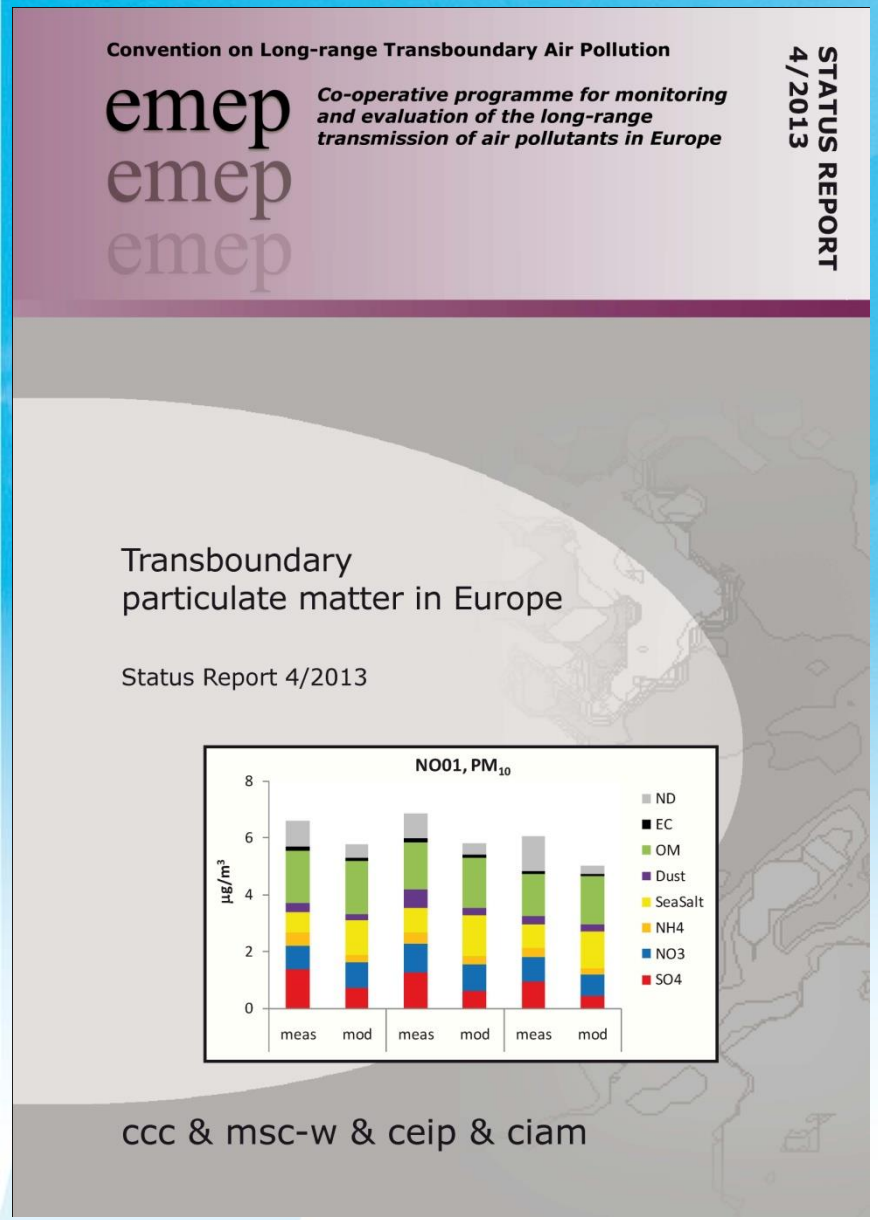
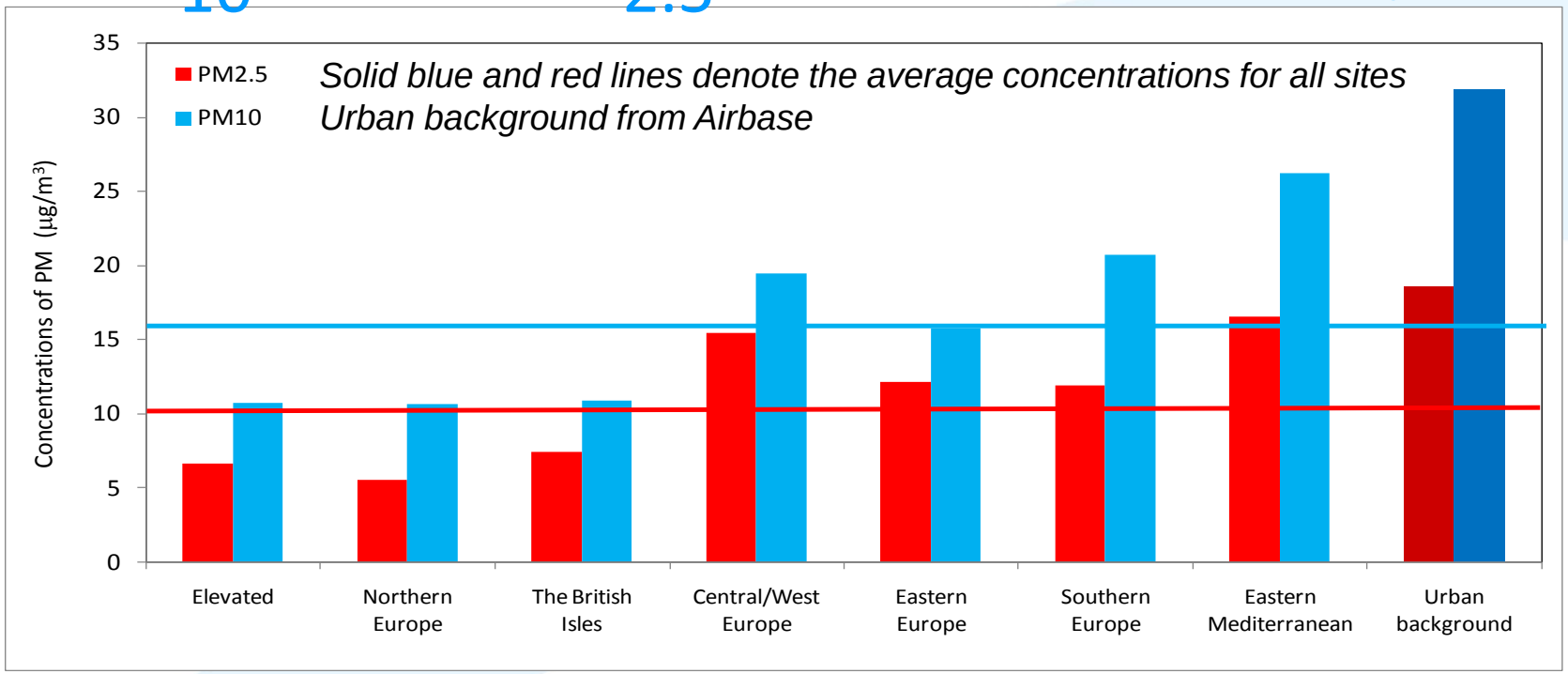
EMEP PM Status 2011 and workplan



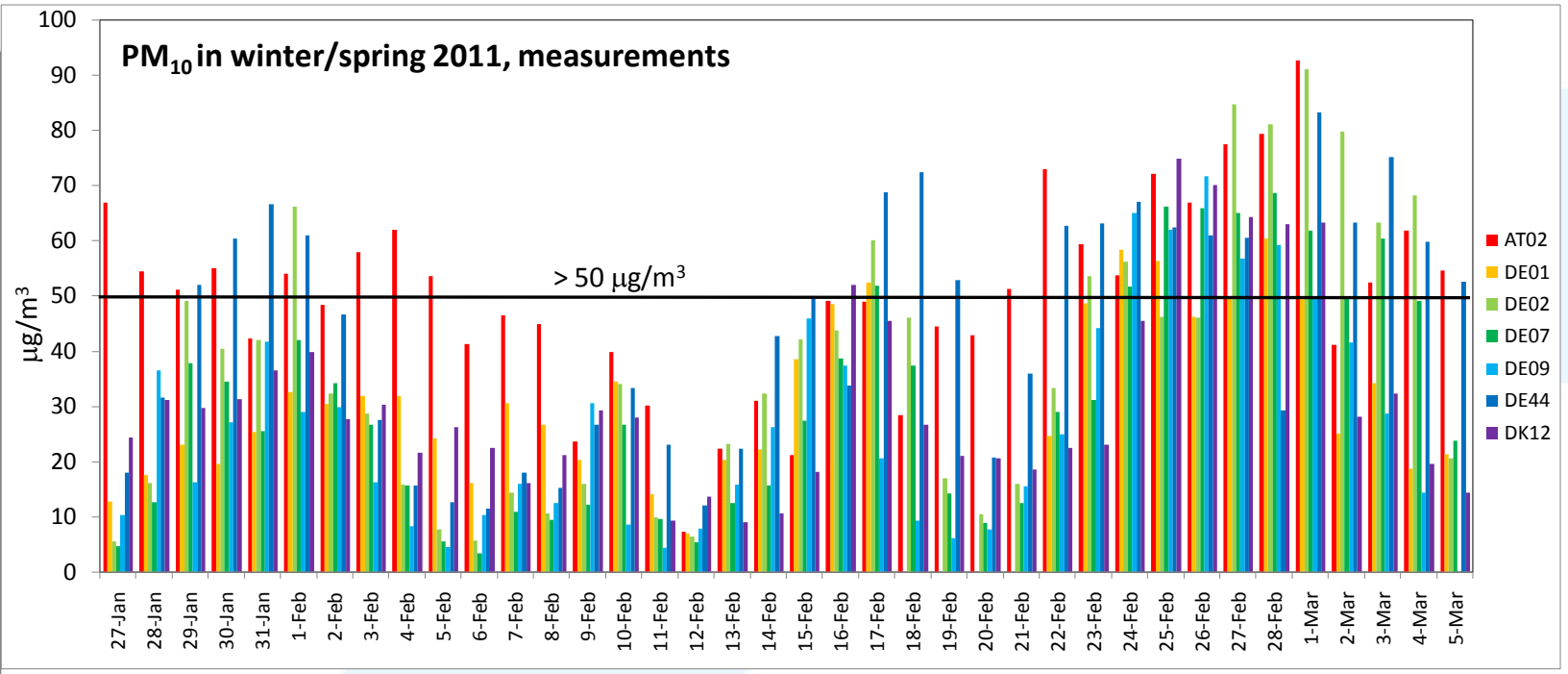
EMEP Status report 4/2013:

