The future of urban AQ monitoring for forecasting and planning activities

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5th March 2013

AirMonTech Workshop, Duisburg 4th-6th March, 2013

2020 and beyond

The future begins now

Consultation on options for revision of the EU Thematic Strategy on Air Pollution and related policies

Section 1/6: Introductory Questions	
A. Are you responding to this consultation as an individual or on behalf of an organisation? -single choice reply-(compulsory)	On behalf of an organisation
A1. What type of organisation do you represent? -single choice reply-(compulsory)	research: private institution
A2. Does your organisation work mainly on an EU-wide basis or in a single country? -single choice reply-(compulsory)	Other (please elaborate below in question D)
A3. Please indicate the country where your organisation is located: -single choice reply-(compulsory)	Rest of Europe
A4. Please indicate the name of your organisation: -open reply-(compulsory)	NILU- Norwegian Institute for Air Research
A5. Please indicate your name and title: -open reply-(compulsory)	Dr. Leonor Tarrason
B. Do you now work on air pollution issues, or have you done so in the past? -single choice reply-(compulsory)	Yes, air pollution has been the main focus of my professional work
D. Please feel free to provide any further details regarding your answers to the introductory questions: -open reply-(optional)	
NILU is a non-profit research institute with focus on atmospheric composition and climate change reserach. It works with research projects worldwide.	
Unless you specify otherwise, your contribution will be published on the Commission's website. Please indicate here if you wish your contribution to be anonymous.(For full information please refer to the Specific Privacy Statement point 3) -single choice reply-(compulsory)	You can publish this contribution as it is.
Section 2/6: Ensuring compliance with EU air quality requirements and coherence with international commitments in the short term	
1. How should the EU modify or supplement its approach to ensure compliance with current air quality legislation? (Please choose one or more responses) -multiple choices reply-(compulsory)	Additional non-legislative options: for example by establishing partnership agreements with MS that focus Member State efforts to address non-compliance with air quality objectives - Strengthening emissions controls: for example more stringent emissions ceilings or source controls that support the attainment of air quality limit values

Forecasting activities

Forecasting provides an appropriate development framework up to 2020

Keywords:

- NRT information
- Data assimilation

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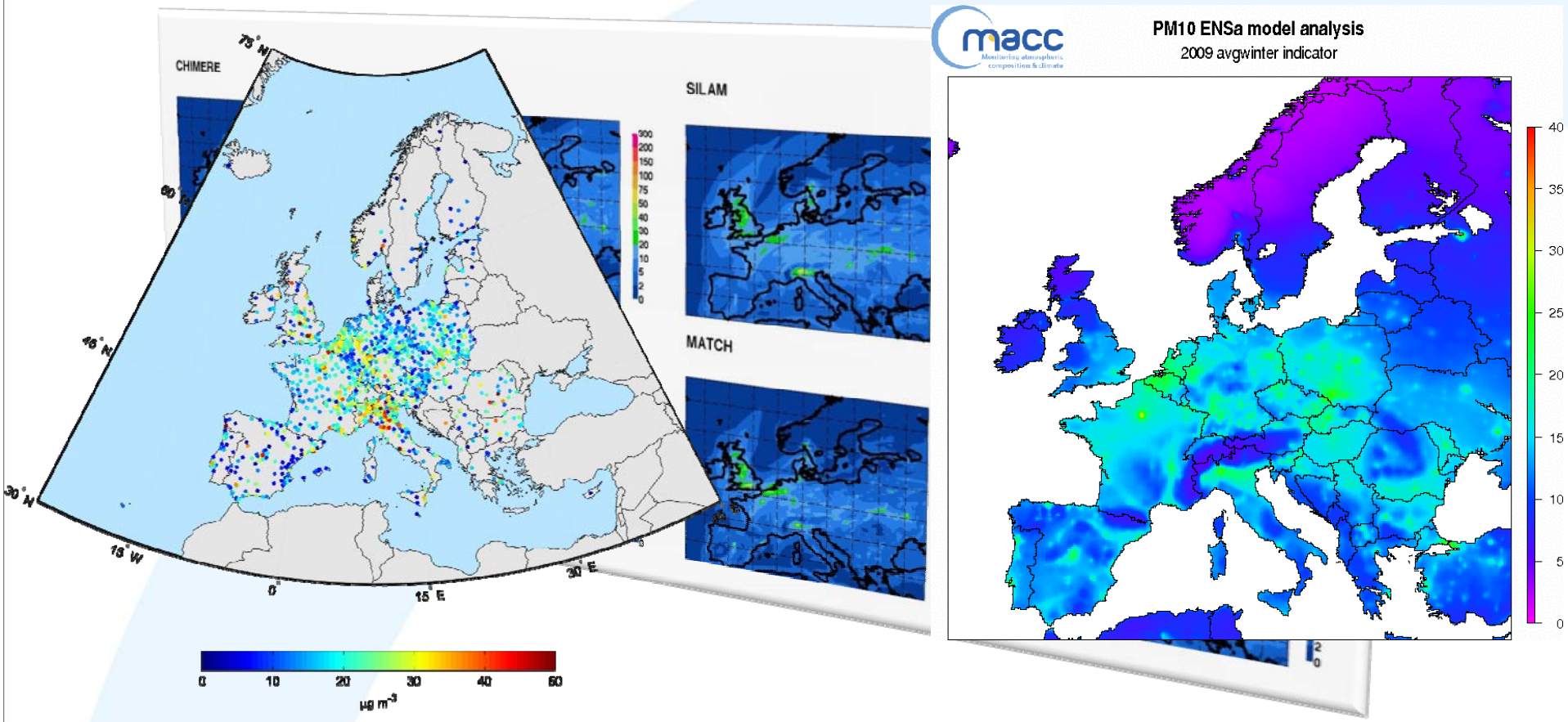
macc Monitoring atmospheric composition & climate

