Emission data for forecasting applications
CCA-WG2: Forecasting

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INTRODUCTION

- Air quality platforms produce daily forecasts for the D+0, D+1 and D+2 (and D+3).
  - provide every day information related to the air quality levels
  - targetted pollutants: O3,NO2,PM10,PM2.5
  - In case of pollution episode:
    - Support to policy users
      - Provide recommendations to the public
      - to identify the likely causes
      - to assess population exposure
      - to set-up efficient measures (short term action plans)
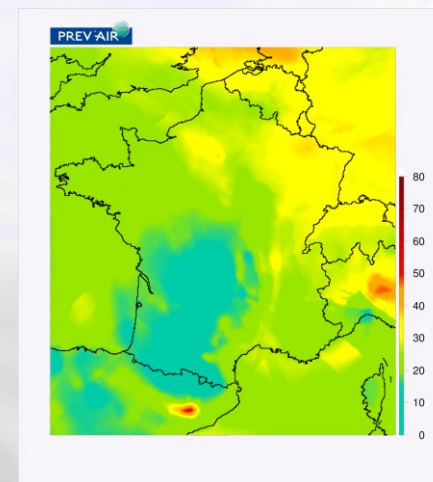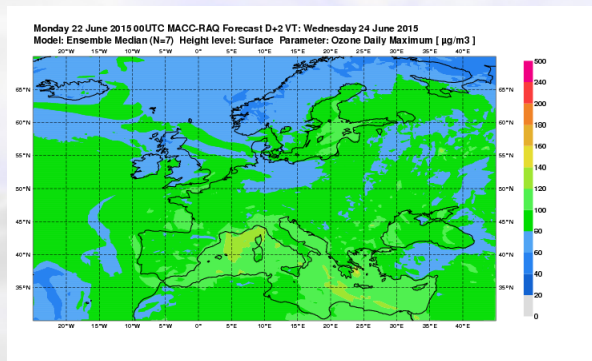
Input data for air quality forecasting

- Emissions:
  - Anthropogenic emissions inventories:
    - European EI TNO (7x7 km2)
  - Natural emissions calculated on-line by the chemical transport model (Biogenic emissions, dust emissions …)
  - Support from the satellite observations to get near real time emissions (biomass burning)

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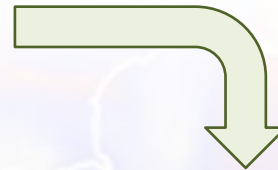*maîtriser le risque*
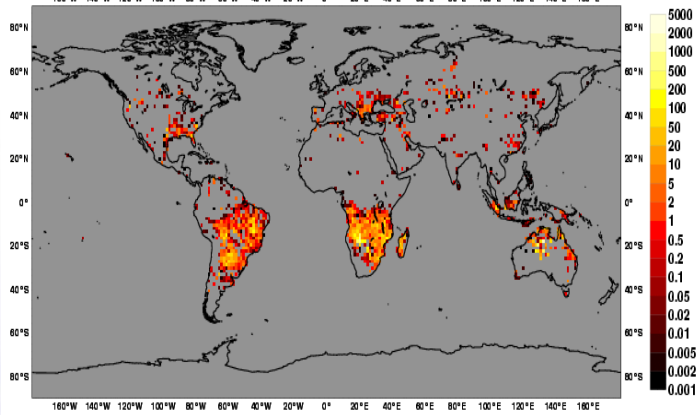*pour un développement durable*
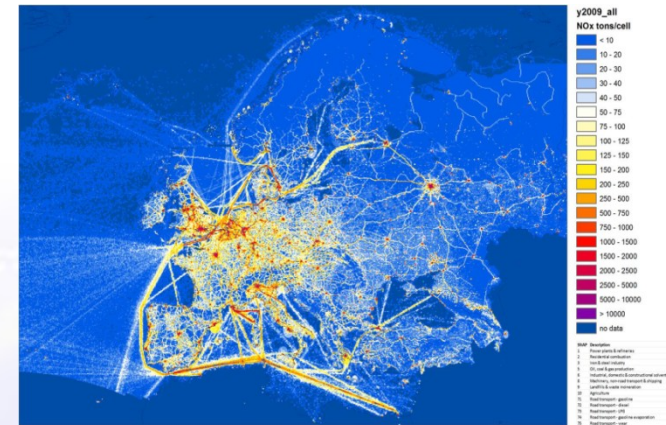
Satellite and Biomass burning

- Forest fires lead to substantial emission of chemical species and particulate matter.