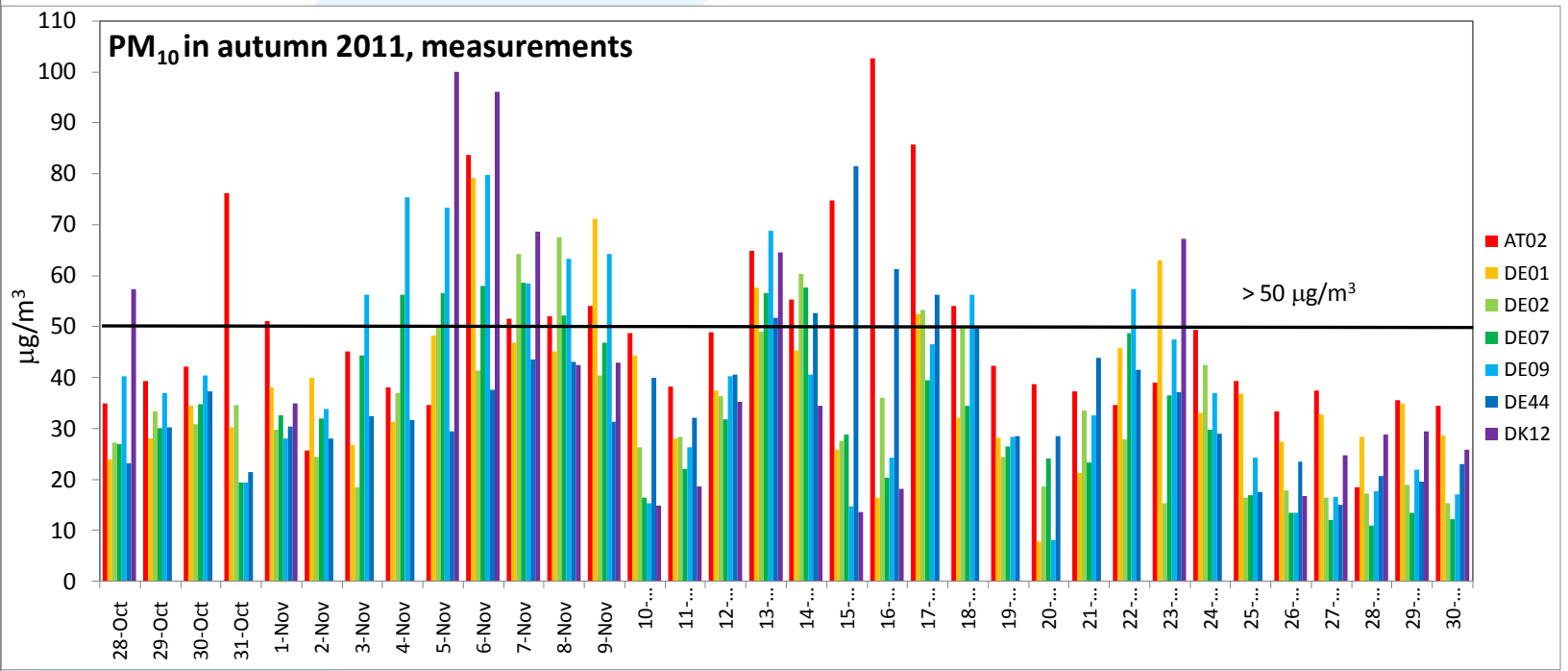
1. Emissions 2011
2. Global emission data, GAINS model for the period 2005 to 2050
3. Measurements and modelling 2011
4. A closer look at high episodes of in Central Europe
5. Time series of mass and their chemical composition
6. The EMEP intensive measurement Mineral dust and trace metals
7. Measurements of particulate matter in the EECCA countries
8. Need development in EMEP model to implement size distribution

PM_{10} and $PM_{2.5}$ concentration , 2011



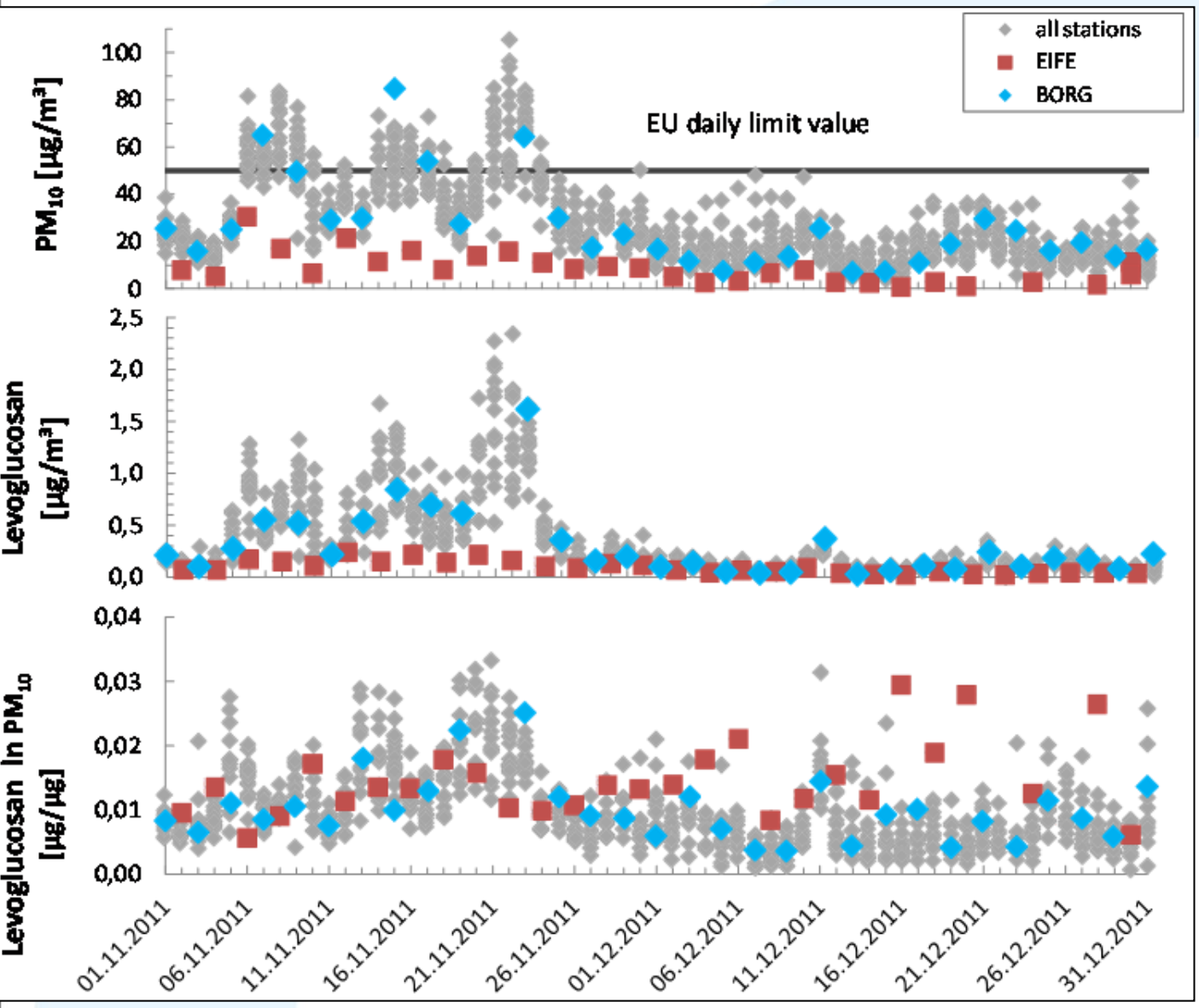
- 65 sites (55 for PM_{10} and 44 for $PM_{2.5}$)
- The PM levels in 2011 are somewhat higher than in 2010. Mainly due to differences in precipitation amount
- mean regional background PM_{10} concentration in 2009 was below the EU limit value of 40 µg/m³. But exceedences of WHO AQG of 20 µg/m³ for PM_{10} and 10 µg/m³ for $PM_{2.5}$ in many parts of Central, Eastern and South-Eastern Europe.





High episodes in Central Europe, 2011 (1)

High episodes in Central Europe, 2011 (2)
Detailed study in North Rhine-Westphalia (NRW)



10 -30 µg/m^3 of PM_{10} were estimated to originate from wood burning in NRW

Tanja Schuck and Ulrich Pfeffer

Landesumweltamt Nordrhein-Westfalen NRW.

High episodes in Central Europe, 2011 (3)

- On average 80% of the annual exceedance days took place during two pollution episodes caused by unfavorable meteorological situation and probably enhanced local emissions from residential heating in February and November 2011.
- EMEP model captures the November episode well (though lower level), but more problems with the February event.

  - accurate meteorological input is a prerequisite for successful prediction of the occurrence of pollution episodes
  - good quality emission data is crucial. Particularly, information on local emissions becomes very important during stagnant meteorological conditions.

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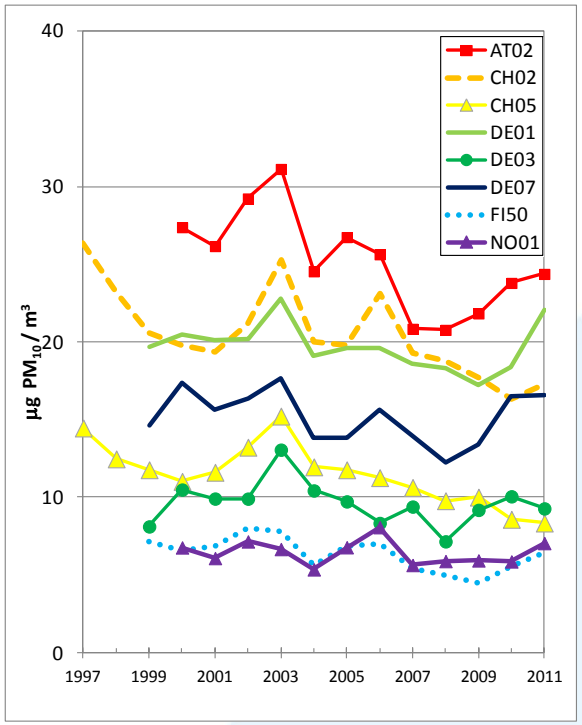
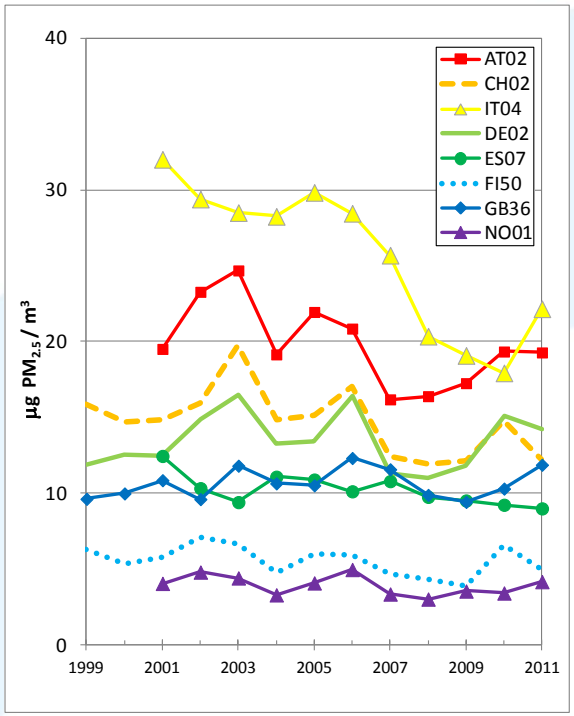
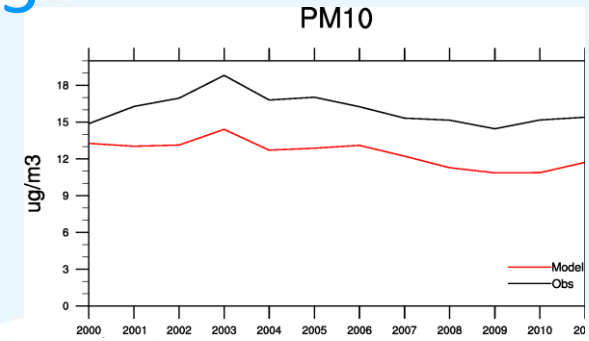
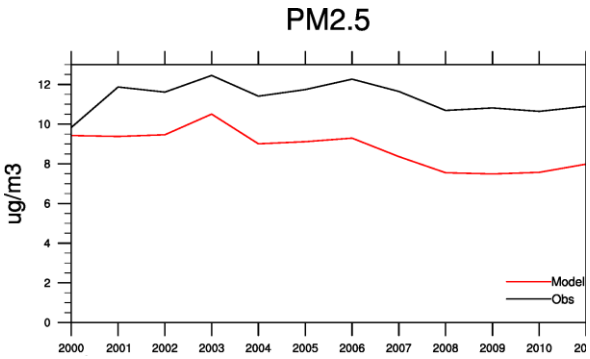
Trends in PM_{10} and $PM_{2.5}$