Forecasting suite



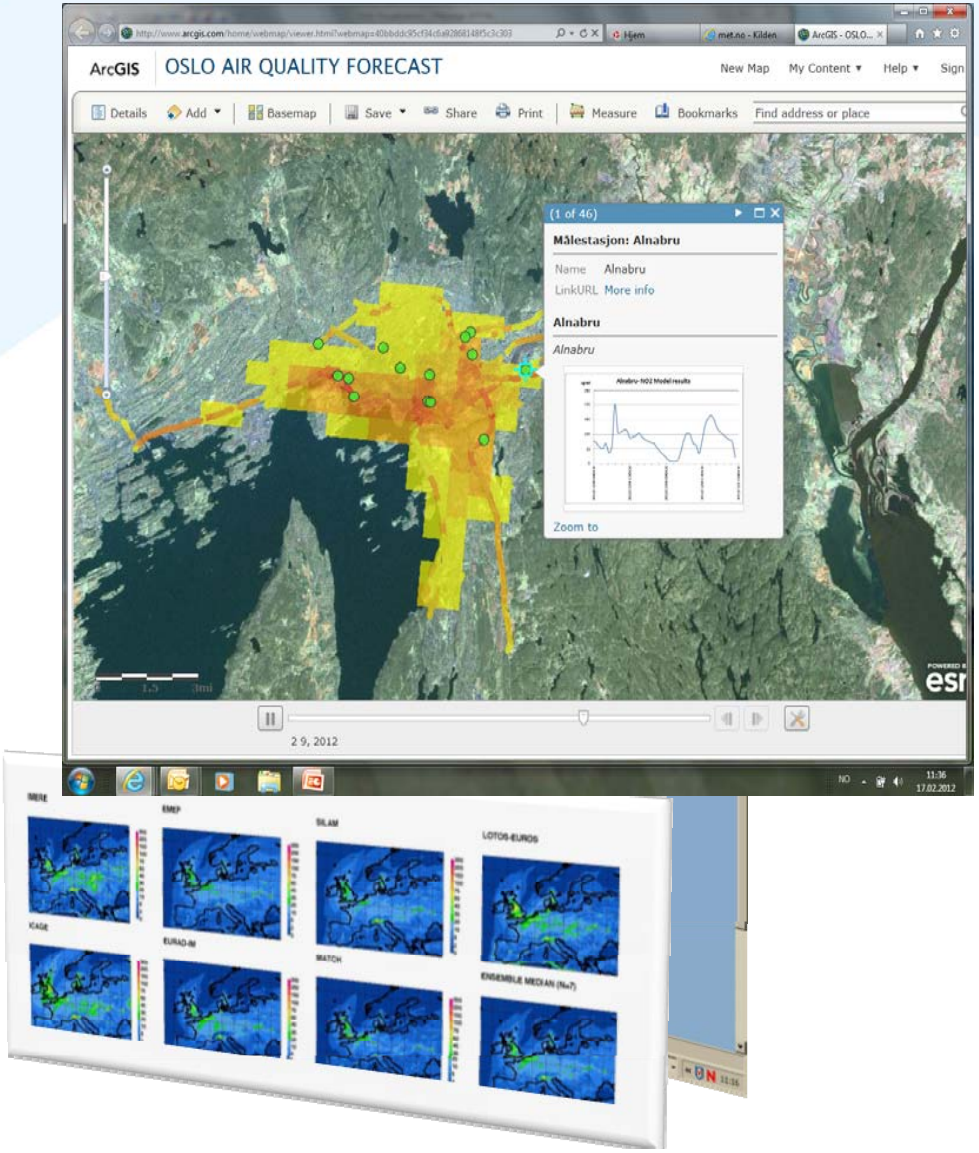
Observations in NRT → **Data assimilation** **Ensemble of models** → **Analyses and Forecasts**

Urban forecasting

Nesting chain:
1)European MACC forecast
2)National AQ forecast
3)City forecast

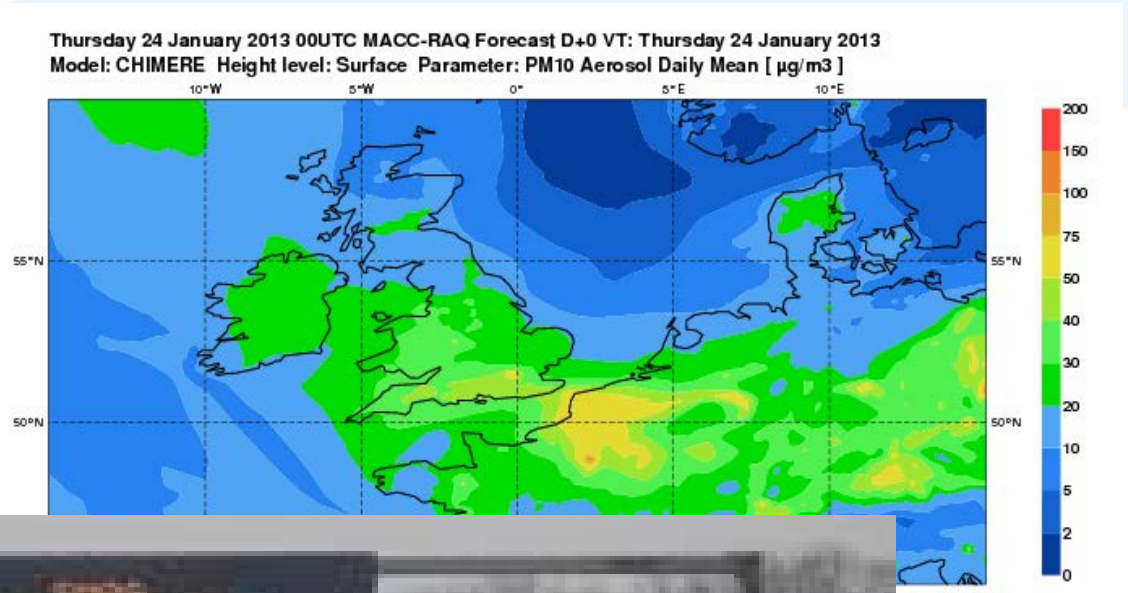
In Oslo, we use boundary conditions from MACC-II and dynamic models with 1x1 km^2

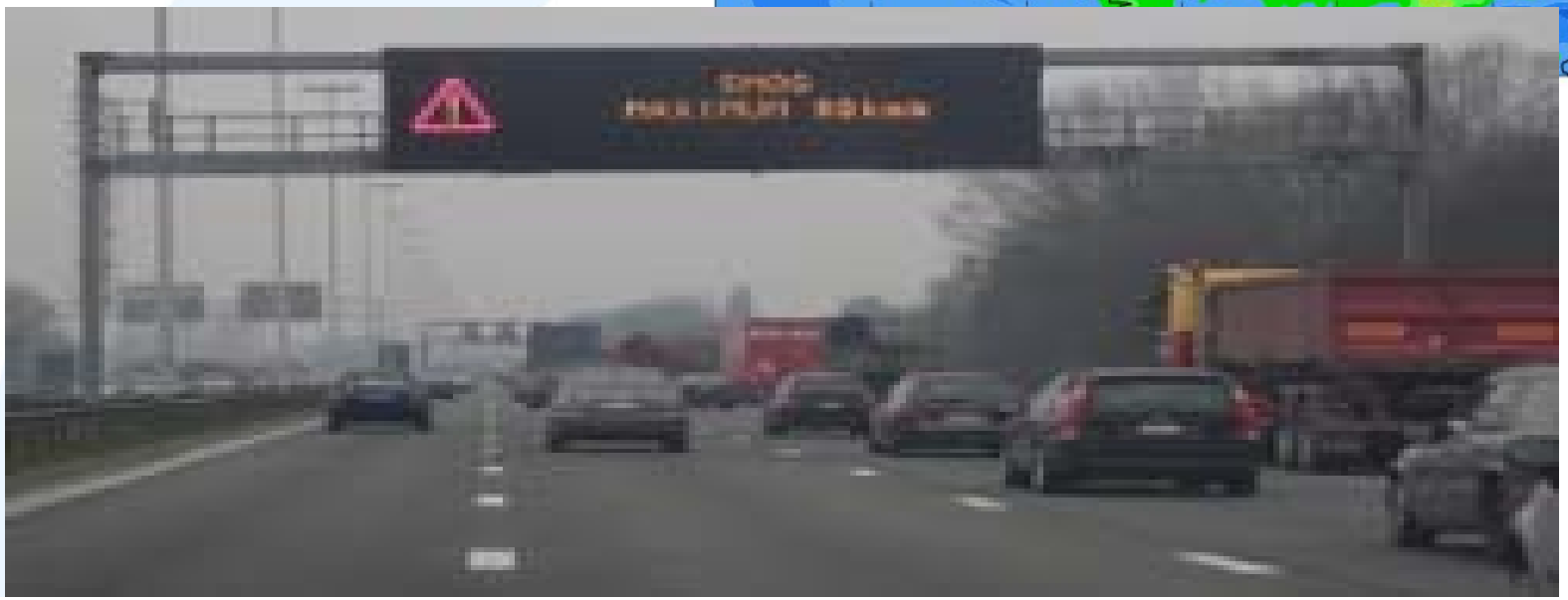
Similar approaches are used generally in most European cities



