



Modelling and measuring aerosols at the Climate Change Unit

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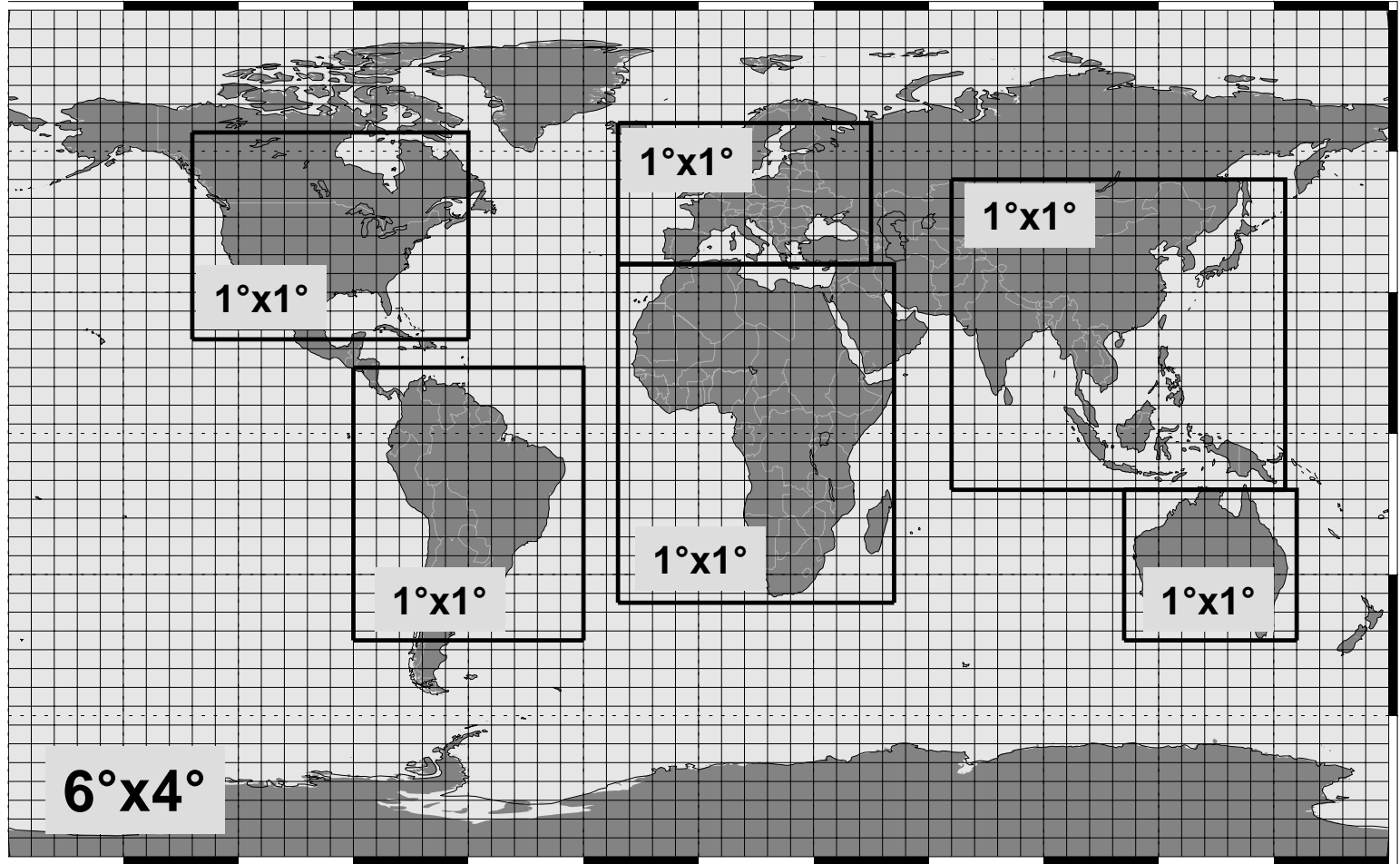
Aerosol modelling: TM5