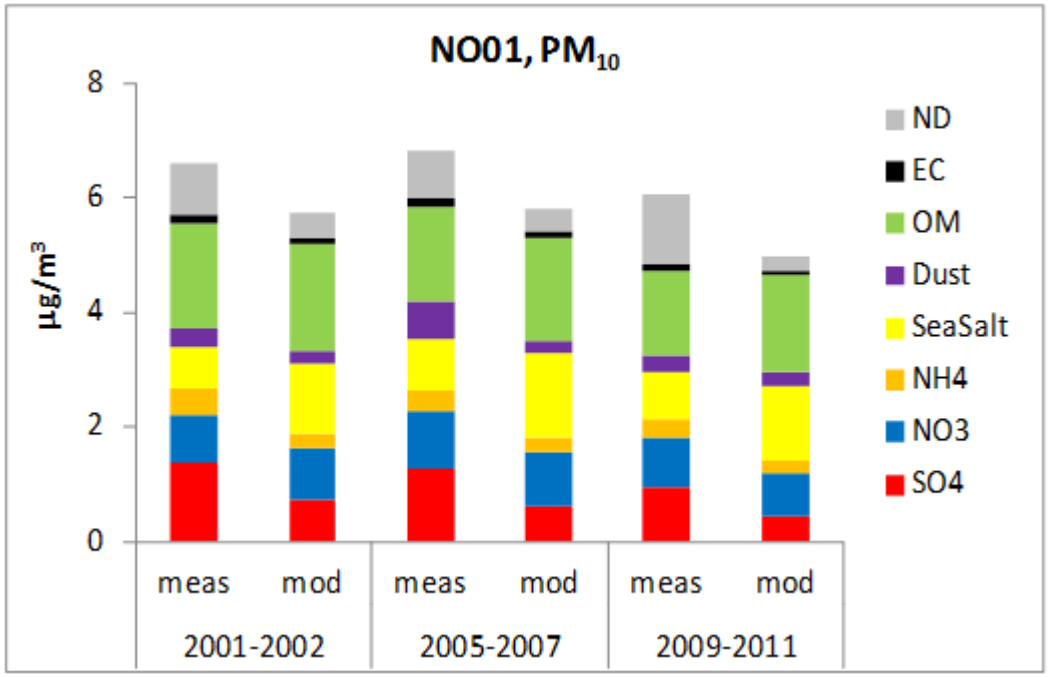


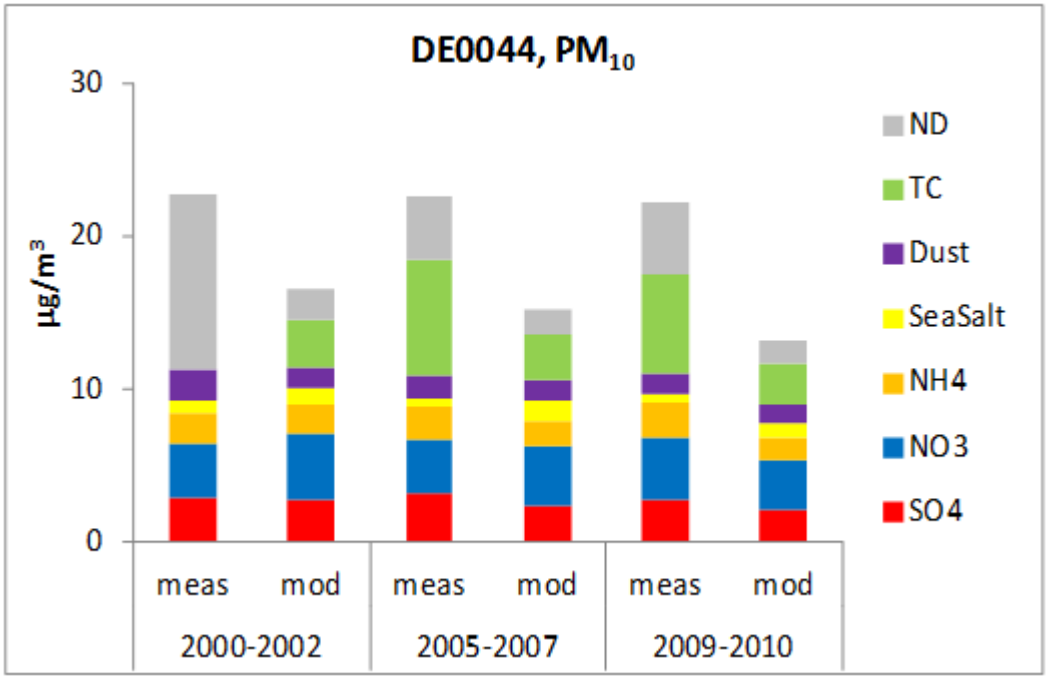


Trend analysis for 2000 to 2011 mass measurements (Mann Kendall test):

- PM10: an average decrease of 18% ±13%
  an annual loss in average mass of 0.29 µg/m3 pr year.
  56% of the 16 sites show a significant decrease,
- PM2.5: an average decrease of 26 ±16%,
  46% of the 13 sites show a significant decrease

These trends are also reflected in the model results, though a bias in total mass





Time series in chemical composition

- Few sites with long term measurements
- A significant reduction in rel. contr. of SO_4 to $PM_{2.5}$ and PM_{10}
- No clear picture for nitrogenor carbonaceous matter

EMEP intensive measurement periods (IMP)

To assist the implementation of the EMEP monitoring strategy, the Task Force of Measurement and Modelling (TFMM) has recommended conducting coordinated intensive measurements of more advanced character. These are done in close cooperation wit EU funded research projects

1 st Period

- 1 - 30 of June 2006
- 8 Jan -4 Feb 2007

2nd Period

- 17 Sep – 16 Oct 2008
- 25 Feb – 26 Mar 2009

3rd Period

- 8 June - July 17 2012
- 11 jan - 8 Febr 2013.

ACTRiS

PEGASOS
Pan-European Gas-AeroSOls-climate interaction Study

ChArMEx

emep

EARLINET

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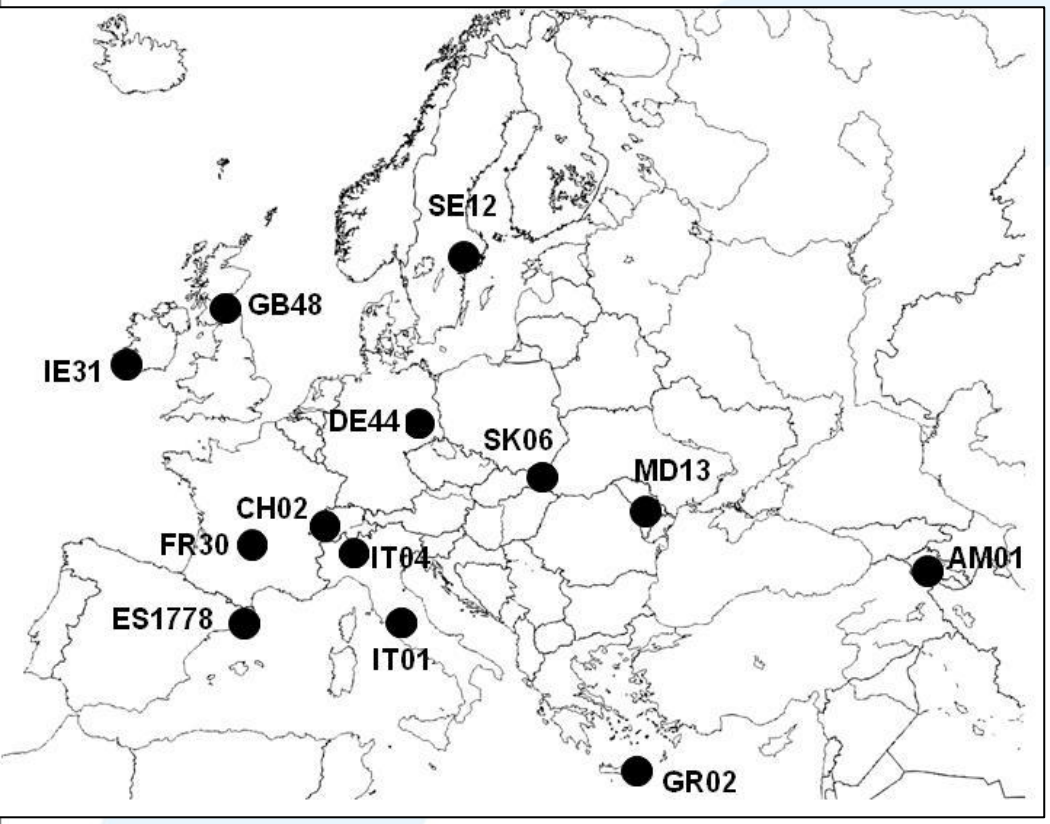
Parties	Station		Online chemistry	VOC	Org. tracers	Mineral dust
Armenia	AM0001	Amberd				X
Switzerland	CH0001	Jungfraujoch	(TOF) ACSM	GCMS		
Switzerland	CH0002	Paverne	HR-TOF AMS			X
Czech Rep	CZ0003	Kosetice	ACSM (winter)	X		
Cyprus		Avia Marina				
Germany	DE0044	Melpitz	ACSM: Marga			X
Germany	DE0043	Hohenpeisenberg	ACSM	GCMS/GCFID		
Spain	ES1778	Montseny	ACSM			X
Spain		Palma de Mallorca				ICP MS
Spain		Montsec				ICP MS
Finland	FI0050	Hyytiälä	ACSM. Marga	GCMS	X	
Finland	FI0096	Pallas	Marga	GCFID		
Finland	FI0007	Virolahti	ACSM			
France	FI0009	Revin	AMS-TOF	Various on/off	X	some
France		OPE / Andra at				some
France		Sirta	ACMS. Pils	PTRMS	X	some
France	FR0030	Puy de Dome		Various on/off	X	X
France		Cape Corse	ACSM. Pils	Various on/off	X	
Great Britain	GB0048	Auchencorth Moss	Q-AMS. Marga	X		X
Greece	GR0002	Finokalia	ACSM			X
Hungary	HU0002	K-Puzta				
Ireland	IE0031	Mace Head	ACSM	GCMS		X
Italy	IT0001	Montelibretti				X
Italy (EC)	IT0004	Ispra			?	X
Italy	IT0010	San Pietro	HR-Tof-AMS		X	
Latvia	LT0015	Preila				
Netherlands	NL0011	Cabauw	ACSM			
Norway	NO0001	Birkenes	ACSM	PTR-MS TOF	X	
Moldova	MD	Leova				X
Sweden	SE0011	Vavihill	HR-ToF-AMS	Tenax tubes	X	
Sweden	SE0012	Aspvreten				X
Slovakia	SK0006	Starina				X
22		32	19	13	8	18