MACC Daily Fire Products Tuesday 13 September 2011
Average of Observed Fire Radiative Power Areal Density [mW/m2]   max value = 2.57 W/m2

Optimized data stream to provide near-real time emission from biomass burning in MACC-III
- available each day before 8 PM (daily emissions
  - ➢ continuous and hourly

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Satellite and Biomass burning

- How to deal with the persistence of the biomass burning within the model for the purpose of the forecasts ?
  - f(soil properties, meteorological conditions)
  - Investigation of several databases to determine parametrization of BB persistence in regional European forecasting
  - A large database available from Apiflam project.
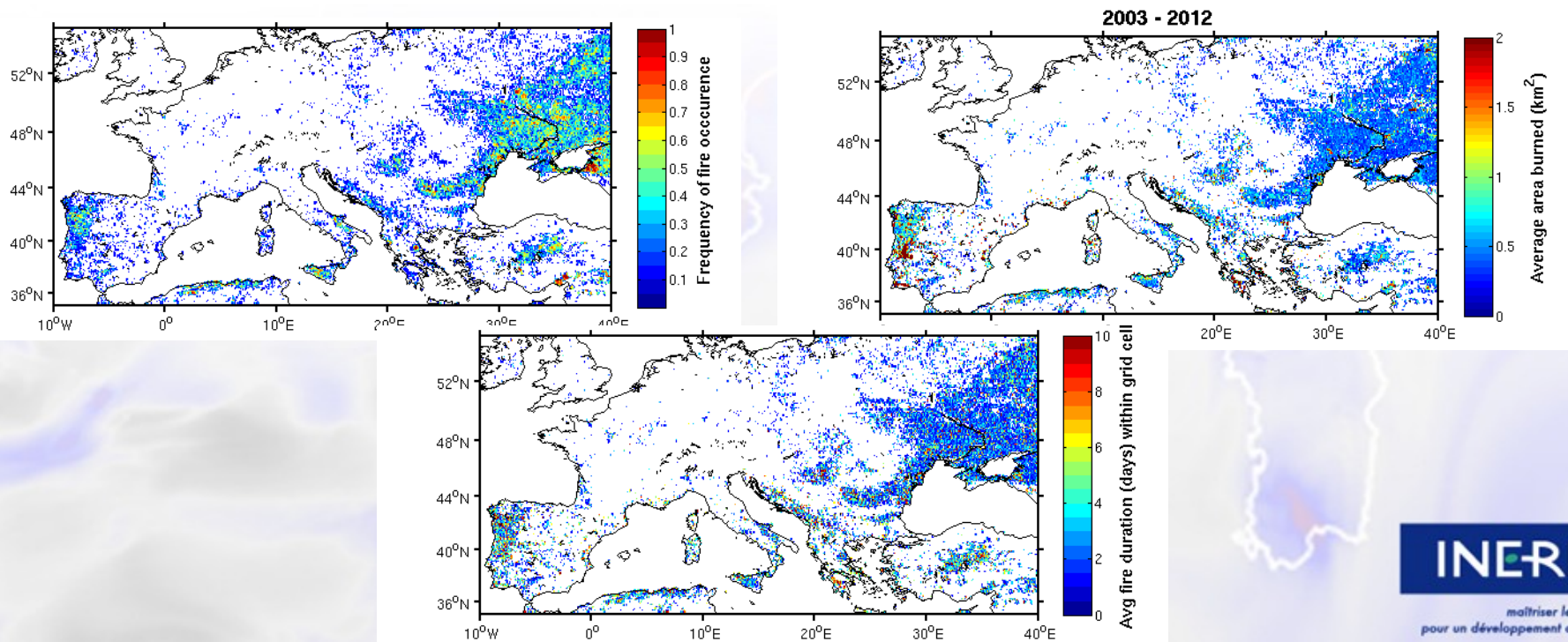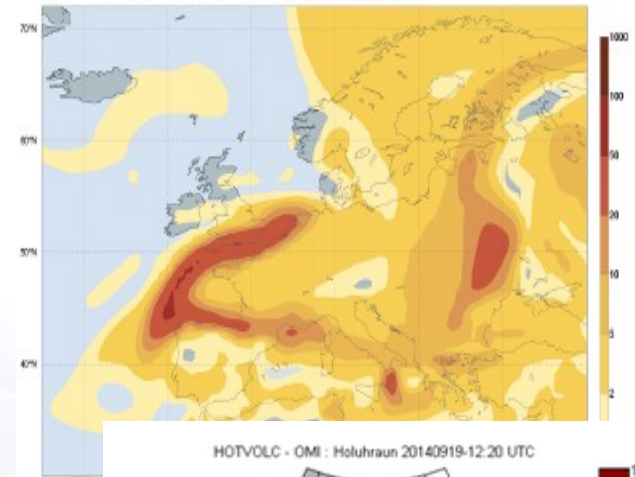
Satellite and NH3 emissions