- Offline atmospheric Chemistry Transport Model TM5 (Krol et al., ACP, 2005)
- meteorological fields from ECMWF
- two-ways nested zoom [global simulation $6^\circ \times 4^\circ$ and zooming $1^\circ \times 1^\circ$]
- Photochemistry, CBM4 chemical mechanism

Aerosols in TM5

- Inorganics (sulphate, nitrate, ammonium)
- Black carbon, Organic carbon
- Secondary Organic Aerosols
- Sea salt and dust

- Aerosol dynamics (M7, Vignati et al. 2004) (sulphate, BC, OC, sea salt and dust)



EMEP station

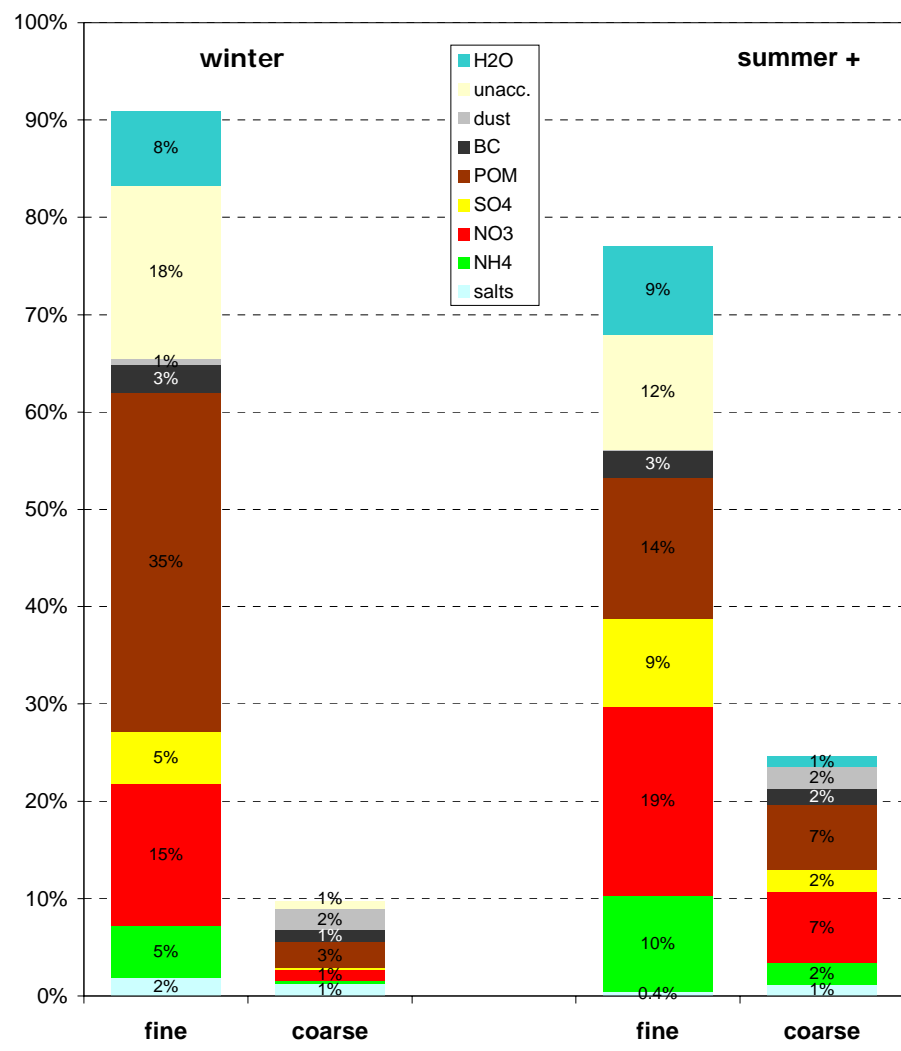
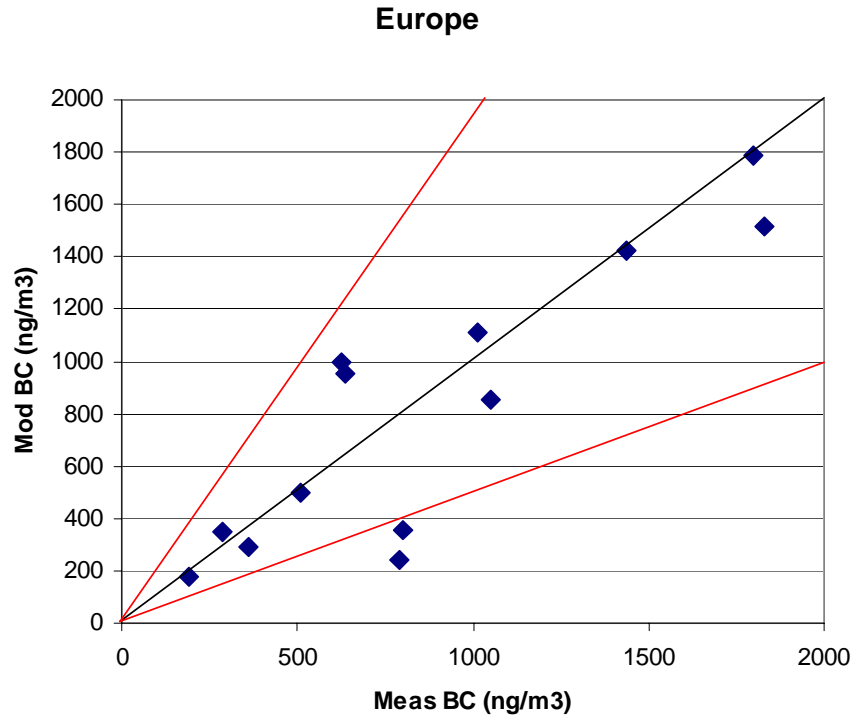
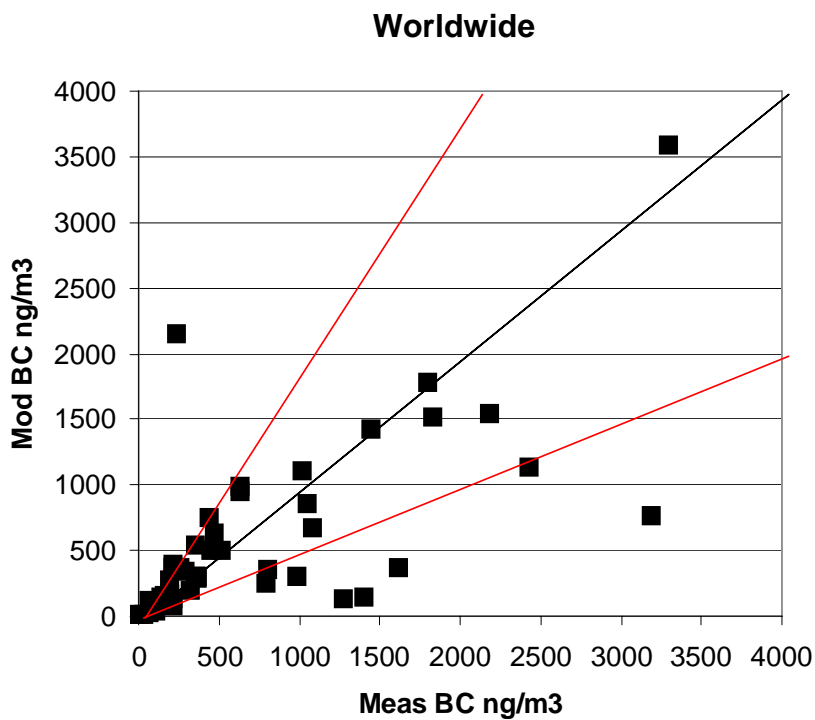