EU FP7
ACTRIS

Speciation of PM_{10}, summer 2012



Mineral dust:
centralized lab using PIXE – laboratory in Florence.
- Scientific lead:
  Xavier Querol and Andrés Alestuey, CSIC

Inorganic ions (regular EMEP)

Carbonaceous
•EC/OC (EMEP)
•Carbonate (Lead by JP Putaud and Fabrizia Cavalli, JRC)

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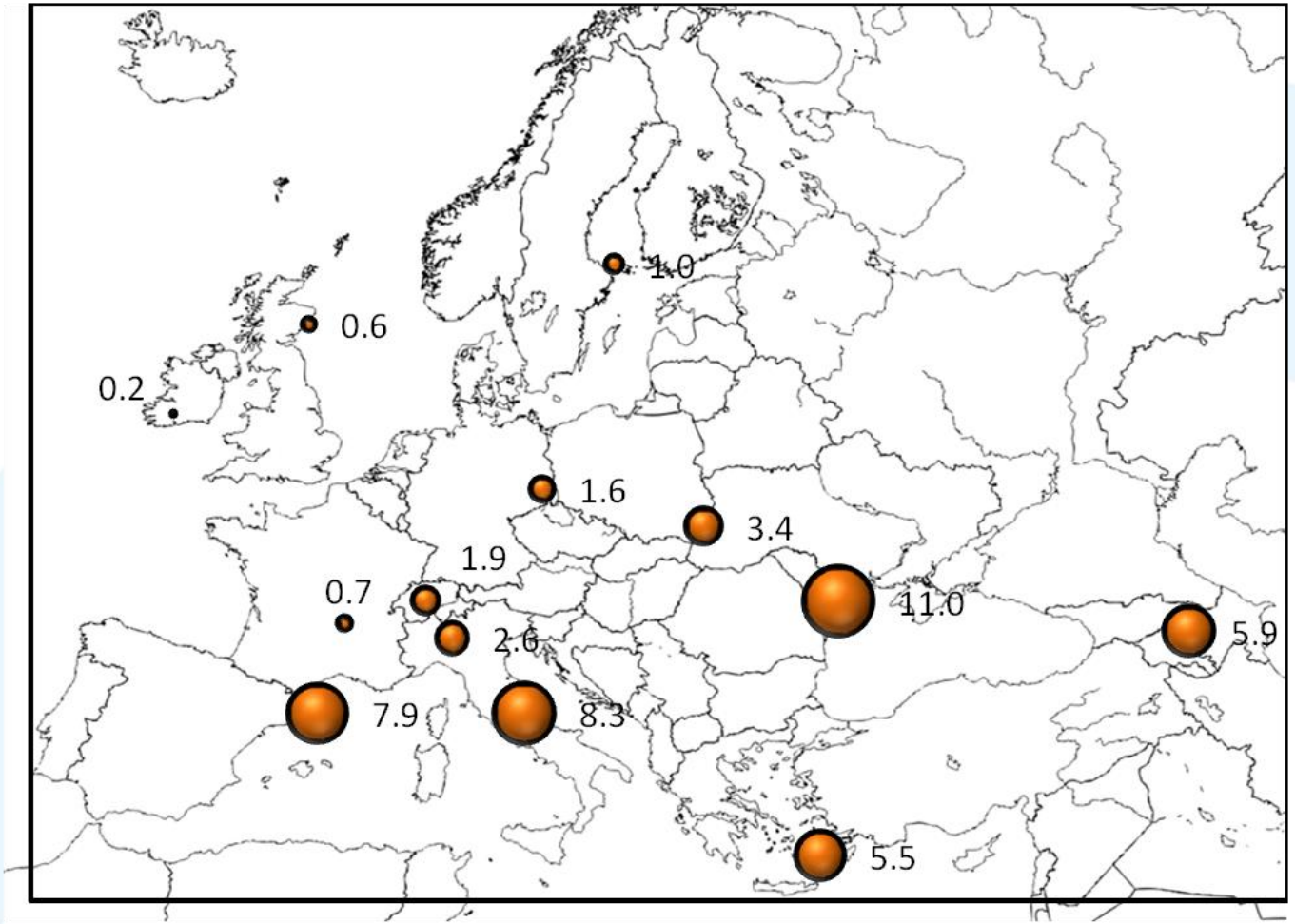
Mineral dust (june 2012) ($\mu g/m^3$)



Mineral load: obtained by the addition of the SiO_2, Al_2O_3, Fe_2O_3 concentrations, and the dust contribution of Na_2O, K_2O, CaO and MgO after the subtraction of their marine contribution from the bulk concentrations

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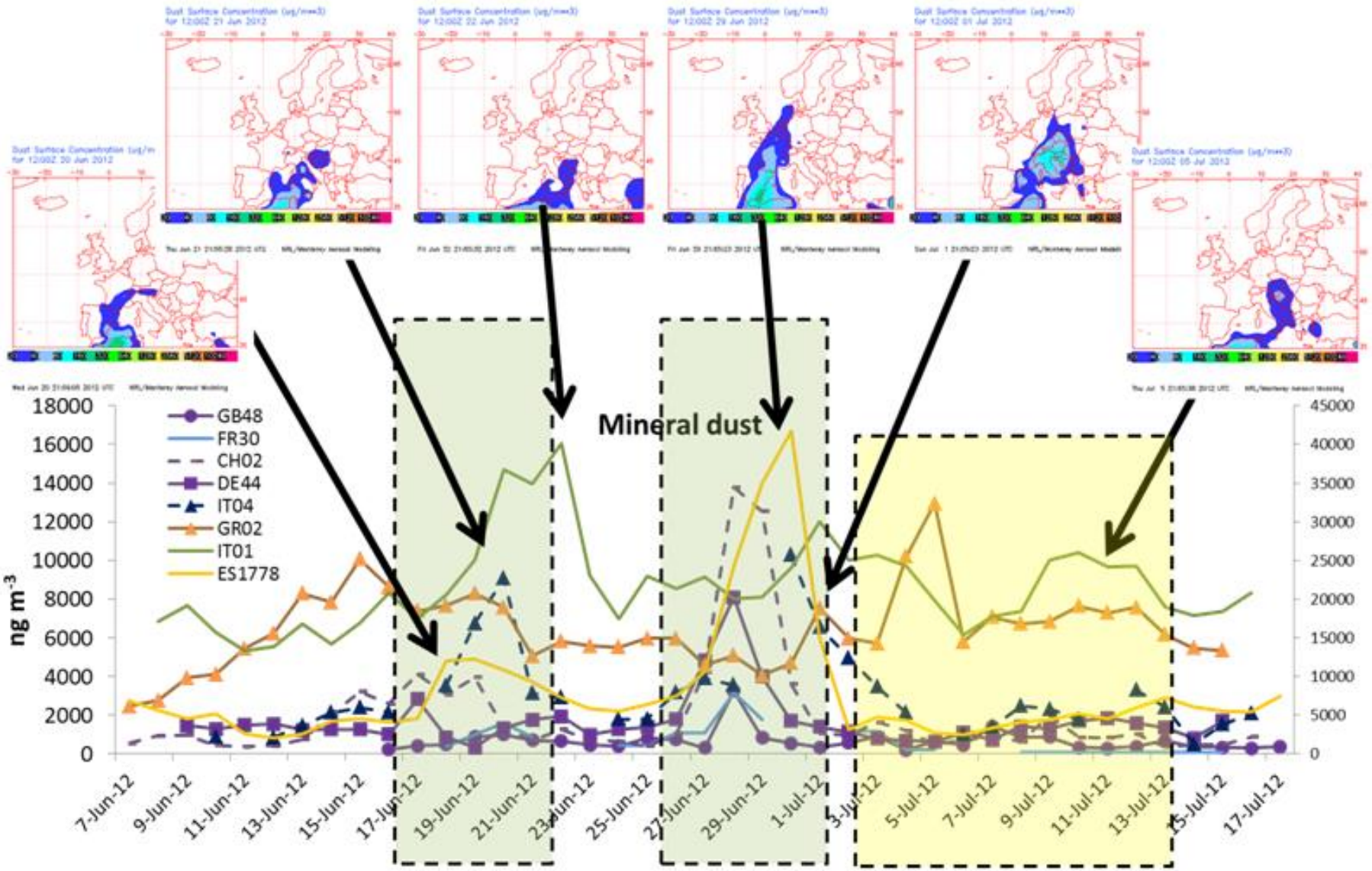
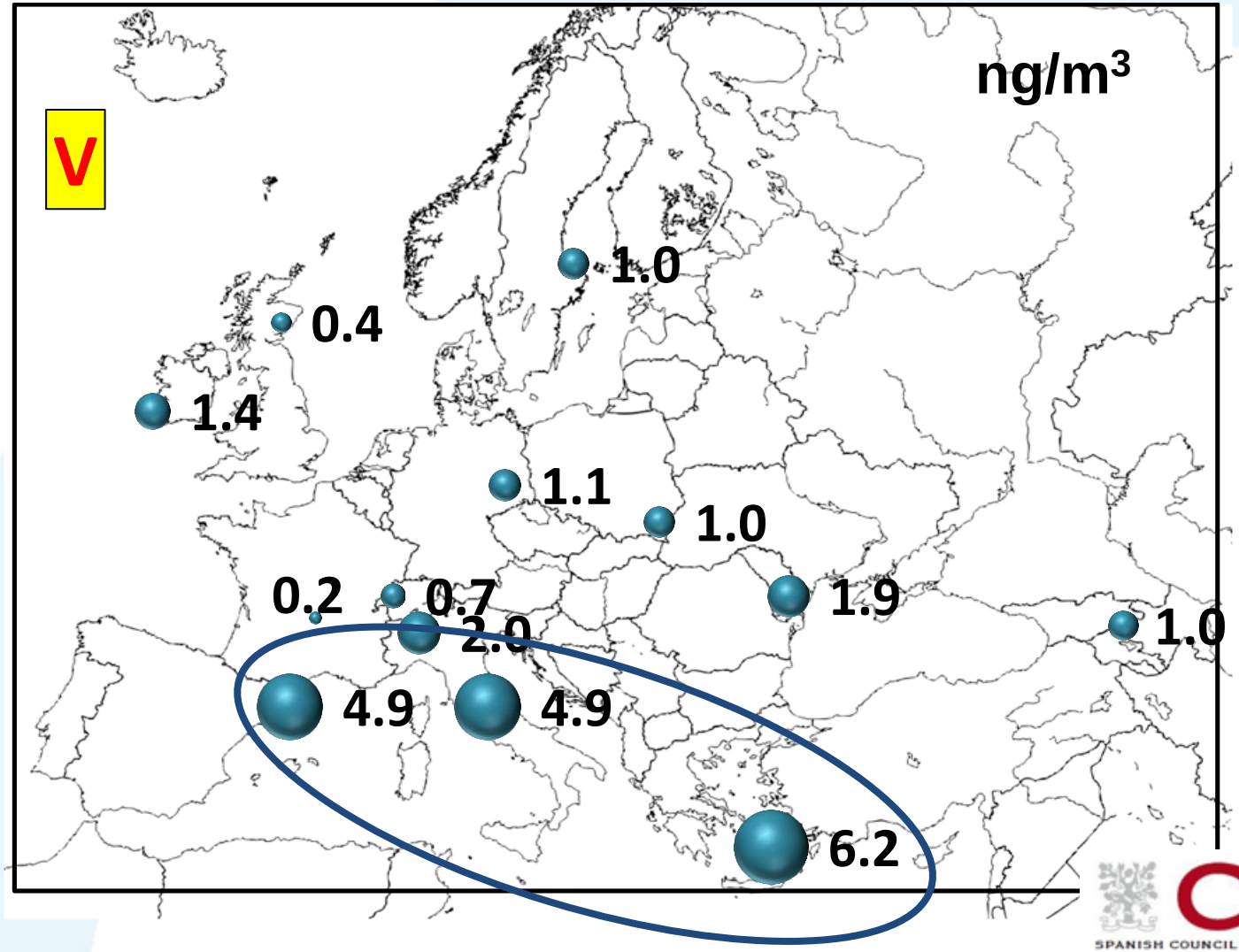
NAAP model : http://www.nrlmry.navy.mil/aeroso



