Recent CHIMERE developments and uses

[1]*Bessagnet, B ;* [1]*Colette, A. ;* [1,2]*Hamaoui, L. ;* [3]*Kvorostyanov, D. ;* [1]*Meleux, F. ;* [3]*Menut, L. ;* [1]*Rouïl, L. ;* [1]*Terrenoire, E.*

1) INERIS, France
2) LISA-CNRS / Université Paris Est Créteil, France
3) LMD IPSL-CNRS/Ecole Polytechnique

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CHIMERE Model Setup

Meteorological Data

ECMWF, GFS/MM5
REGCM

Boundary conditions

Average monthly climatologies GOCART, MOZART, LMDzINCA

Emissions
- Anthropogenic (EMEP)
- Biogenic

CHIMERE

Gaseous chemistry

MELCHIOR [*Lattuati, 1997*]
44 species, 116 reactions

Aerosol module

[*Bessagnet et al., 2004*]

Transport

- Horizontal (PPM)
- Vertical diffusion

Deposition

- Dry [*Seinfeld and Pandis, 1998*]
- Wet [*Guelle et al., 1998*]

-Résolution
horizontal : 2-50km
vertical : 200 hPa
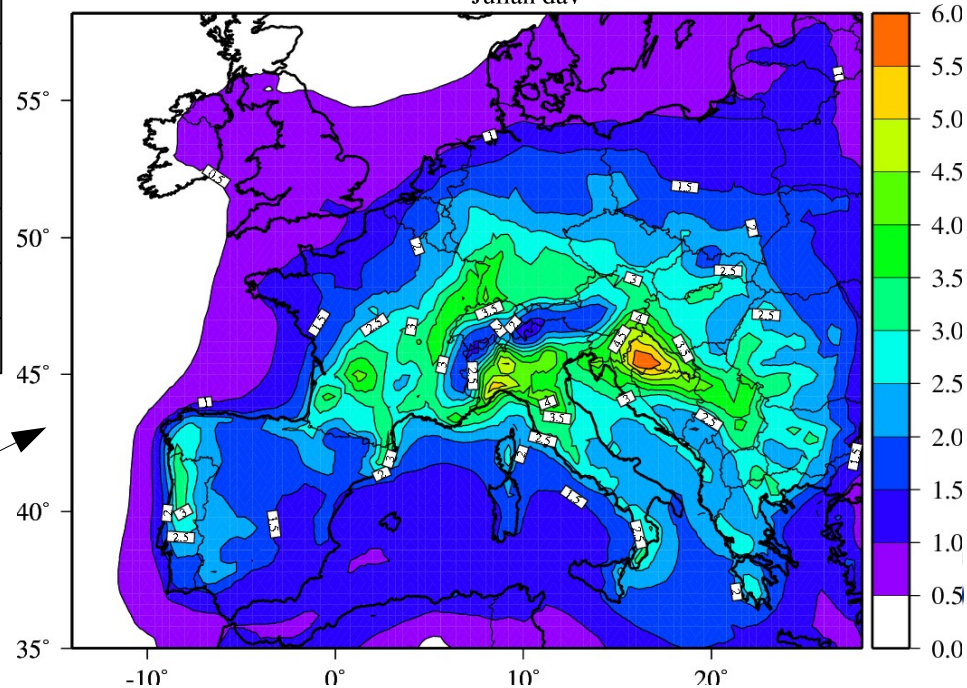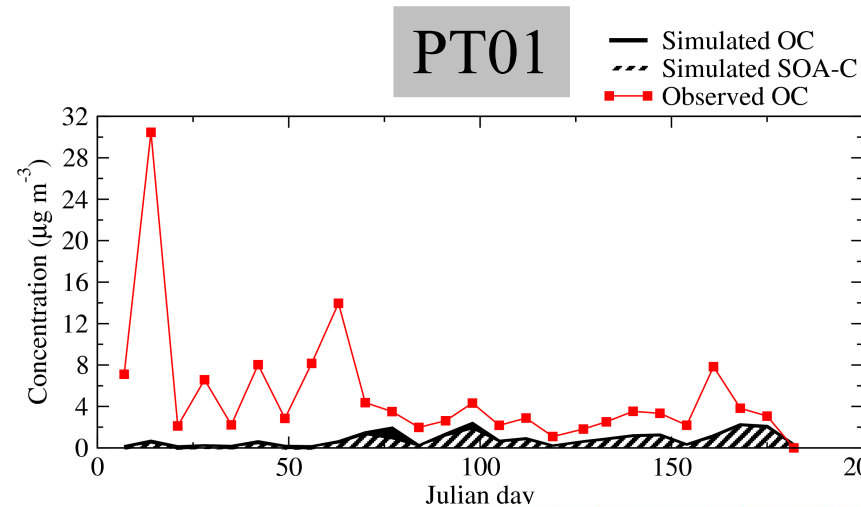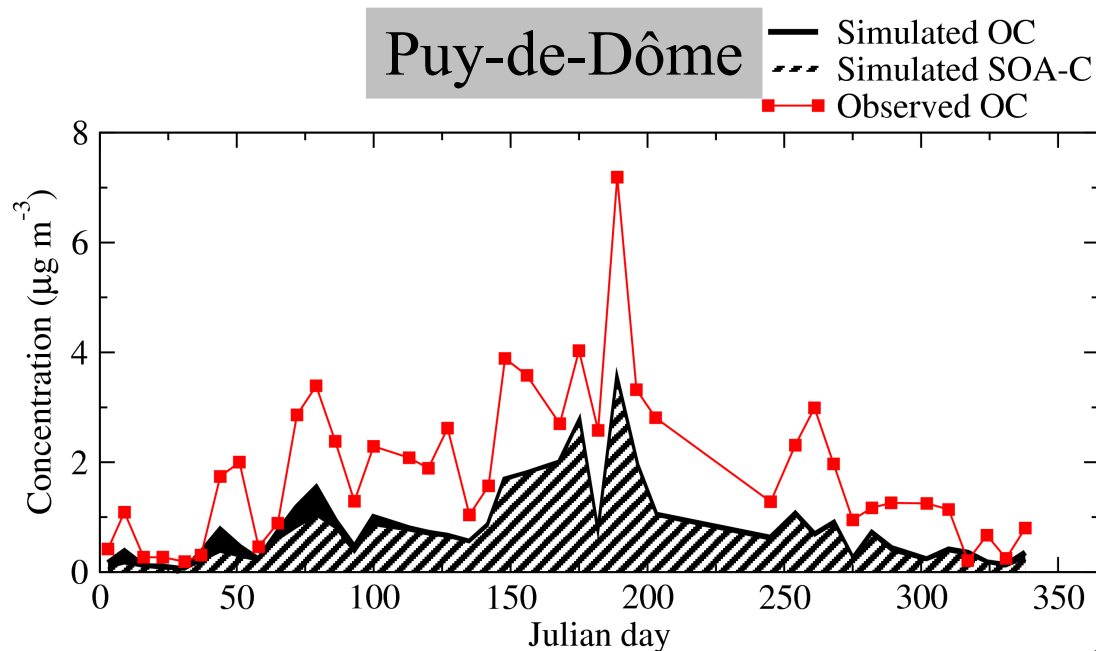
Air pollutant forecasting
(D, D+1, D+2)
PREVAIR