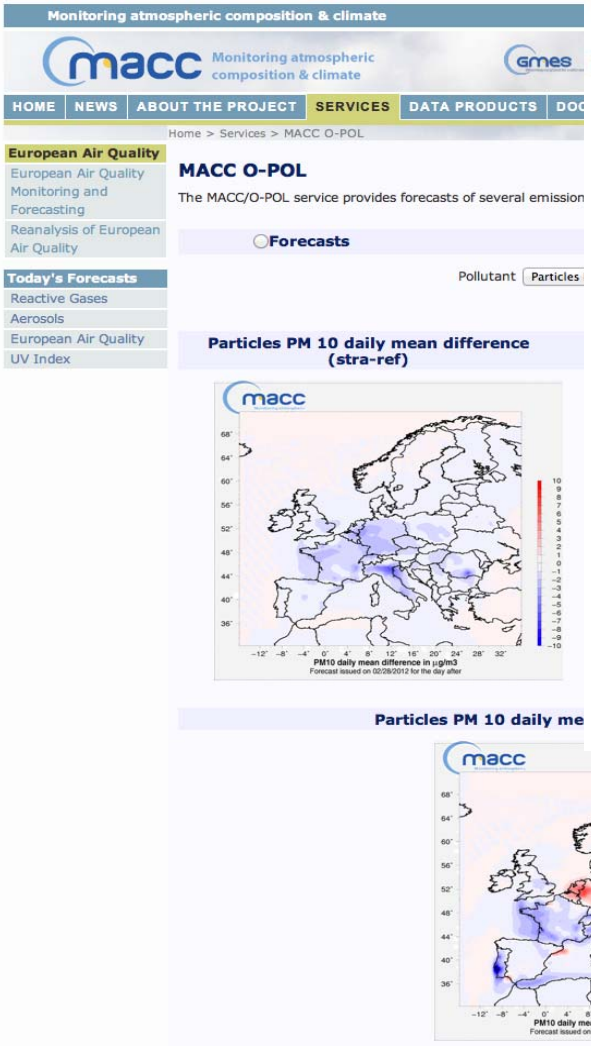
Short-term planning: Smog episode in Brussels

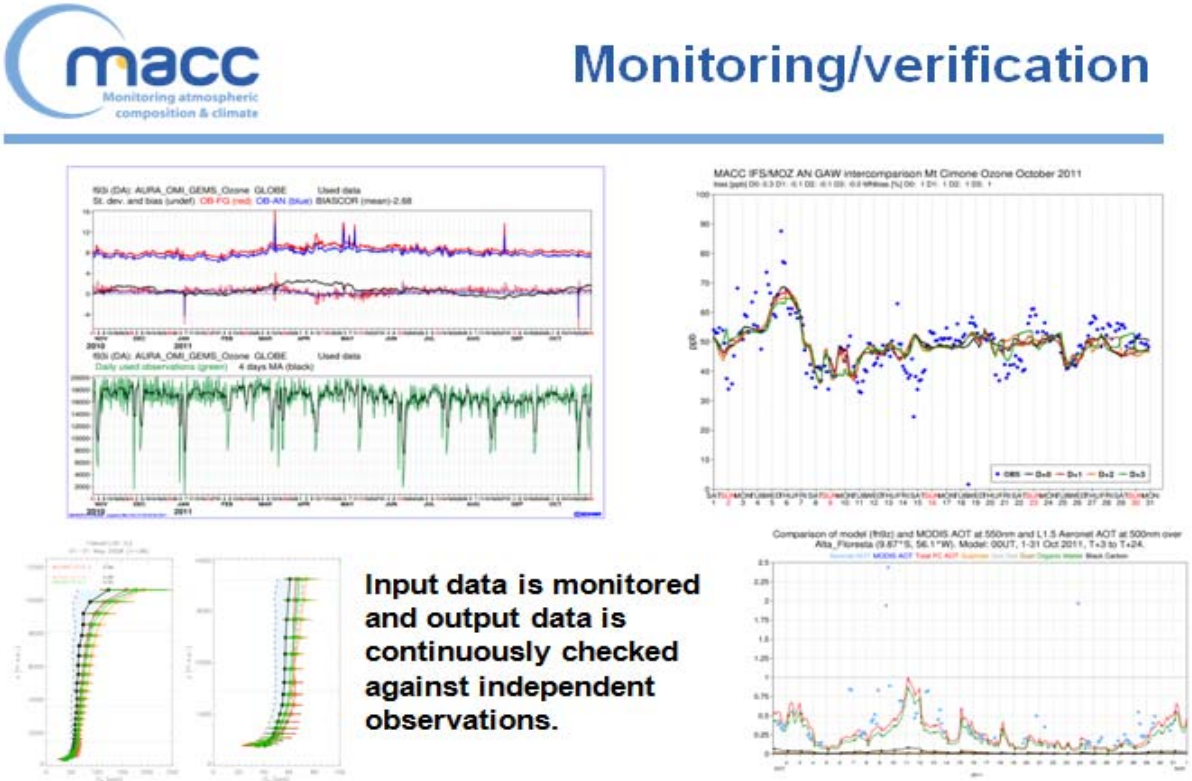
- 24th January 2013
- Use of MACC-II forecasts by Belguim authorities
- Reduction of speed limit to 90km/h in certain areas





Use of the forecasting skills to assess future emission reduction scenarios





Forecasting needs

On-line observations (NRT)

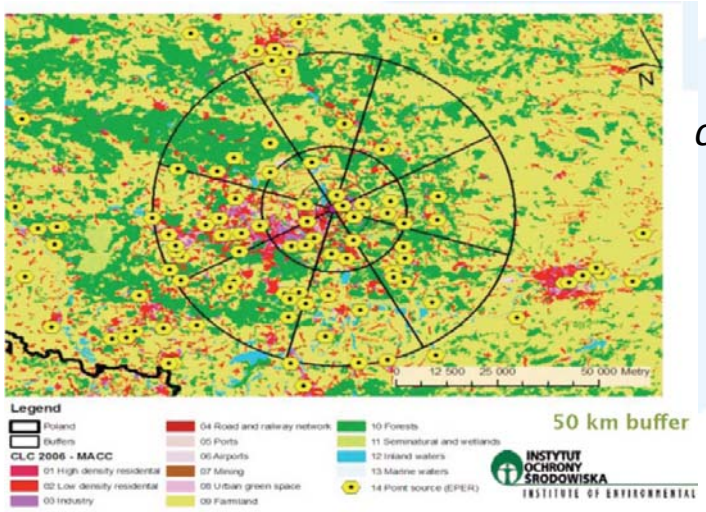
Observations for process understanding

Provides:

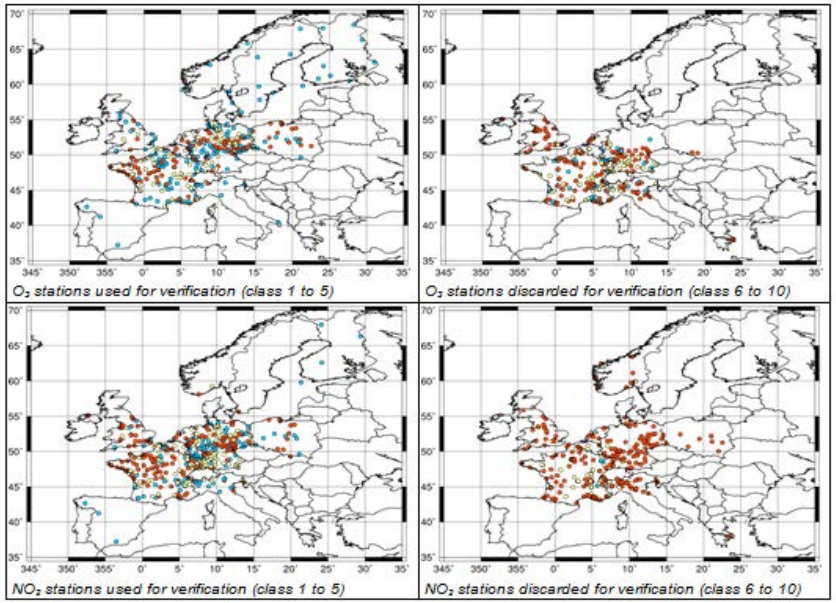
Continuous validation

Robust scientificbasis for planning future scenarios

Current work within MACC-II with relevance for AQ monitoring strategy

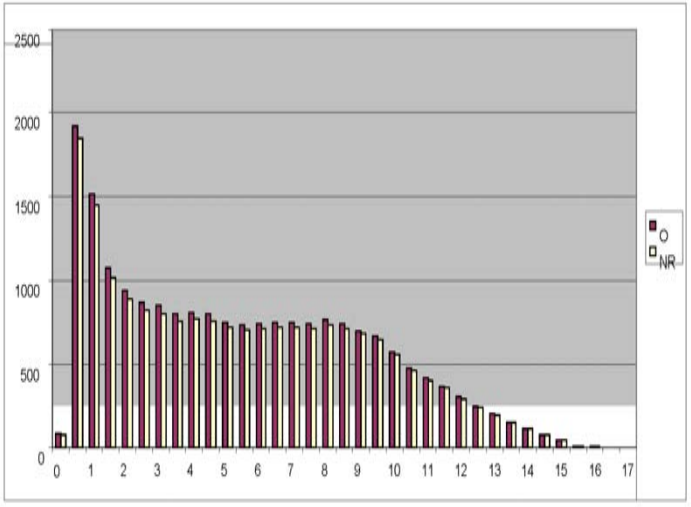


Objective classification of European Air quality sites (based on past measurements time series)



MACC stations delivering NRT observations of O_3 (top) and NO_2 (bottom). The colour represents the station type as specified in the metadata: red (urban), yellow (suburban), blue (rural). On the right the stations of