Trace metals: fuel oil combustion



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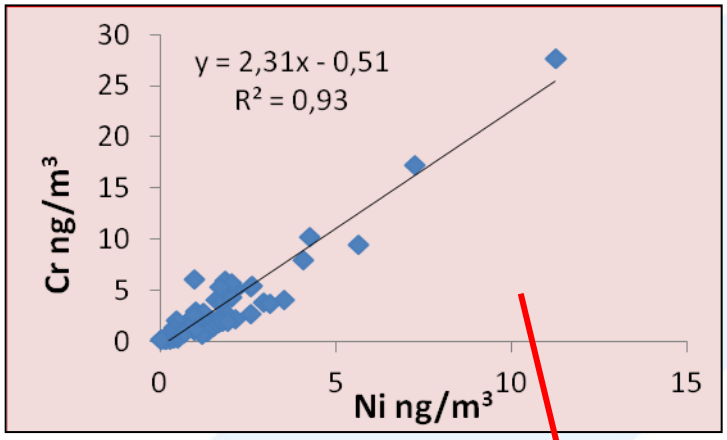
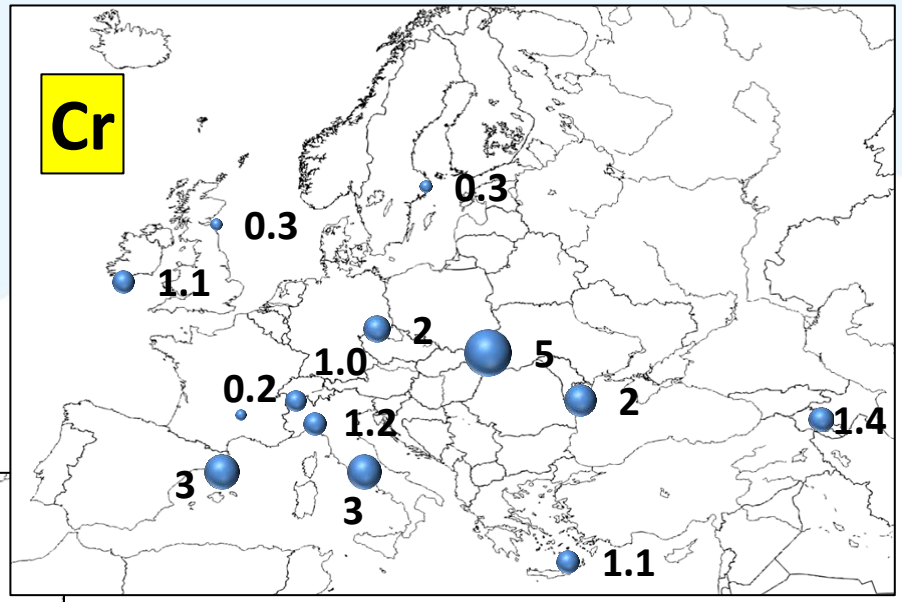
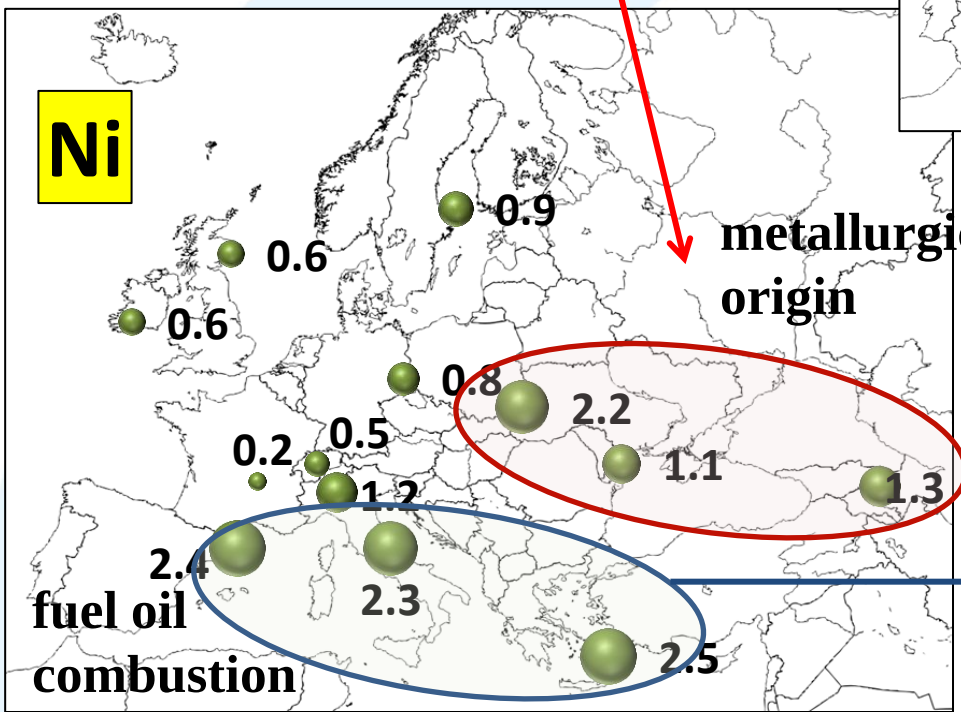
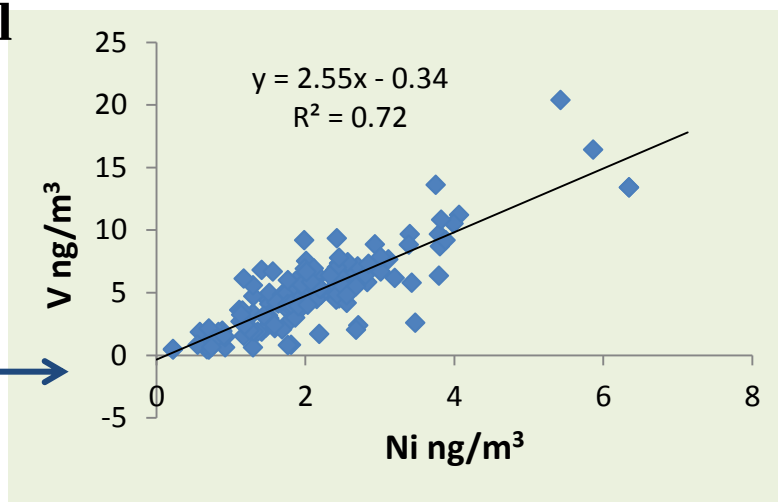
Trace metals: mixed origin