- Investigate the use of IASI to improve the representation of ammonia emissions

- Assumptions that the differences between CHIMERE and IASI are only due to the emissions prescribed in the model

☐ **Use of IASI monthly / daily values to modulate the NH3 emission**

  ☐ **IASI: spatial and temporal proxy**

  - to improve the spatial distribution and provide more dynamic emissions than the standard temporal profile
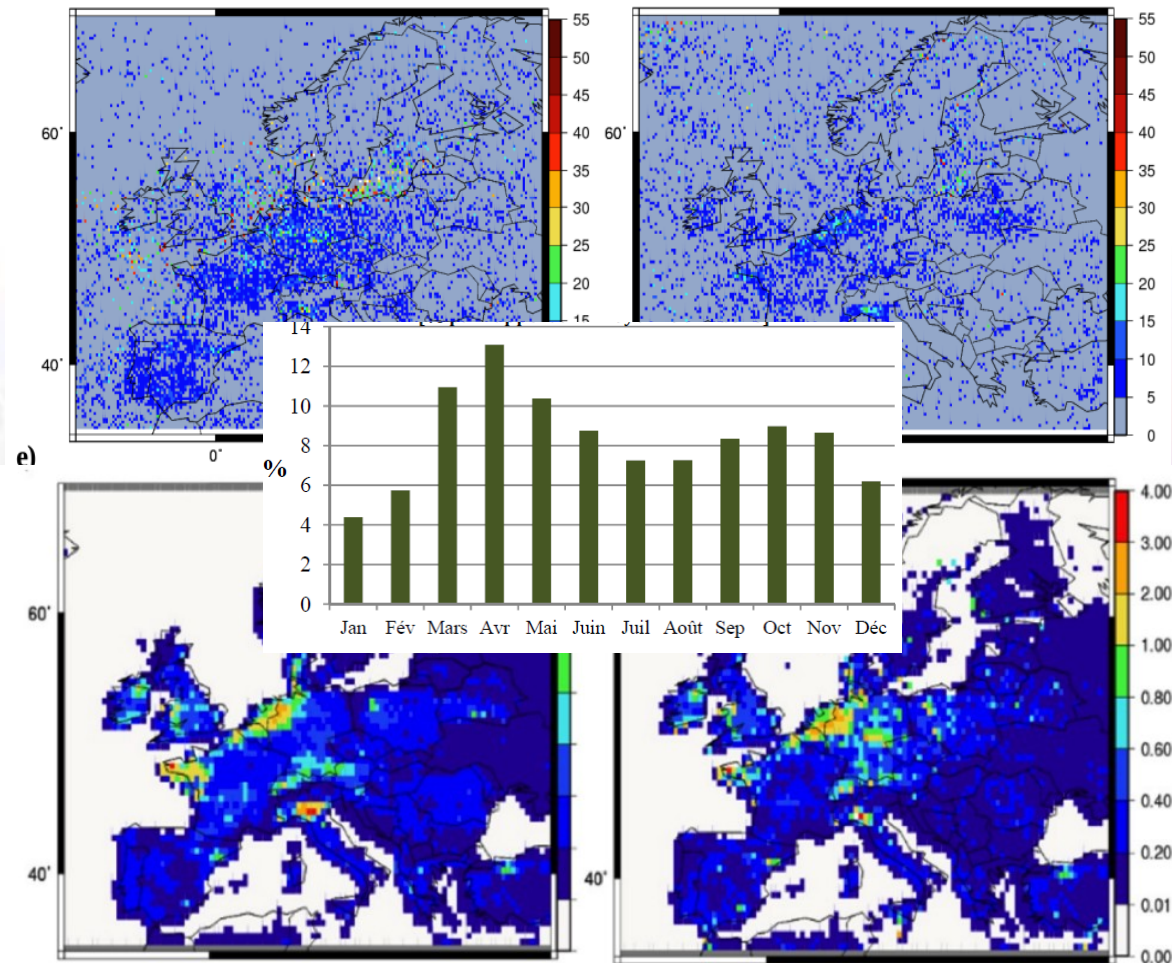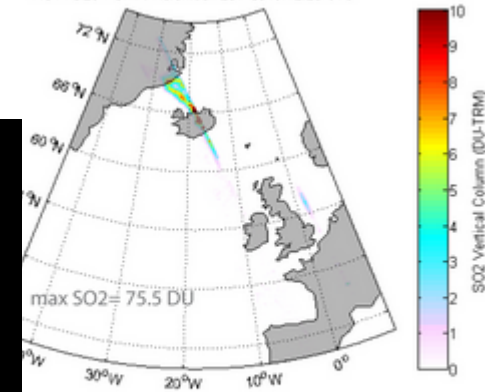
Satellite and SO2 Volcano emissions (Bardarbugua)

• OMI measurements : Assimilation manage to represent the SO2 plume in the model and its dispersion towards Europe at global scale
• provide BC to regional forecast

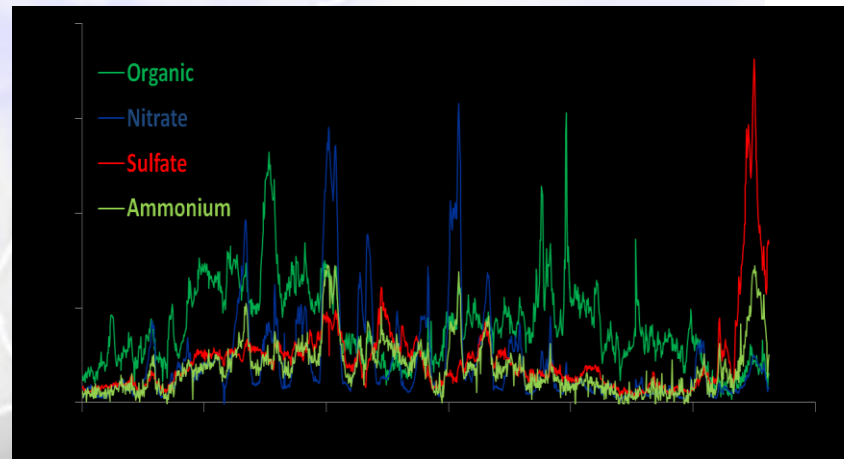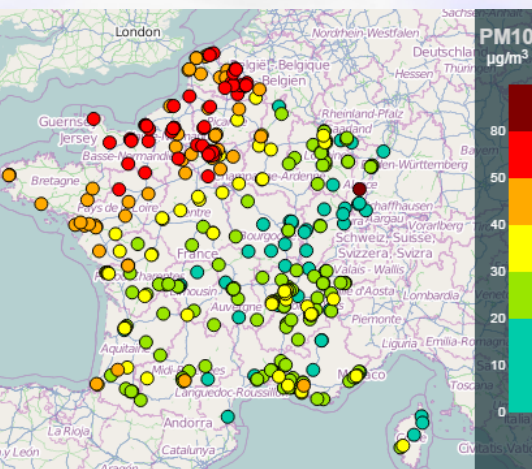• Monitoring services produces in NRT assessment of the emissions (not yet useful for forecasting)