Simulation for emission
reduction studies
EURODELTA – CITYDELTA
EC4MACS - CITYZEN

Optical properties computation
Pere et al., 2009.

- Free download at http://euler.lmd.polytechnique.fr/chimere
- Development at IPSL/LMD (CNRS), LISA and INERIS

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Carbonaceous species in CHIMERE

- CHIMERE is a state of the art CTM (PM, O3)
- SOA scheme with isoprene chemistry

PT01

Simulated OC
Simulated SOA-C
Observed OC

Puy-de-Dôme

Simulated OC
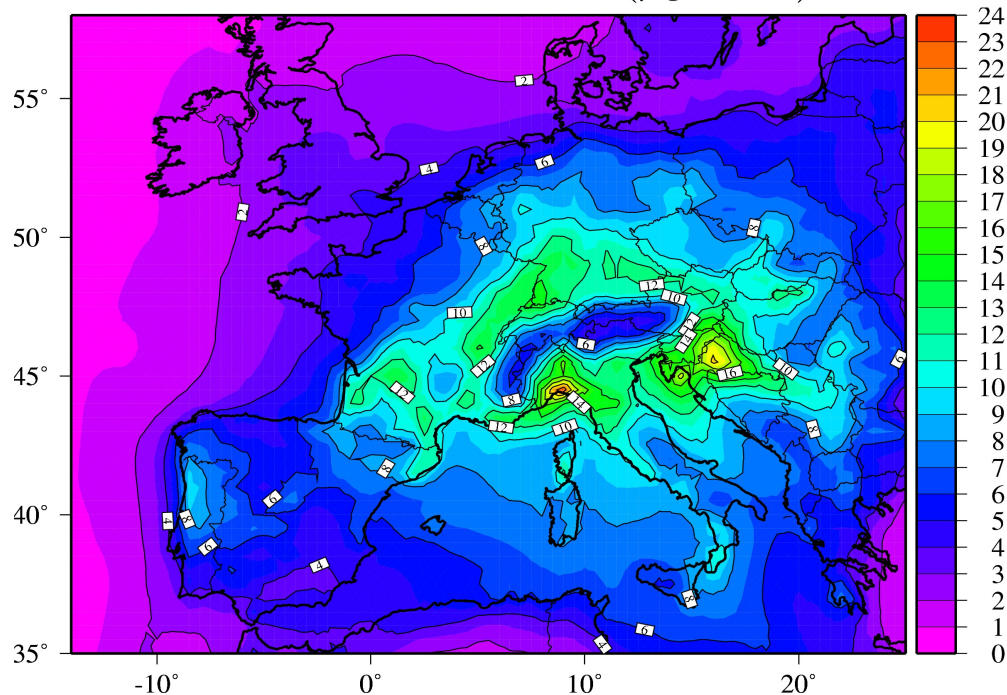Simulated SOA-C
Observed OC

SOA in Europe in 2003 with CHIMERE

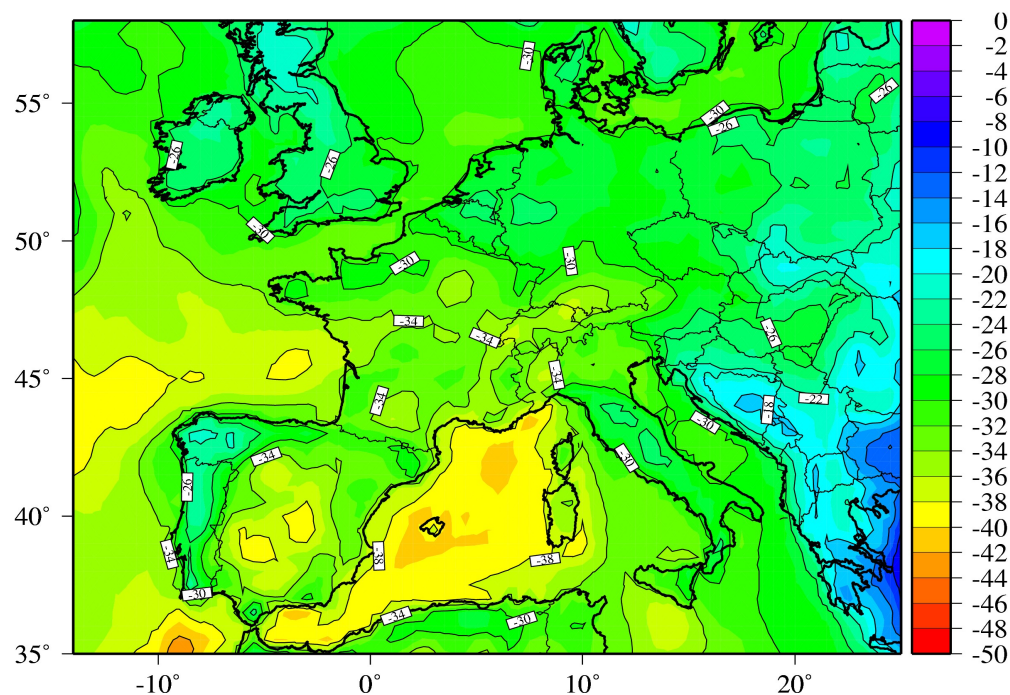*Bessagnet et al., 2009*

Impact of gas-phase semi-volatil species deposition on SOA calculations

SIM-A : no deposition of SVOCs

SIM-B : activation of deposition velocities

SIM-B simulation
SOA concentrations ($\mu g\ m^{-3}$)

Decrease (%)
from SIM-A to SIM-B

SOA concentrations in July 2006

Bessagnet et al., 2010

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Towards a dynamic ammonia emission module