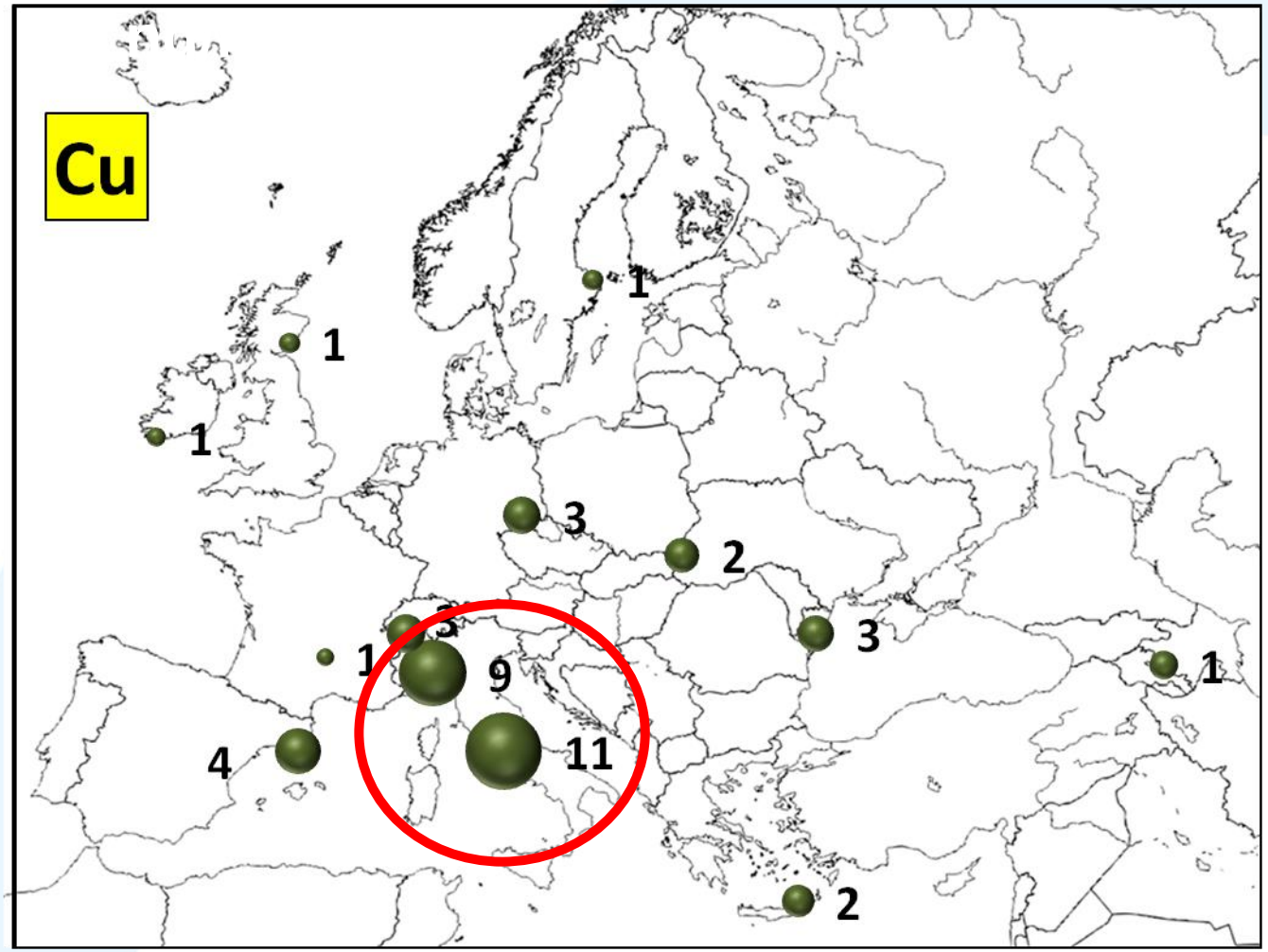




metallurgical origin



Trace metals: traffic origin



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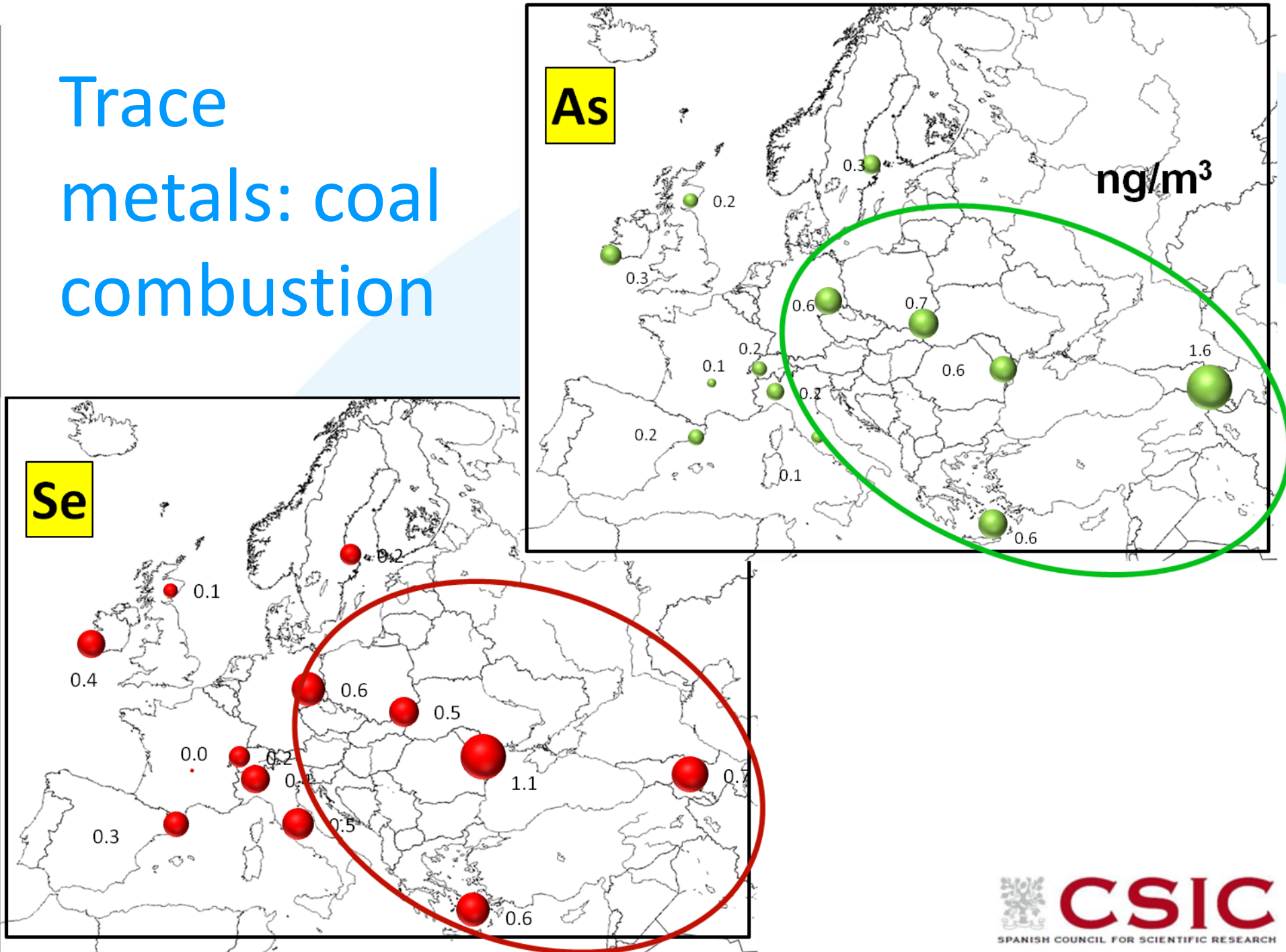
Trace metals: coal combustion



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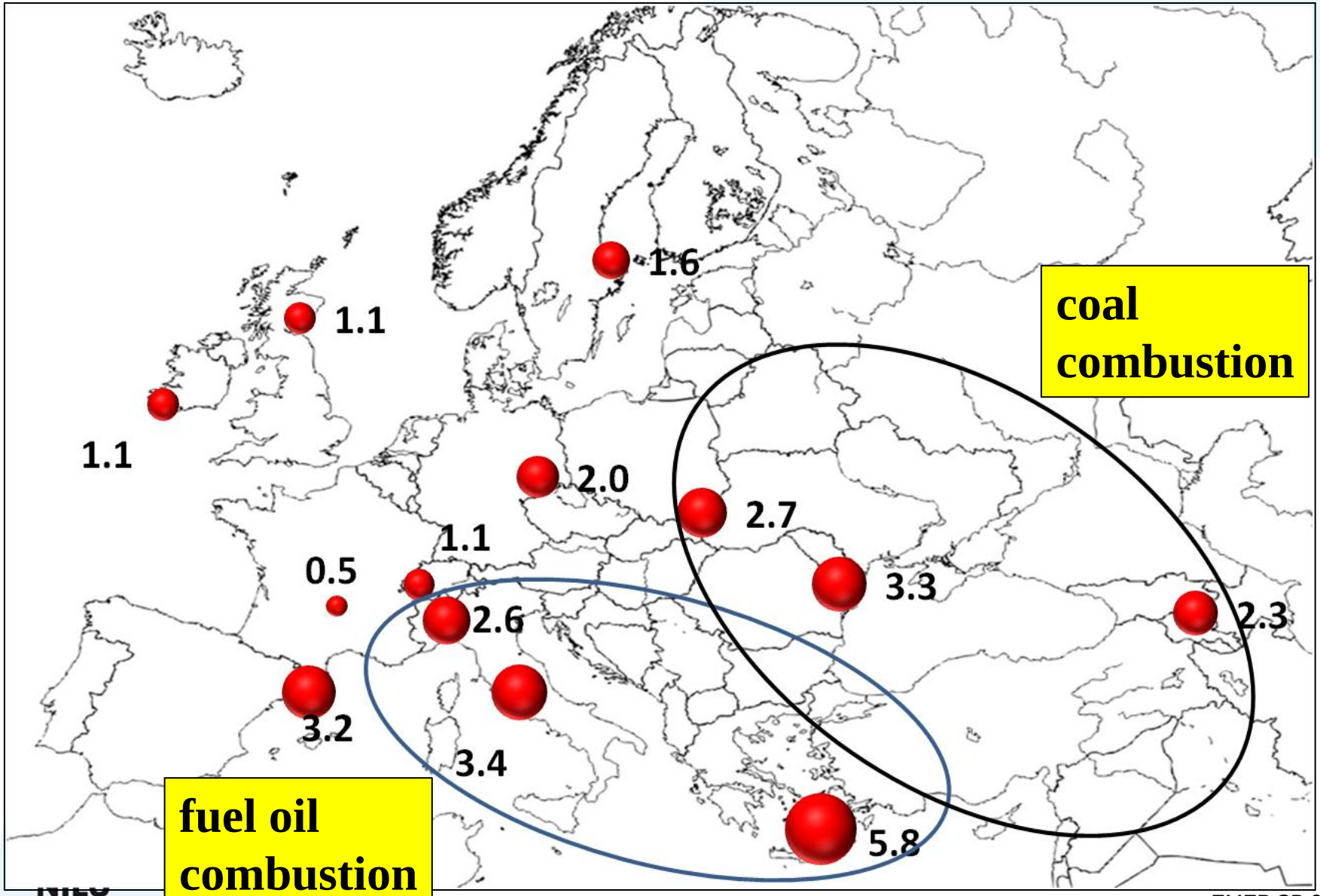
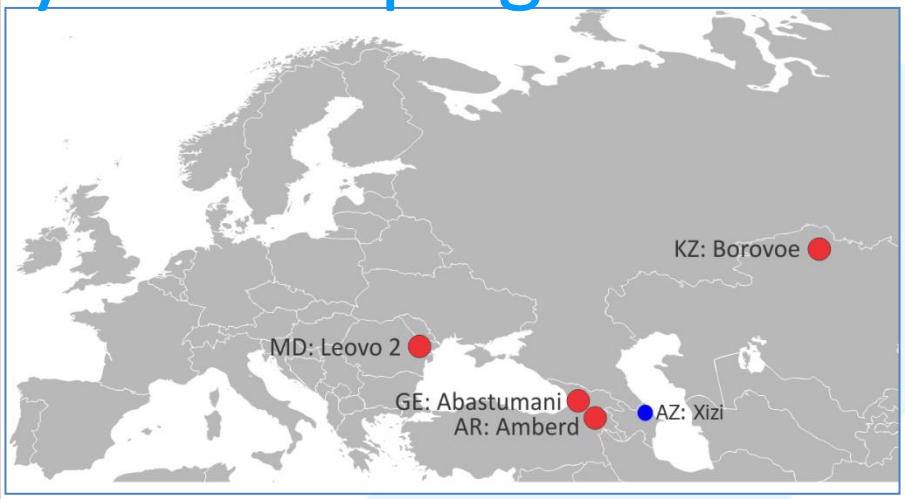
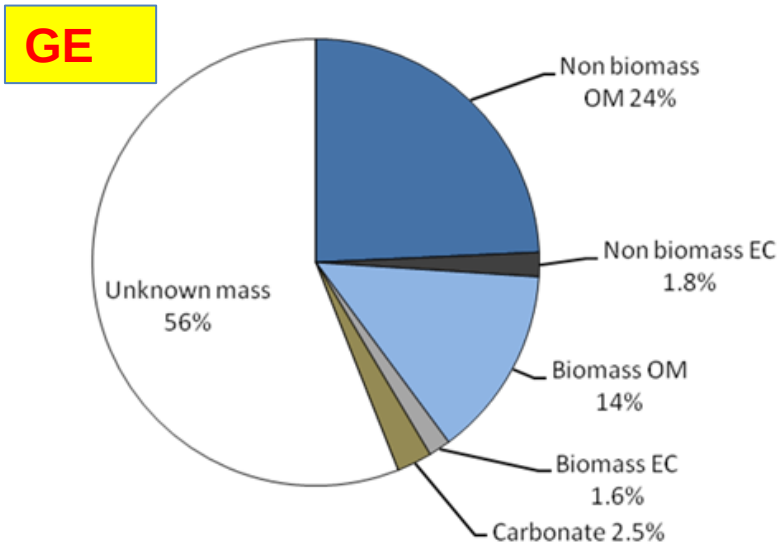
Sulphate