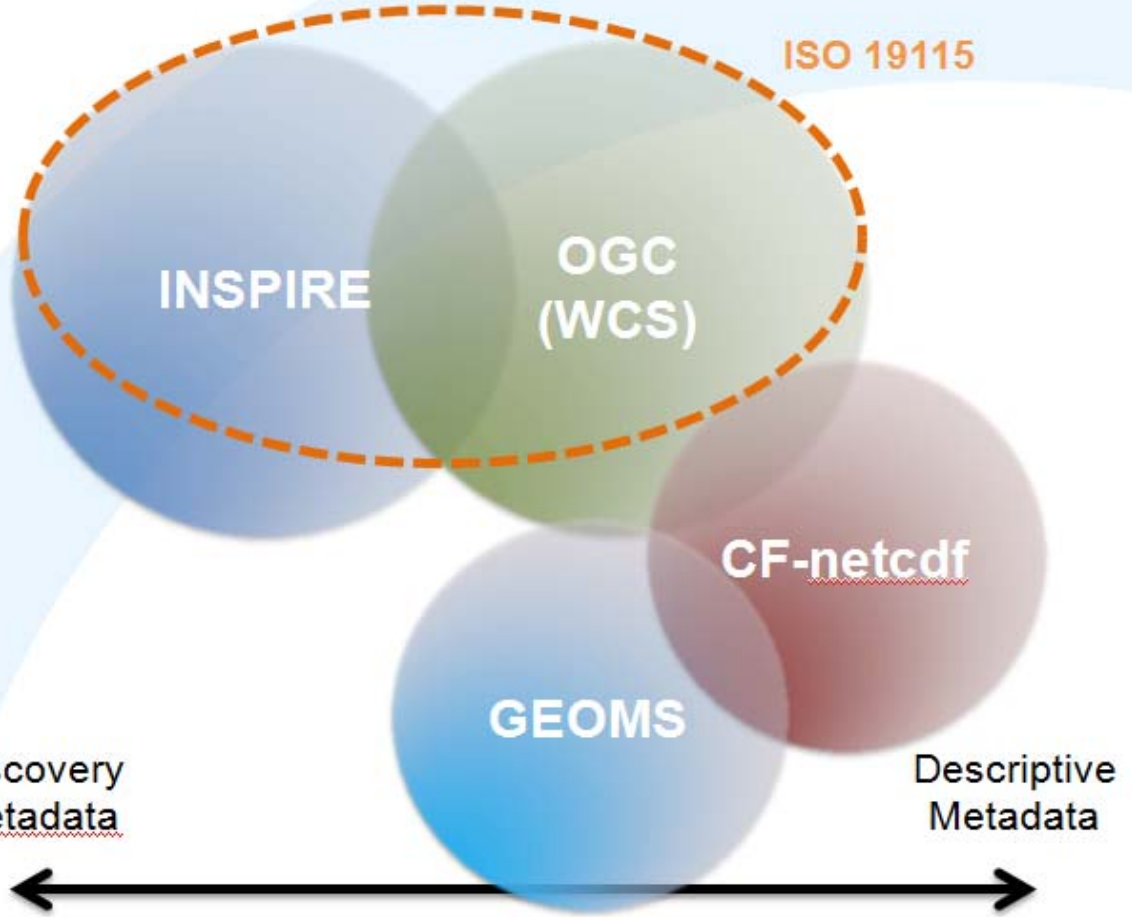
NRT vs validated data in Slovenia



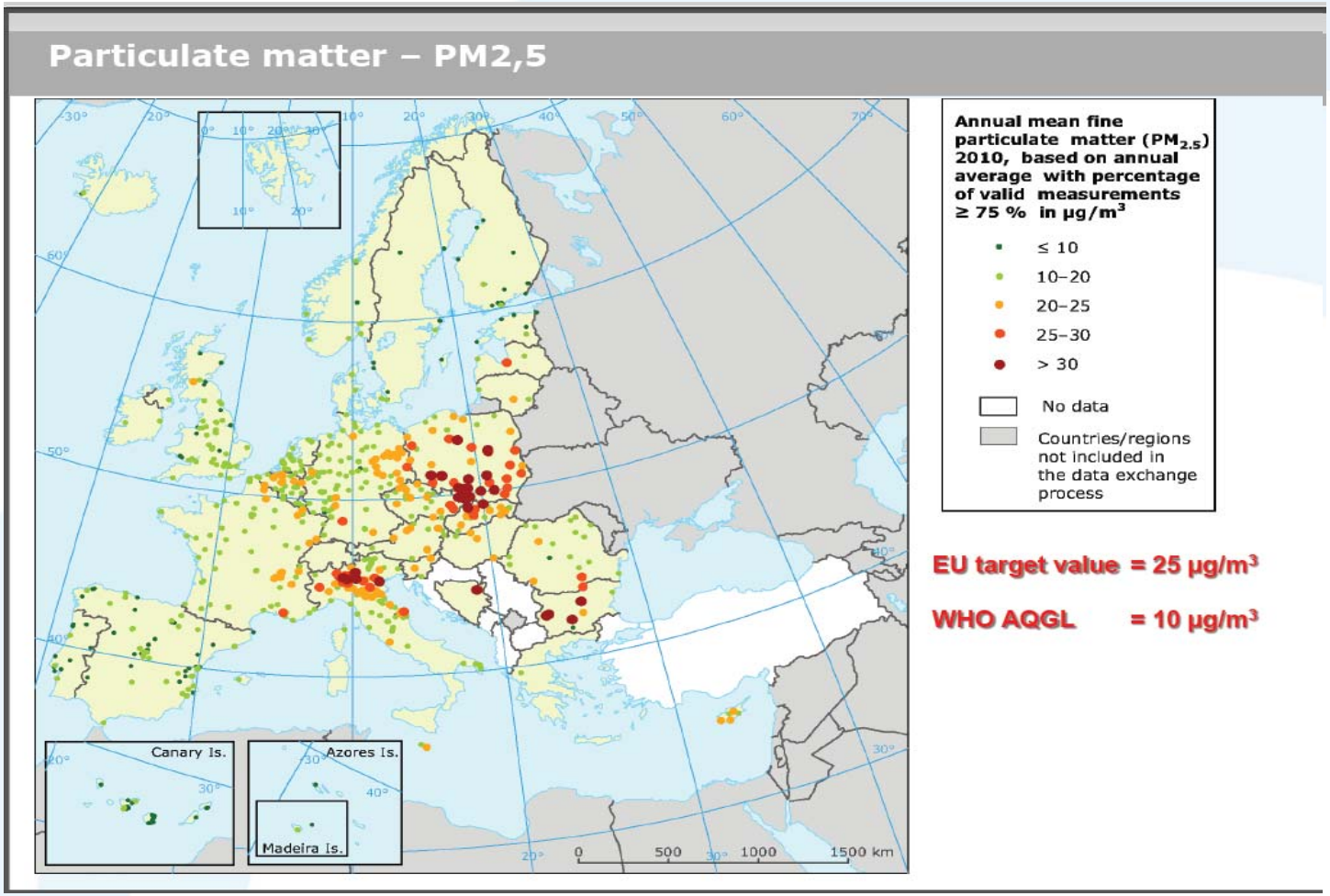
- Support the review the air quality monitoring strategy : station representativeness, geographical coverage.
- Foster the development of NRT data reporting and promote e-reporting

Metadata spaces and interoperability

- Identify essential metadata elements needed for dataset and service discovery and use
- Advance common understanding of interoperability
- **Formulate best practices for metadata generation and use**
- **Joint approach for emissions, models, ground based and remote observations**



Will we still be concerned with the same problems?



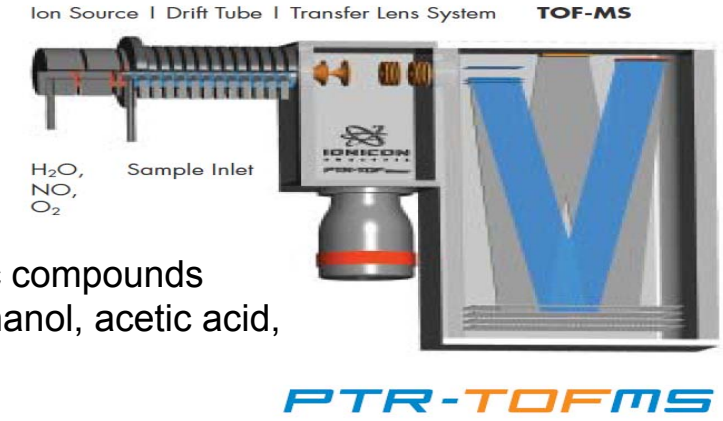
EEA 4/2012 report "Air Quality in Europe"

Probably yes, but with a shift of focus

Will we measure the same components ?

Probably stronger focus on chemical speciation and physical characterisation of aerosol

- BC-EC/OC
- VOC – SOA
- CH4, O3, CO2
- PNC, Particle size
- Nanoparticles
- PAH, HM



PTR-TOF – organic compounds (ethanol, aceticethanol, acetic acid, aldehydes, etc.)

Will we measure with the same instruments ?

Instrument evolution in two directions

NOWCASTING

- Need for less expensive instruments
- Less maintenance
- Lower detectable limit and traceability
- Need for Equivalence testing

MC2

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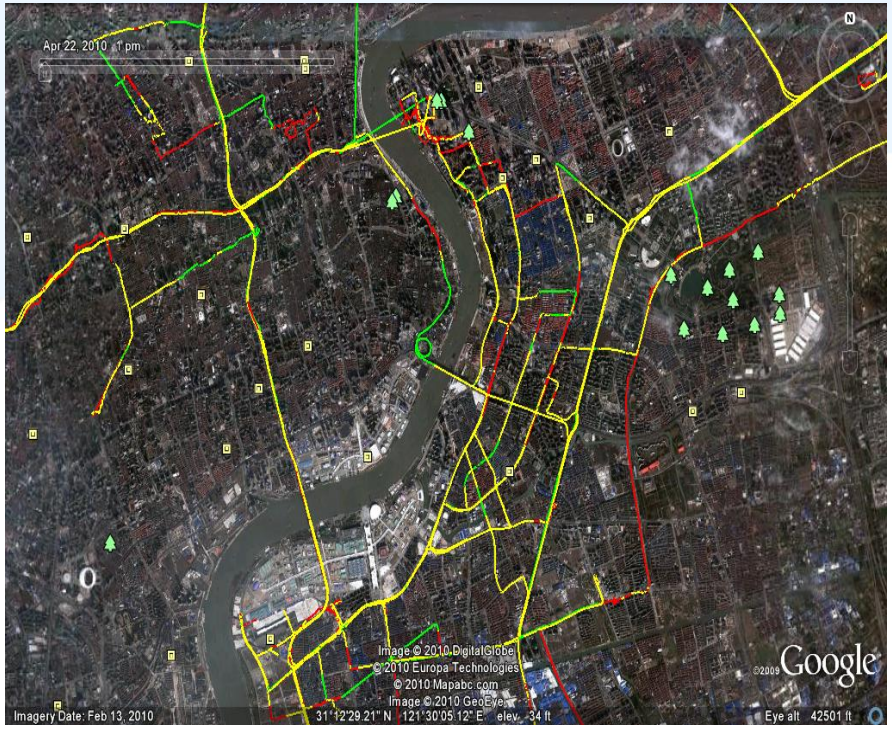
Sens300