Modelling agricultural ammonia emissions over France taking into account climatic and environmental conditions and the agricultural practices for improving the spatio-temporal descriptions of emissions.
This work is based on a 1D model (Voltair) which simulates the ammonia volatilization after spreading organic and/or synthetic fertilizers (INRA).
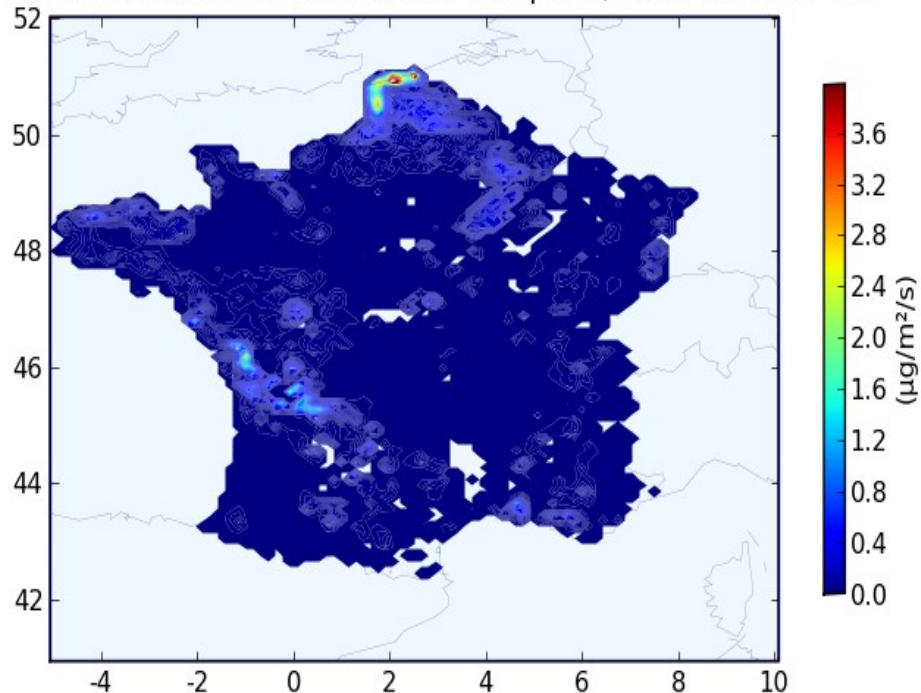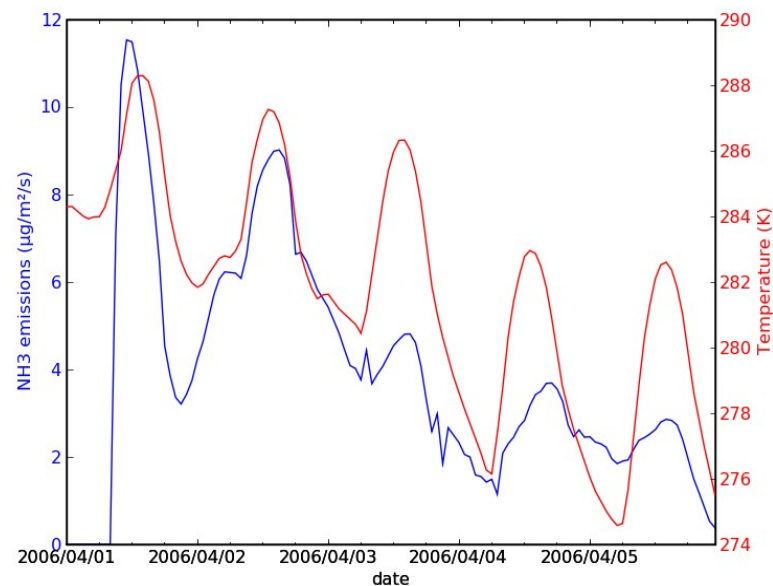
Hamaoui et al., 2010 (EGU)
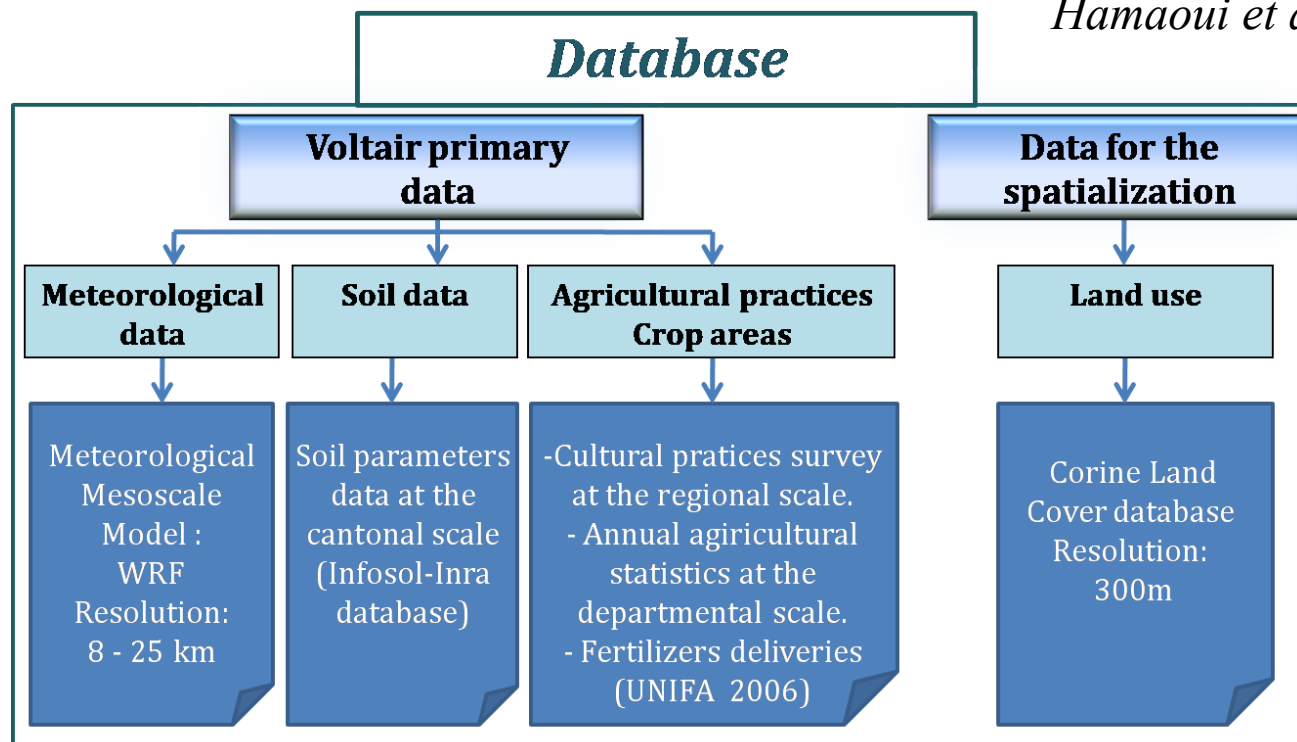
First results of the ammonia emission module

