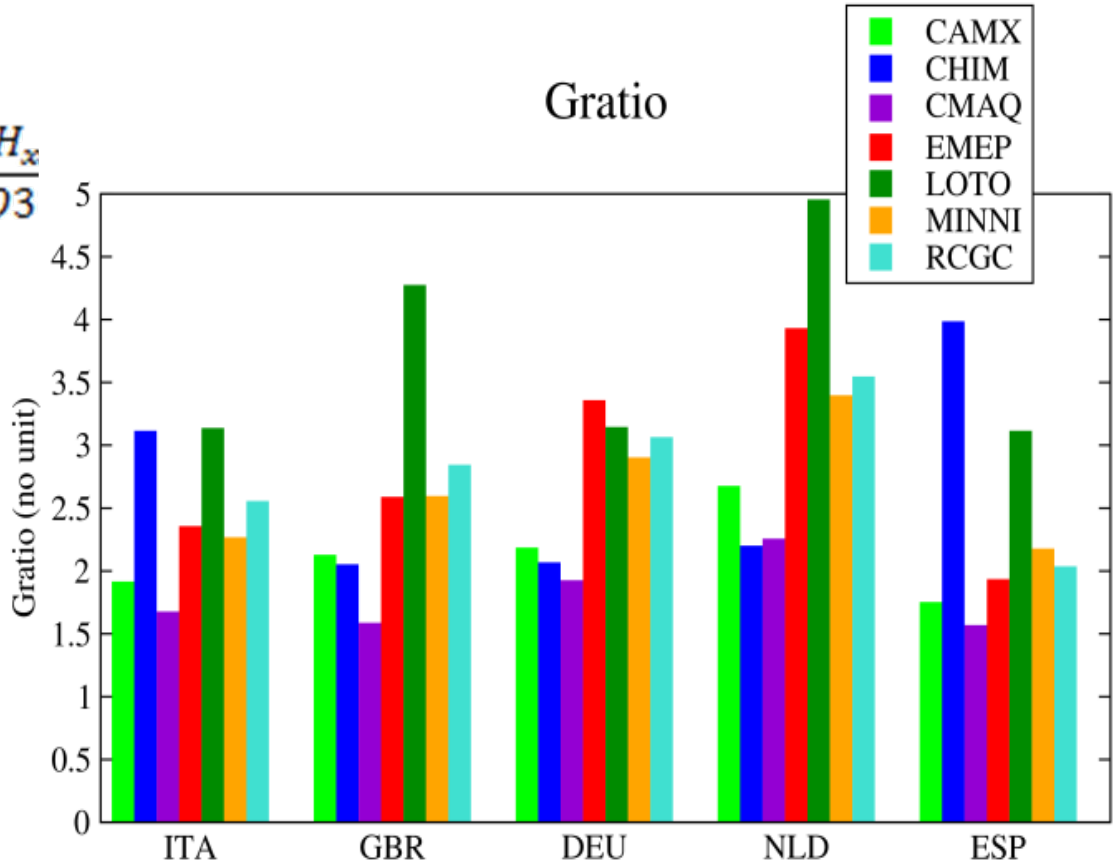
Correlations





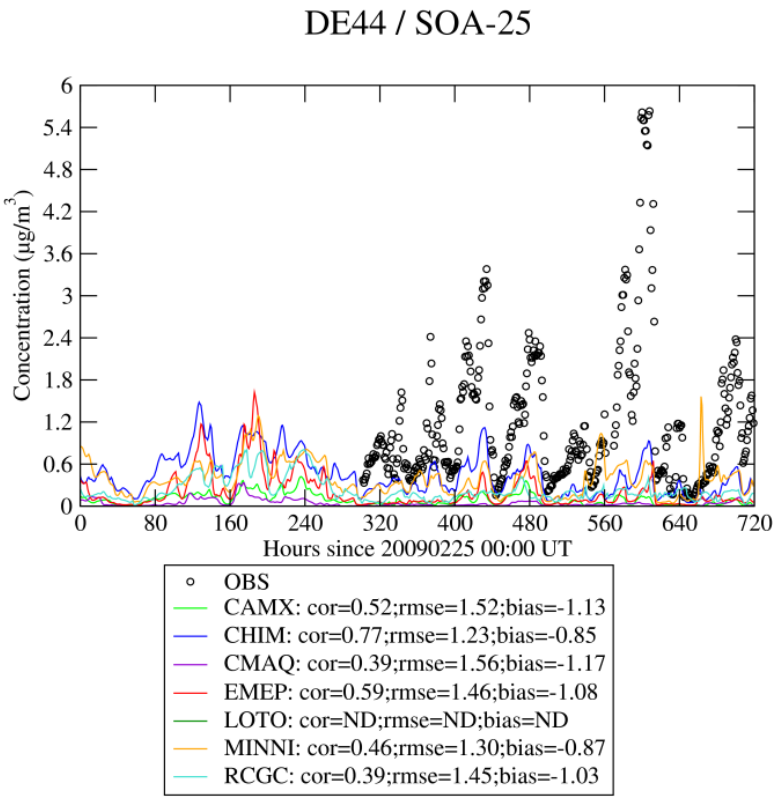
Chemical regime of models for