FORECASTING AND PLANNING

- Need for accurate measurements
- Physical and chemical properties
- Vertical profiles

Nowcasting activitivies
Use of microsensors as in CITISENSE



Use of micro-sensors in air quality monitoring
Green cities – sustainable planning and forecasting
Information in near real-time (NRT) – Nowcasting activities
Increased population involvement

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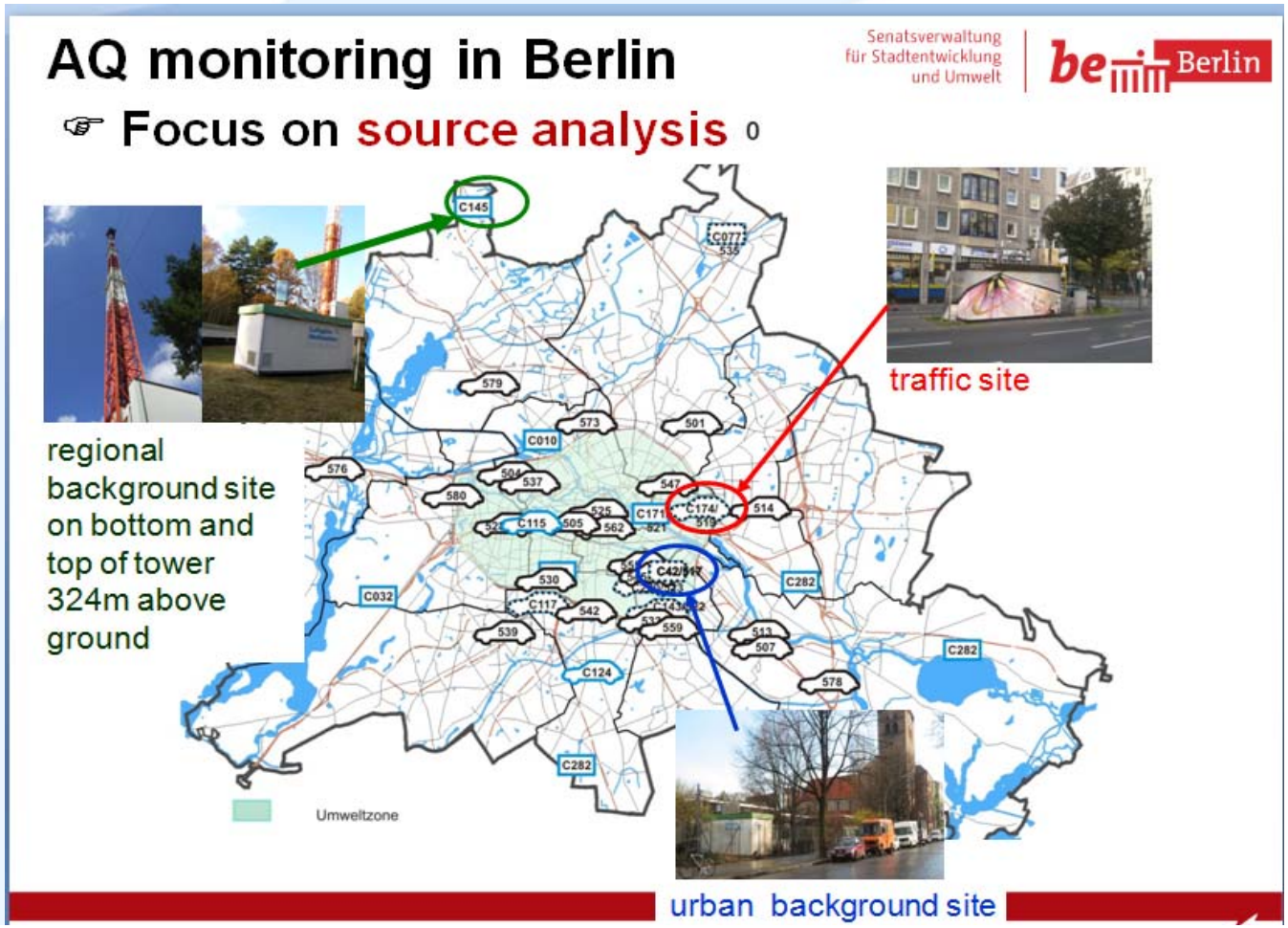
Will we measure in the same networks ?

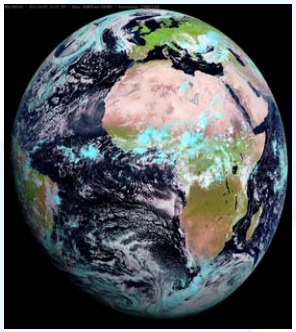
Evolution of the network – less stations, more microsensor use, more specialised urban observatories