Monday 22 September 2014 00UTC MACC_C-IFS Forecast t+036 VT: Tuesday 23 September 2014 12UTC
Total Column Sulphur Dioxide [10*15 molecules / cm2]   mean: 1.8 max: 131.3

HOTVOLC - OMI : Holuhraun 20140919-12:20 UTC

max SO2= 75.5 DU

Total SO2= 105kt
Flux SO2 = 540 kg/s

PM10
µg/m³

—Organic
—Nitrate
—Sulfate
—Ammonium

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General improvements of emissions

- Will have benefits for emission inventory used in forecasting chains:
  - PM emissions could be revised including EF considering SVOC/IVOC
    - Can lead to substantial increase of PM emissions in Europe
  - WG TFMM/TFEI (B.Bessagnet)

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General improvements of emissions

- Update of wood burning emission inventories (Denier van der Gon et al., 2015)
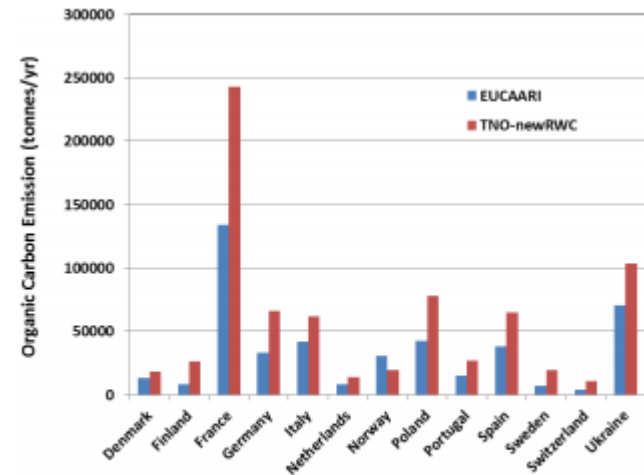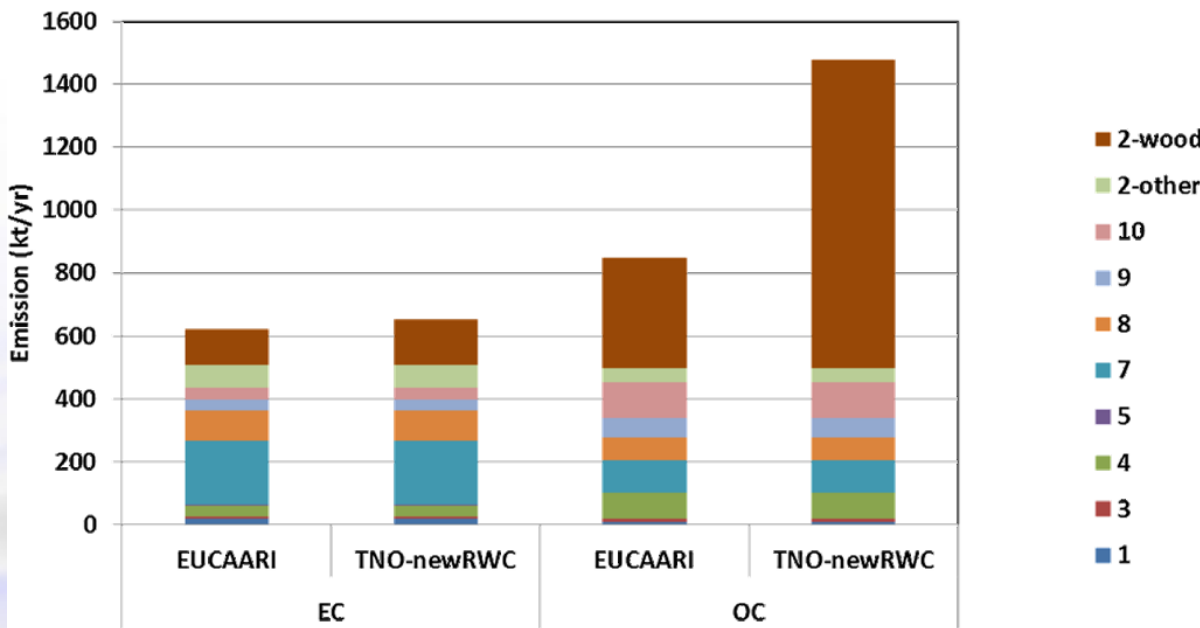 - Revised emissions by a factor 2-3 of residential wood burning