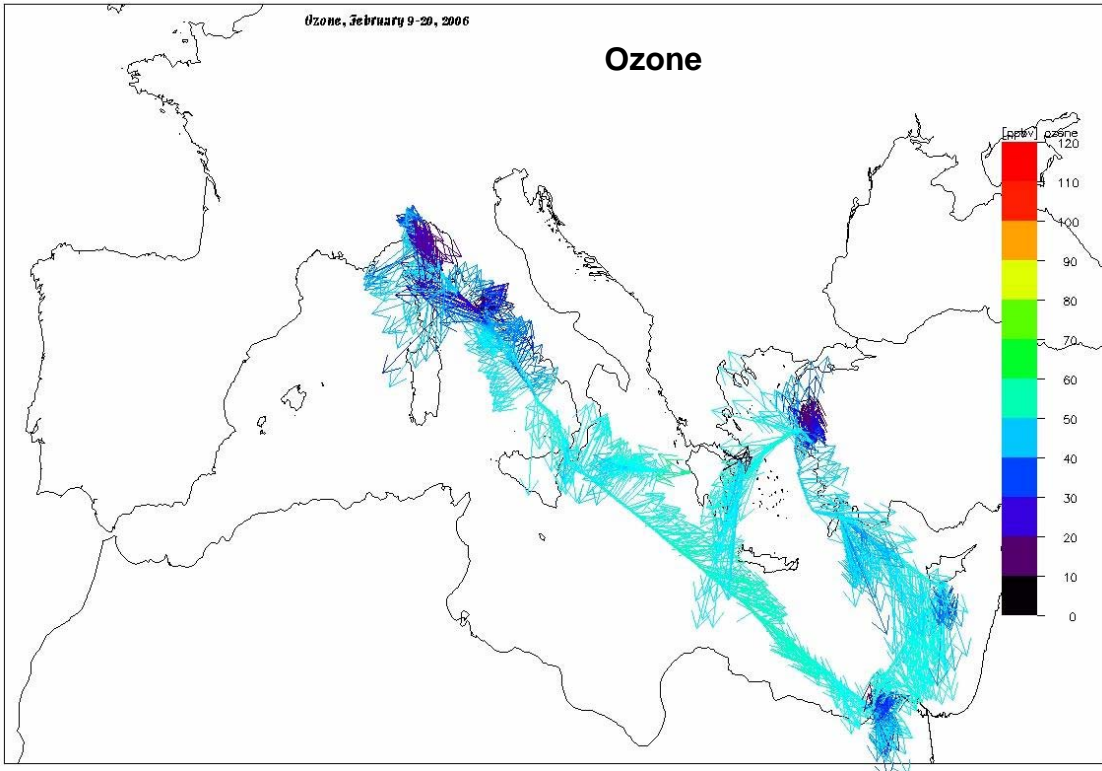
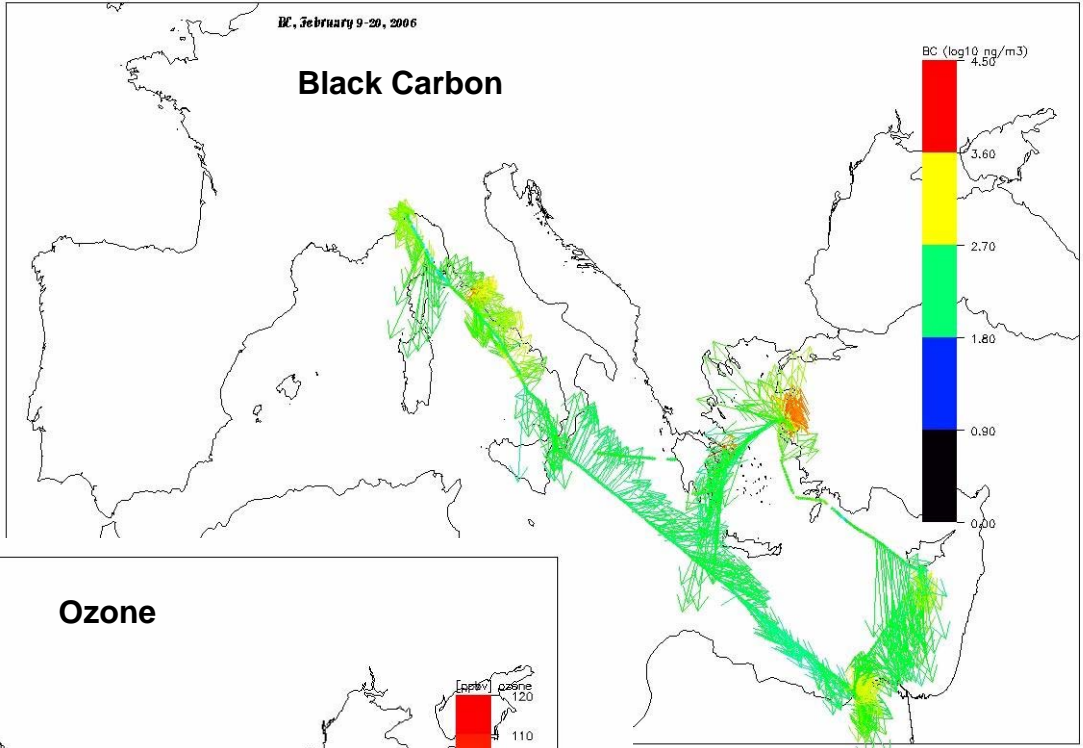
Fig. 17: average contribution of PM_{2.5} and PM_{coarse} to PM₁₀ mass concentrations determined from gravimetric measurements at 50% RH for days on which PM₁₀ > 50µg/m³, in winter (Jan., Feb., Dec.) and extended summer (Apr. – Oct.).