SIA formation (Gratio for the free NH3)

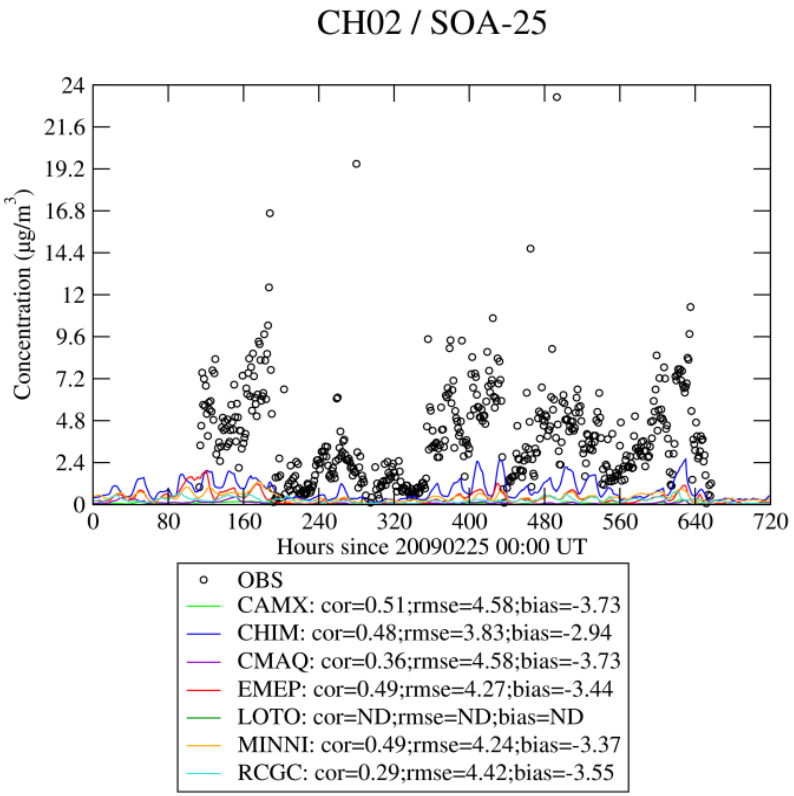
$$G_{ratio} = \frac{F\text{-}NH_x}{TNO3}$$