Figure 3. Total organic carbon emissions ($tCyr^{-1}$) for selected countries according to the EUCAARI and the TNO-newRWC emission inventories.

Should reduce the wintertime PM underestimation during cold surge

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General improvements of emissions

- Use proxies from national bottom-up emission inventory to improve emission spatial distributions
  - France, Great-Britain
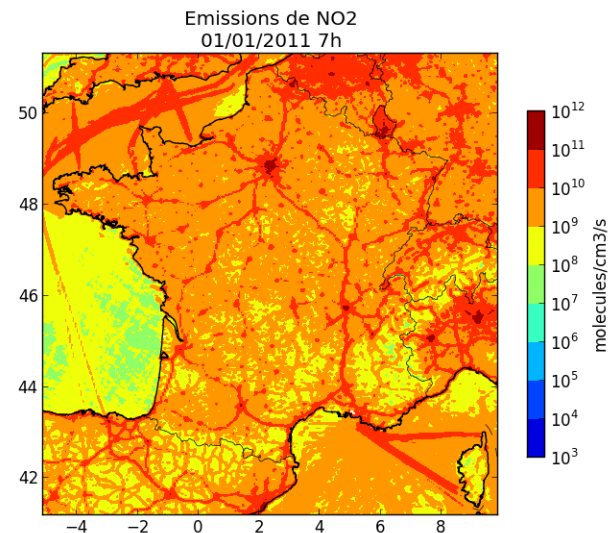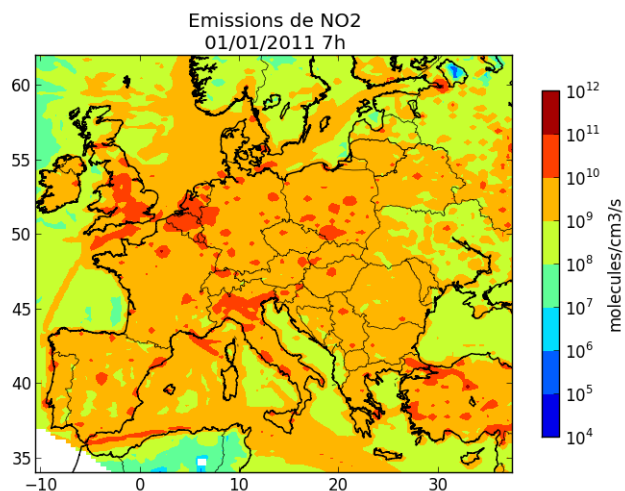
Conclusions

- Satellite brings a useful information to improve spatial and temporal distribution for several emissions

- Effort to evaluate the impact of SVOC/IVOC on the possible underestimation in PM emissions in Europe

- Recent work shows this impact on SNAP2 for residential heating coming from wood combustion.

- Improvement of the spatial distribution of emissions based upon national proxies from bottom-up emission inventory