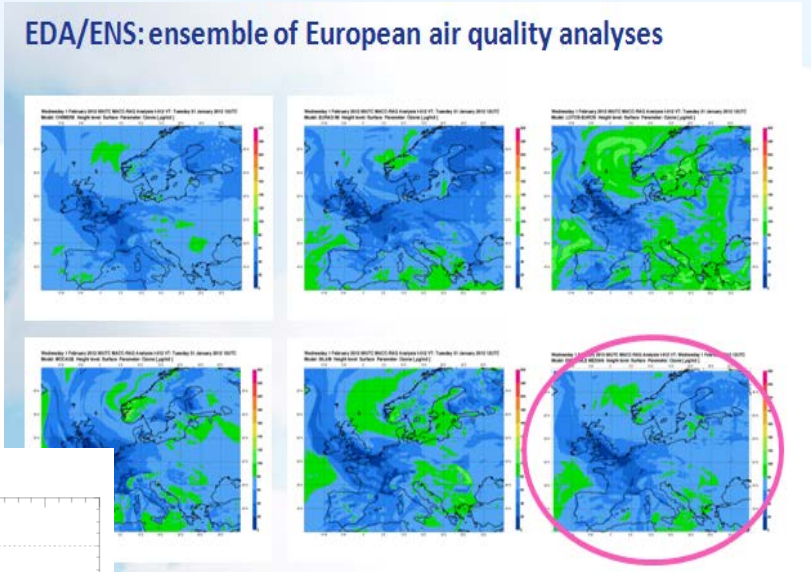


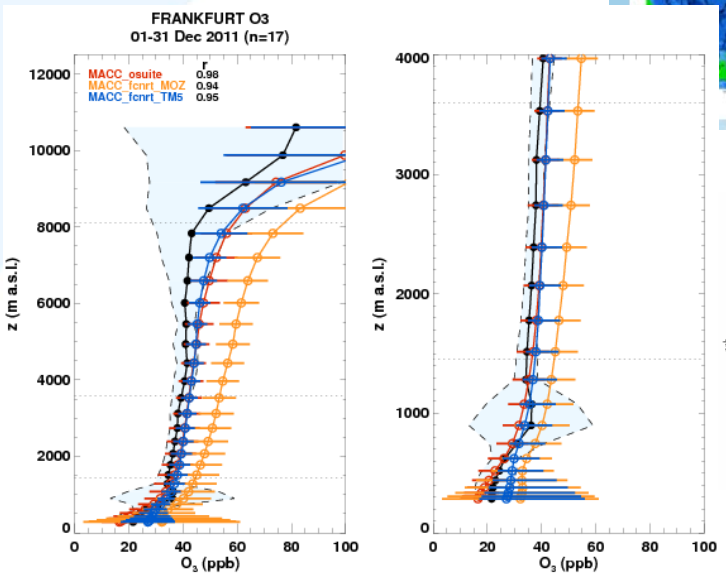
Will we have the same models?

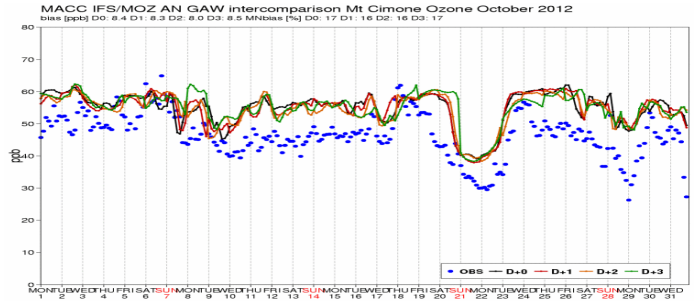
Evolution of models: observations are key to method development!

- Process studies
- Better parametrisations









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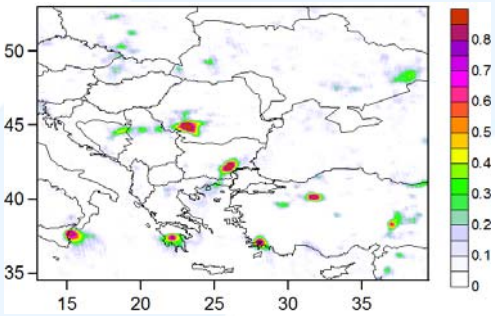
Will we have the same emissions?



- Also here method evolution is expected with more extended use of bottom- up approaches

  - Integrated methods (multimodel assessments, combined models and observations, data assimilation, inverse modelling)
  - Multispecies analysis
  - Dynamic emission factors
  - Optical new observations (both ground-based + satellite)
  - Eddy covariance flux methods
  - In-situ measurements of emissions

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GEIA
Global Emissions InitiAtive

In summary

- Monitoring will become more NRT
- Extended monitoring design that combines ground based and remote measurements, NRT emission data and models using data assimilation techniques

- Revised urban networks:
  - **Low cost microsensors for nowcasting activities**
  - **Urban Supersites for specific microenvironments for forecasting and planning activities**
- Focus on understanding sources and processes
  - **Emission measurements**
  - **Physical and chemical speciation of aerosol, specially on SOA and VOC**
- Increased focus on data access and interoperability

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Thank you for your attention!

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

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Station representativeness:
An important part of metadata information

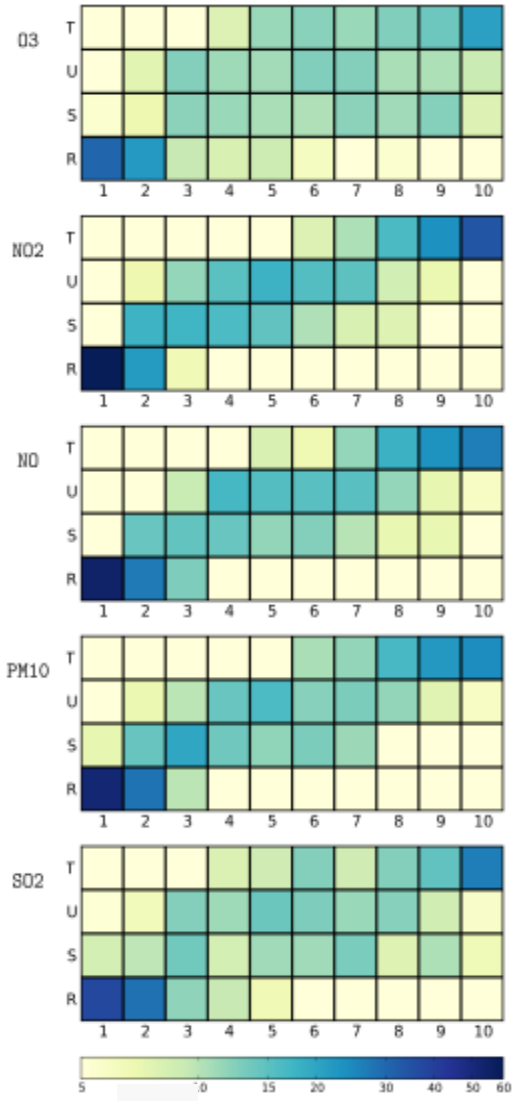
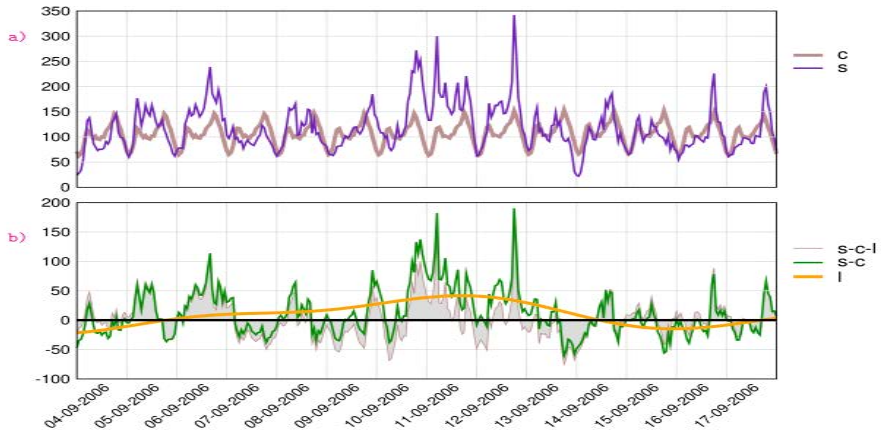


Figure 6: Comparison between the obtained classes and the groups based on the meta-data. For each group, the colour corresponds to the percentage of stations falling in each class (logarithmic colour scale).