NH3 emissions from ammonitrates on April 1, 2006 at 12:00 PM

Diurnal cycle of NH3 emissions

Not yet fully on-line coupled with CHIMERE

CITYZEN FP7 project

A <u>joint modelling exercise</u> designed to assess the respective impact of <u>emission changes and meteorological variability</u> on the observed <u>air quality trends in major urban hotspots</u>.

Ones of CityZen objectives

- Air quality trends over the past decade
  - Respective role of emission & meteorological variability
  - Prepare investigation of megacities in a global change context (projections of emissions & climate changes)
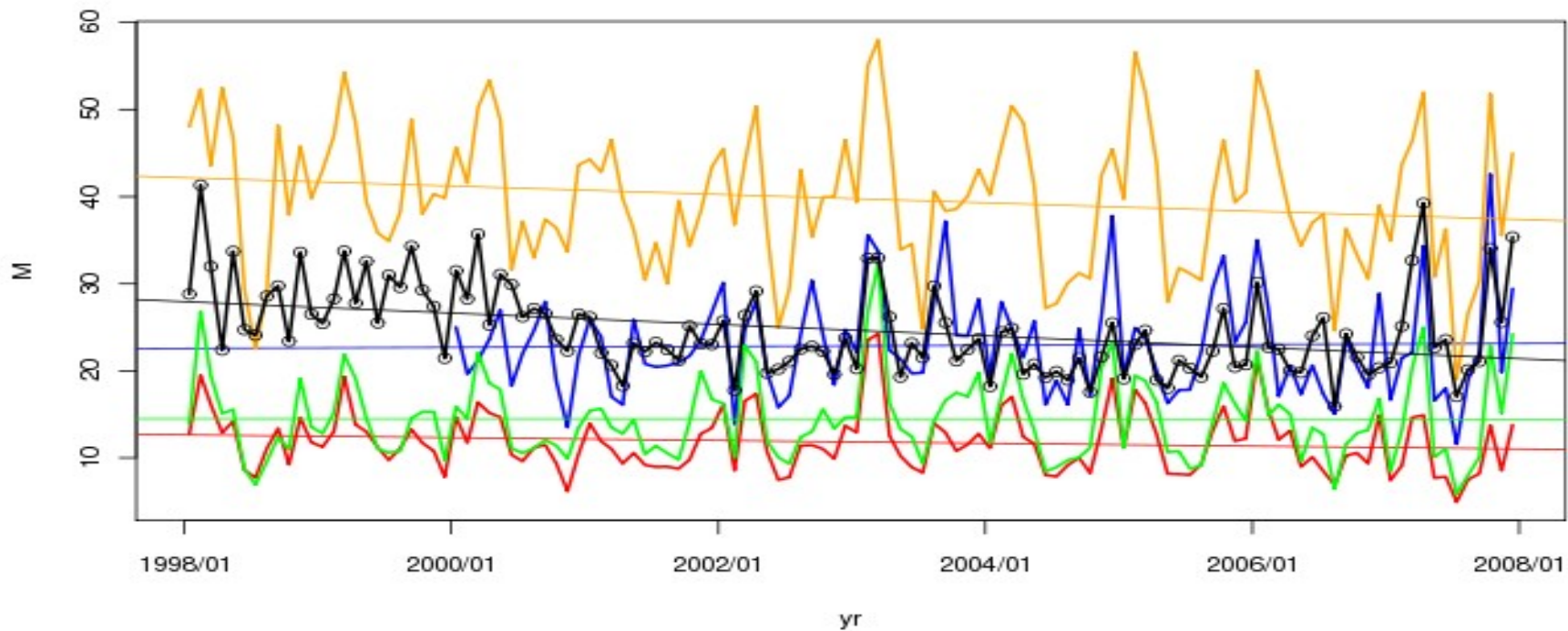
Fast facts of this 10yr trend hindcast