1.6
1.1
1.1
2.0
2.7
1.1
0.5
3.3
2.6
2.3
3.2
3.4
5.8
coal combustion
fuel oil combustion

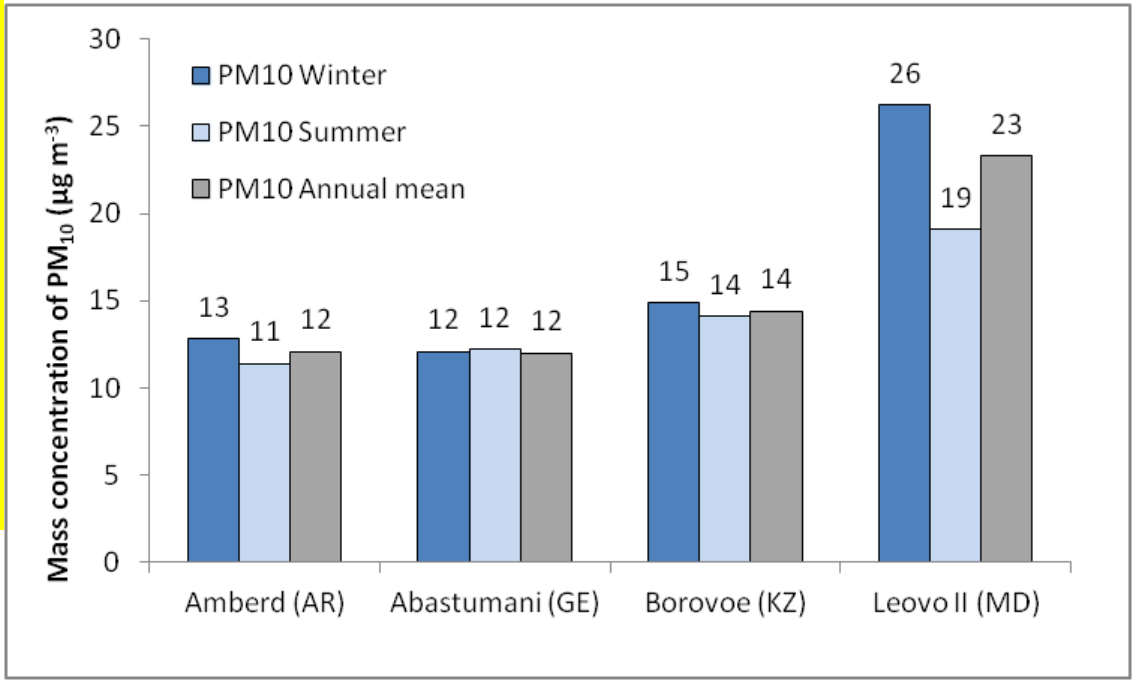
EECCA, PM_{10} and carbonaceous matter. One year campaign





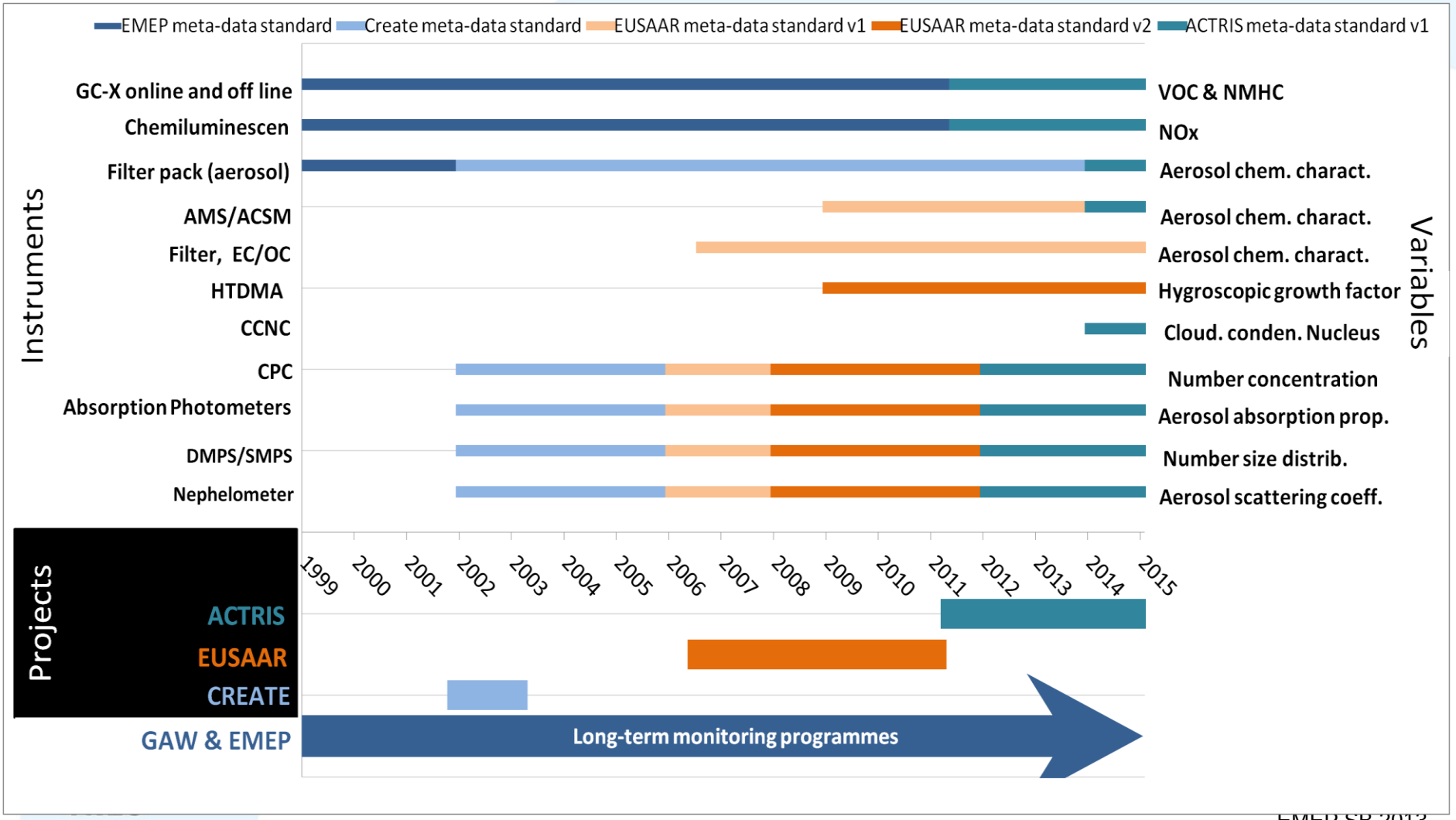
Positive tendency with more measurements from EECCA, though some challenges:

- ❖Lack of long term funding/commitments
- ❖Dependent on key personnel
- ❖ QA/QC issues. In the field work and reporting



Improvement in characterisation of atmospheric aerosol, measurements

new data format and reporting of data



Improvement in characterisation of atmospheric aerosol, modelling

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Knowledge of the size distribution of atmospheric aerosols is essential for estimation of aerosol climate effects and also health implications. The submicron particles contribute negligibly in PM10 and PM2.5 mass and should be described in terms of number concentration.

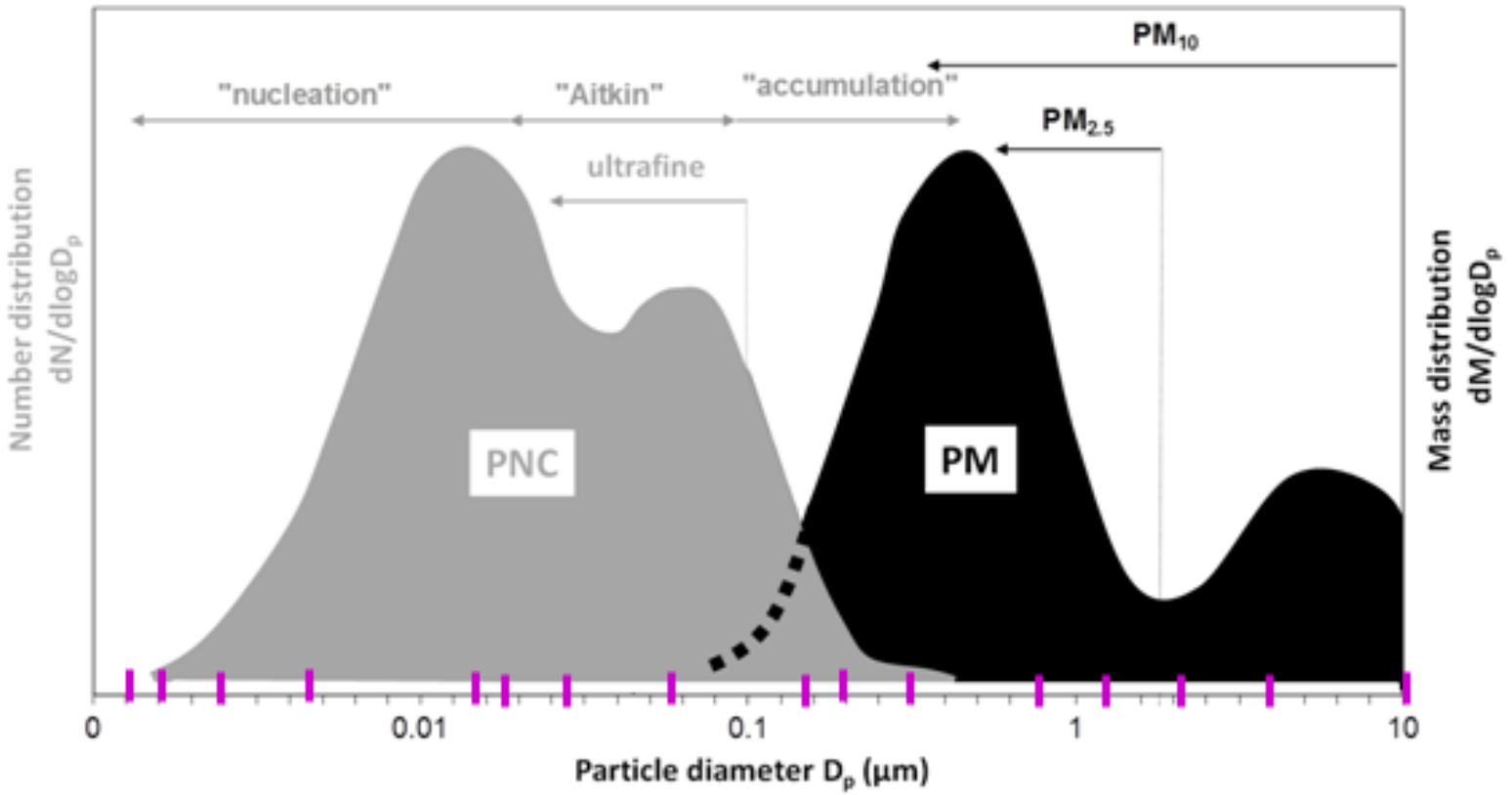
Taking the step from bulk to size-resolved aerosol description:

Modelling of size distributions with the EMEP-MAFOR model

Matthias Karl and Svetlana Tsyro

EAC 2013, Prague, 1-6 September 2012

PNC and PM size-resolved definition



Size distribution: 16 sections (pink tick-marks)

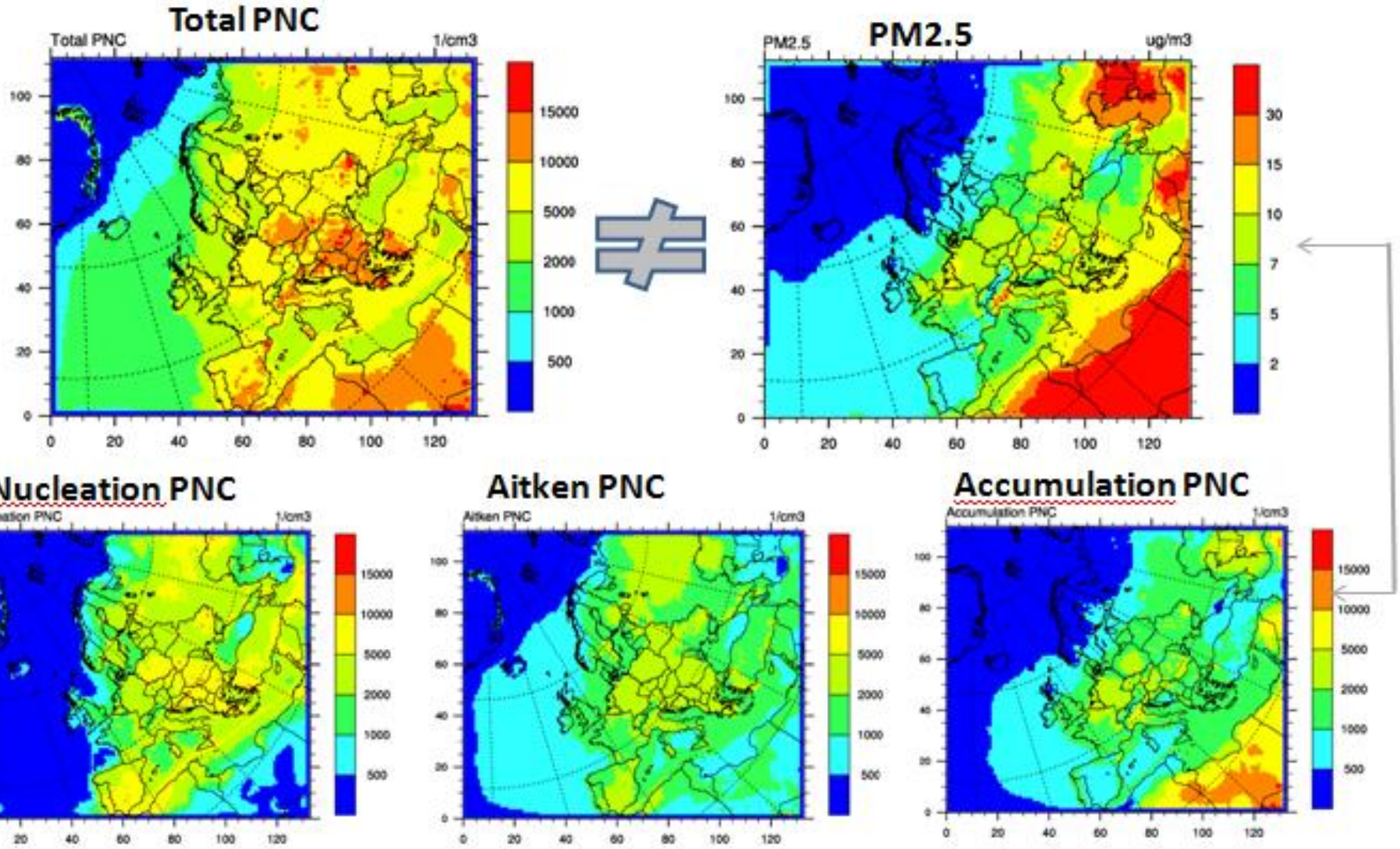
Aerosol Dynamic Processes:

nucleation, coagulation,
condensation of H_2SO_4 and Biogenic VOC

Norwegian Meteorological Institute

Model: particle number and mass concentrations

2008 mean



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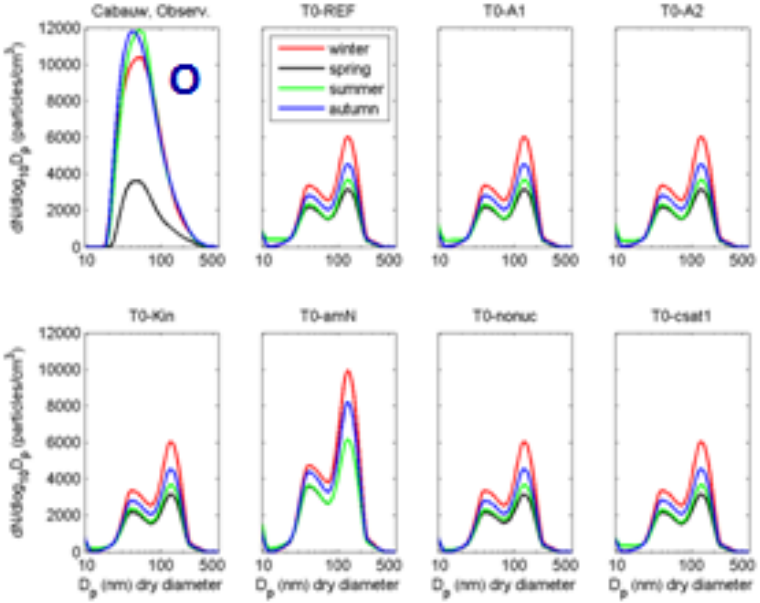
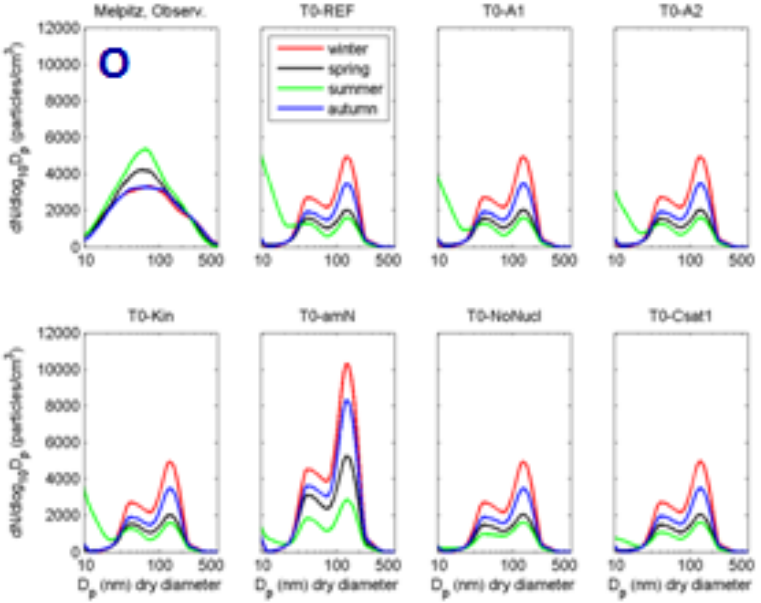
Particle size distribution: 2008 annual median

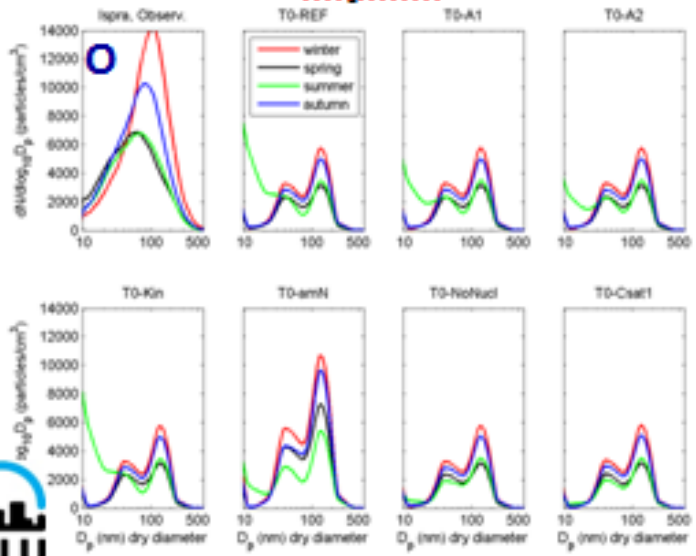
Cabauw



Melpitz



Ispra



MODEL (several sensitivity tests on nucleation and condensation) vs. **OBSERVATIONS** (O)

- Pronounced 2-modal size distribution (Obsereved – rather one-modal)
- Summer: too many particles <20nm (too frequent nucleation and too efficient growth due to BVOC)
- Larger PNC in win/aut then in spr/sum – *driven by anthoporenic emissions* (observed max – summer/spring)

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Work plan 2013-2015

❖**Data reporting and dissimination**

- ✓ Develop improved reporting templates for meta data documentation and dissemination

❖**QA/QC:**

- ➢ Revise and develop further the methodologies to be applied in monitoring atmospheric composition, Updated EMEP manual. In close cooperation with experts, i.e. in FP7 ACTRIS, CEN and WMO/GAW
- ➢ Assist Parties in implementing these new measurements.
- ➢ Training courses related to measurement activities, QA/QC

❖**Interpret and assess the observation data.**

- ➢ Much new data from intensive measurements to be used for evaluation and model development/evaluation
- ➢ Ensure strong links with scientific groups involved in level2 and level3 measurement activities

❖ **Model development on size distribution**

- improvement of nucleation parameterization
- improvement of SOA formation, including anthropogenic VOC
- implementation of size-resolved particle number emissions
- implementation of size-resolved ammonium nitrate formation

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New ideas on reporting

Presently the division between status report 1 (acid./eutro./photo.) and 4 (PM) cause problems due to much overlap

➢A need for change? A possible way forward:

1. Annual technical centre reports on measurement data, QA/QC, model output , country reports, source receptor etc on the year in question
2. Status report on thematic topic, i.e on SLCP. These does not necessarily have to be for a specif year and needs to be defined in due time to ensure proper assessment. One theme each year?

➢Ensure not double work/reporting but production of reports that the users wants