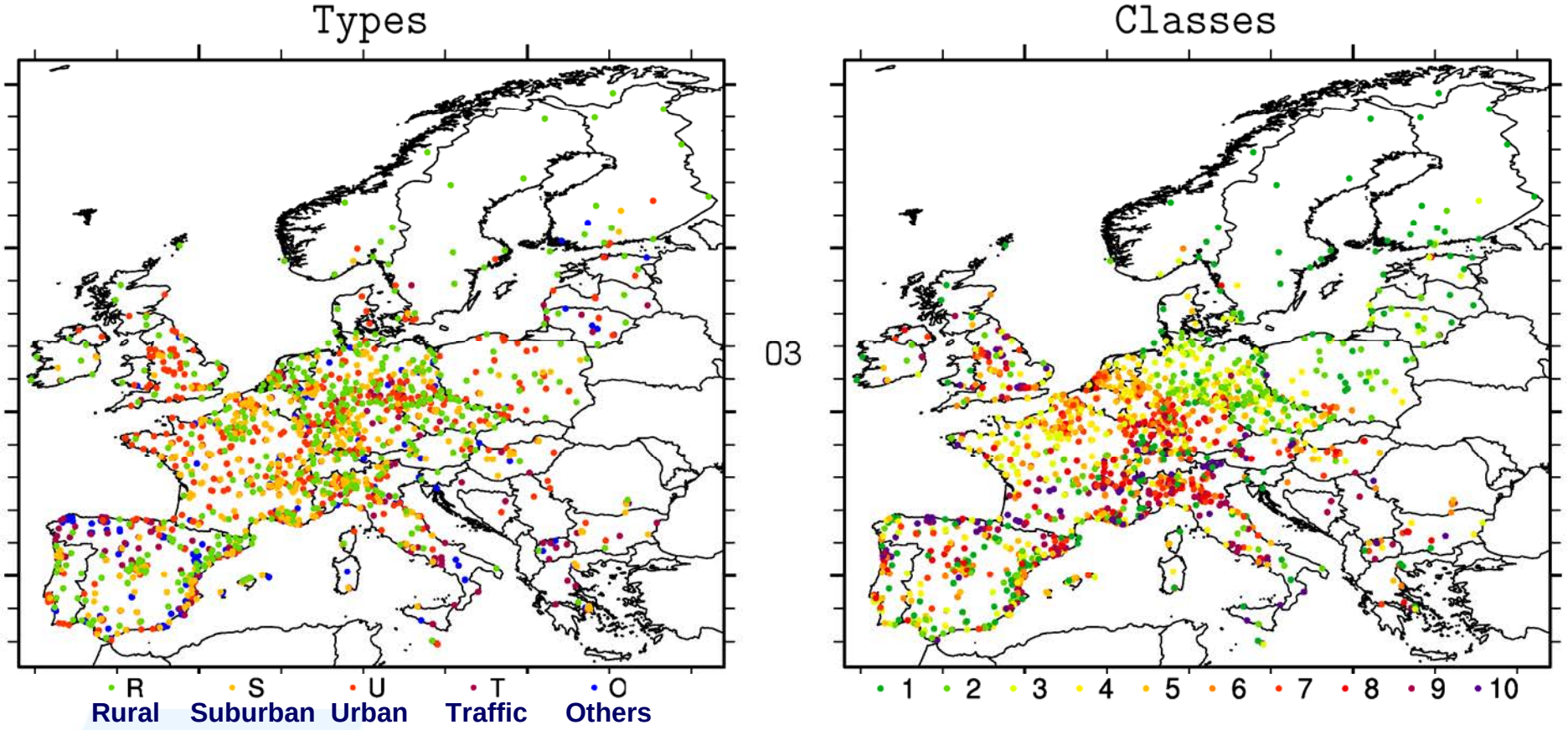
The station « real fingerprint » is to be found in its past observations rather than in external information - Peuch and Joly, 2010 -



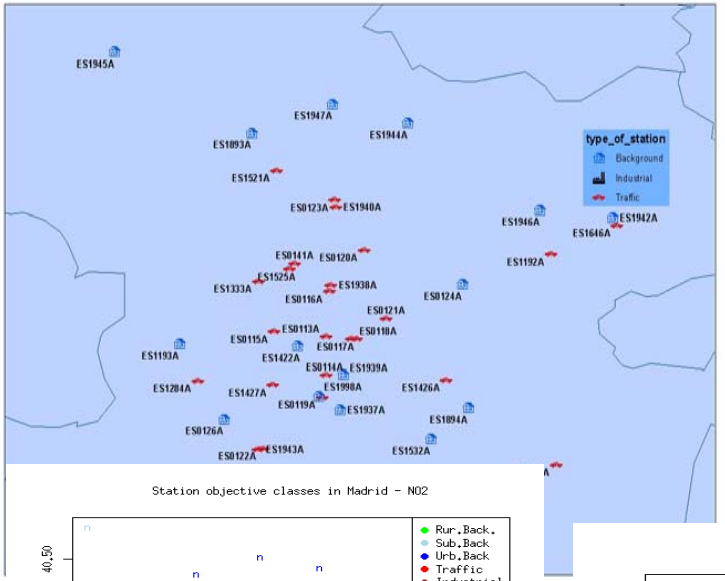
	AIRBASE Site	AIRBASE Area	BDQA	O3	NO2	NO	PMI0	SO2
T	Traffic	Urban	Traffic	187	475	382	328	243
U	Background	Urban	Urban	496	616	433	462	400
S	Background	Suburban	Suburban	268	256	224	182	137
R	Background	Rural	Rural	293	153	127	106	128
O	Others	Others	Others	374	561	459	416	491
Total				1618	2061	1625	1494	1399

METEO FRANCE
Toujours un temps d'avance
cnrs

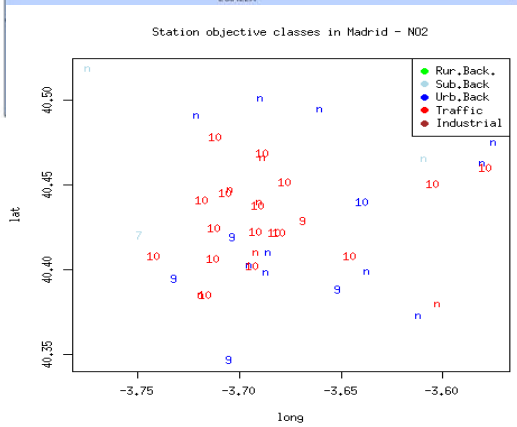
Classification of O_3 monitoring sites
Application for EEAs Air Pilot Project

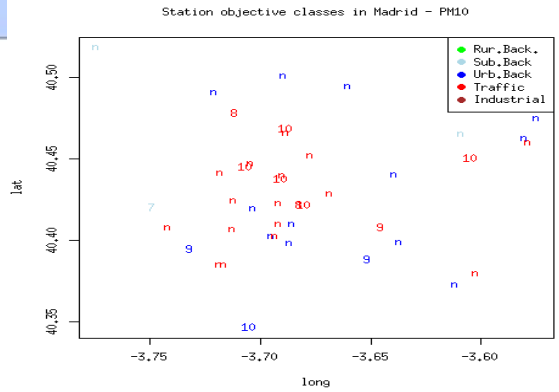


Madrid



All stations in the city (classified as urban background or urban traffic in AirBase) show similar behaviour according to the new classification.





Challenge for MACC- communicating the applicability of the method