- Regional CTMs
- Focus on main hotpots in Europe (BeneLux, Po-valley, East-Med.)
- Consistent set of emissions

CITYZEN FP7 project

PM10 trends in Benelux

Data
Emep
Chimere

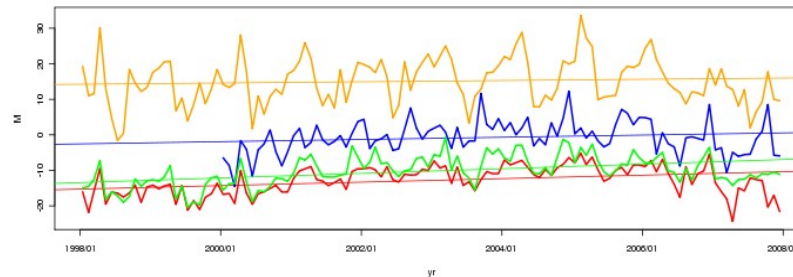*Colettte et al., 2010 (EGU)*

CITYZEN FP7 projet

Data
Emep
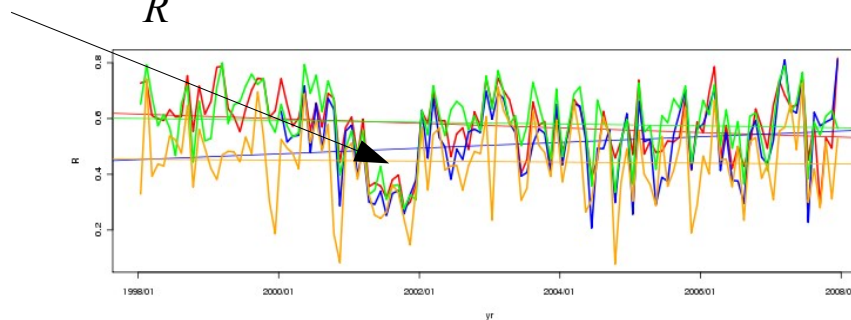**Chimere**

PM10 Scores

Bias

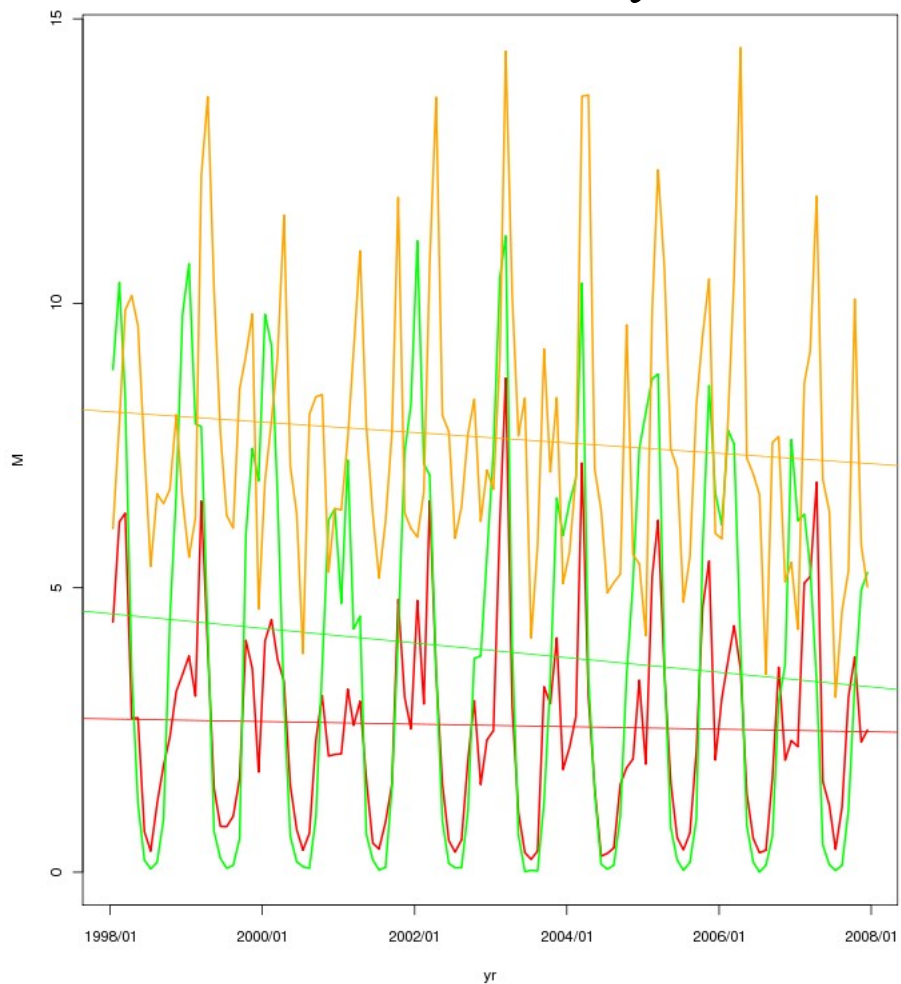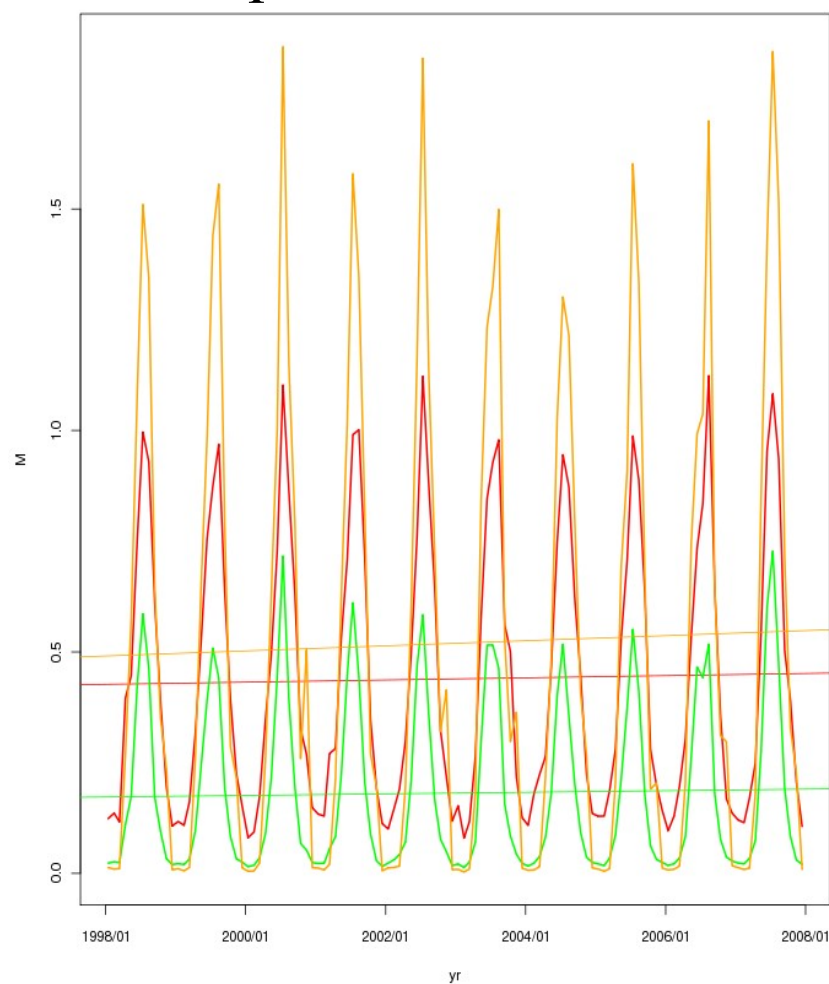*R*