G_{ratio} > 1 means exces of ammonia

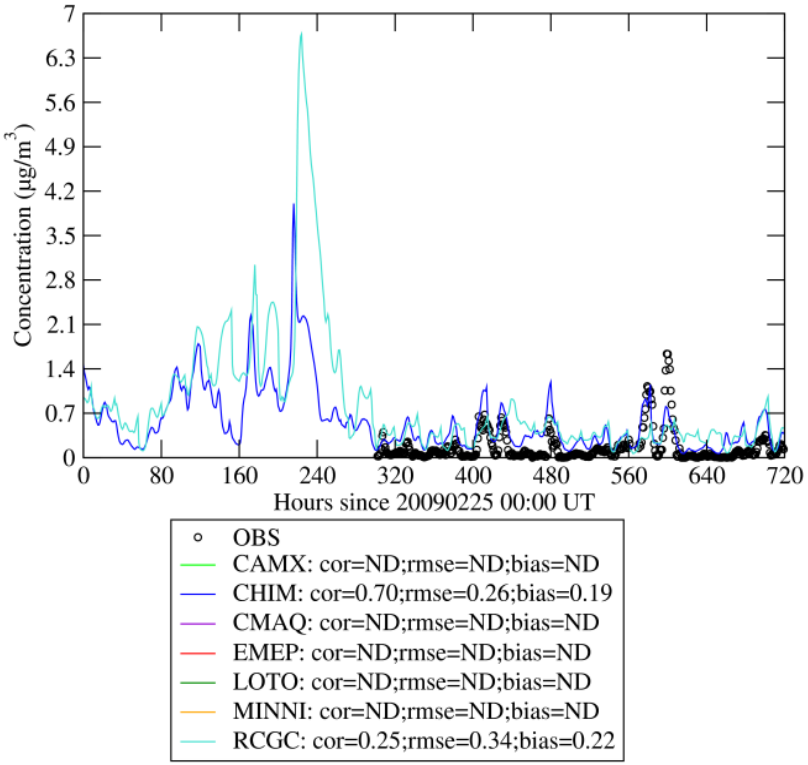
Modelled SOA versus OOA measurements



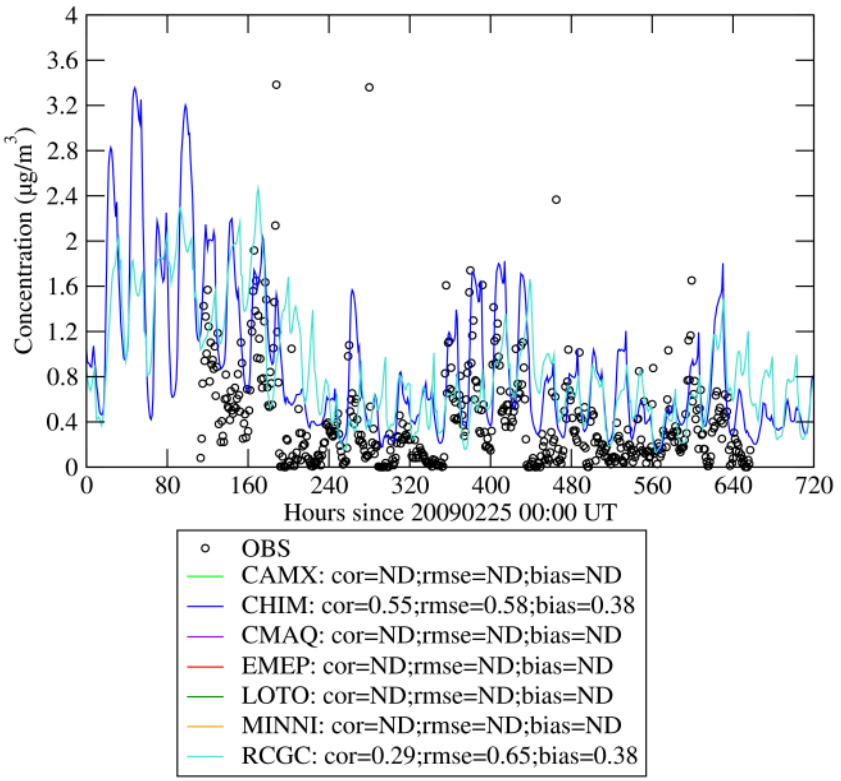


POM from SNAP2 versus BBOA measurements

DE44 / POMS2-25



CH02 / POMS2-25



Main outcomes for the 2009 campaign

- Important variability of model results for PM (processes, biogenic emissions, diagnosed meteorology)
- Use of IFS field rather questioning (biases on the wind speed)
- The models are too flat (PM gradients)
- More similar patterns for SIA between models
- Underestimate of OM, a factor of 2 to 6 during episodes particularly in wintertime:
  - Chemistry of POA
  - POA emissions
- A group of models underestimate the peaks of ammonium nitrate while the other overestimate total nitrate
- Good behaviour of models including advanced wind blown dust modules
- Co-analysis of deposition and concentrations (Gas and particles) was fruitful to understand the model behavior