RMS
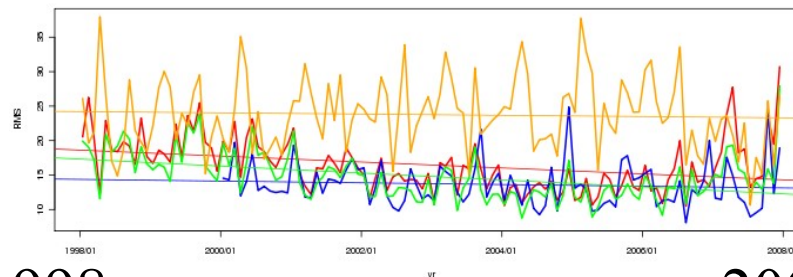
1998   2007

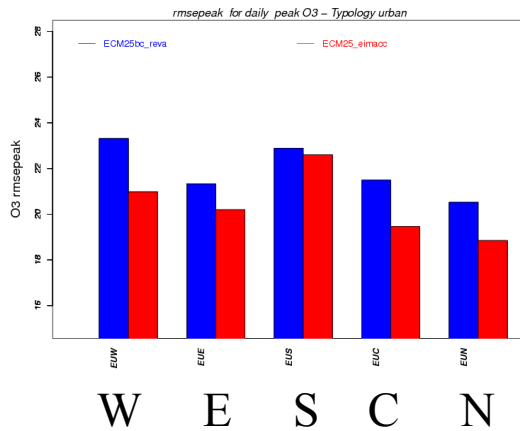# CITYZEN FP7 project

NO3 in Po-valley
Isoprene in East-Med

Emep
Chimere

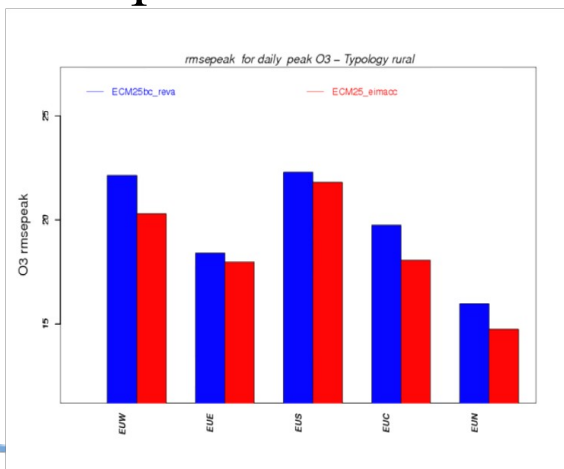# Comparing EMEP vs. MACC-TNO inventories
CHIMERE 0.5°x0.5° in August 2007
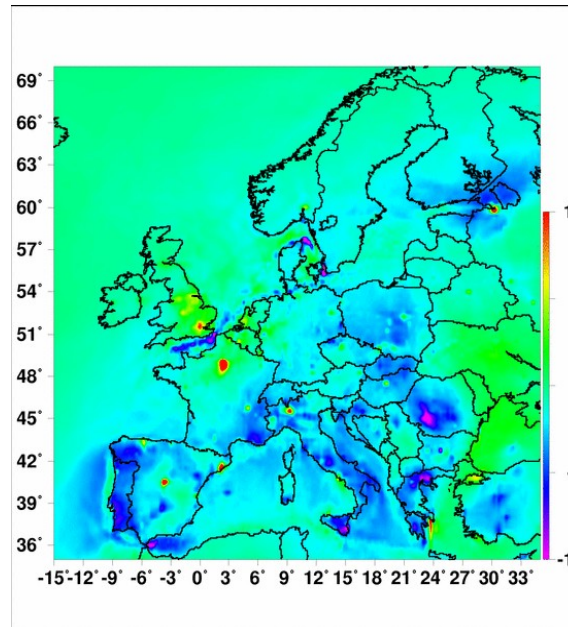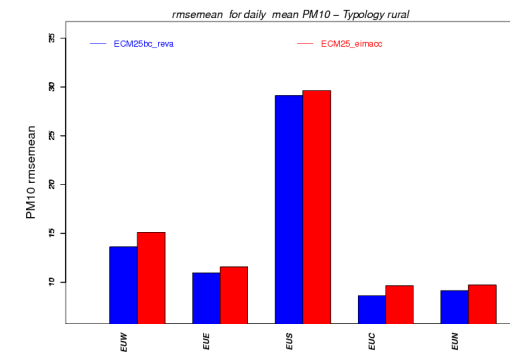
O3 peak RMS -Urban

W E S C N
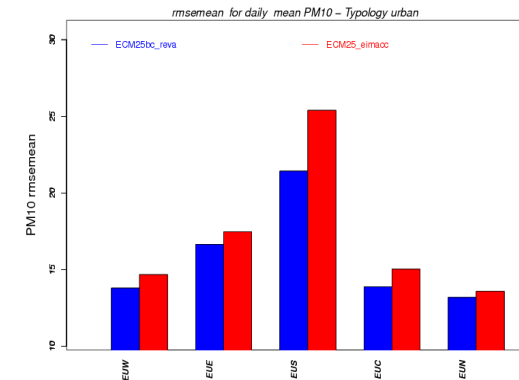
O3 peak RMS -Rural

O3 conc. diff.
EMEP - TNO

- Similar correlations
- For O3 : reduce bias
- For PM10 : increase the negative bias

PM10 mean RMS -Urban

PM10 mean RMS -Rural

Perspectives

- Work on the surface layer height impact on pollutant concentrations

- On going works on SOA (VBS approach)
             and downscaling methodologies

- Works on trafic resuspension

- Implement a new wind blown dust parameterization

- Participation to EURODELTA III