BC at global and European scale



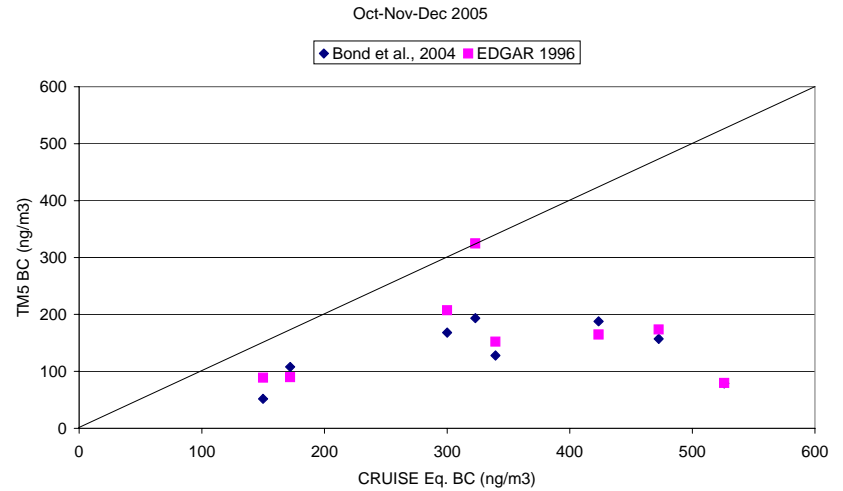
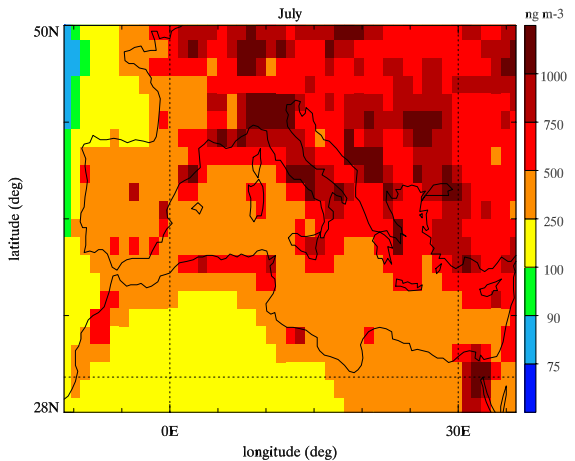
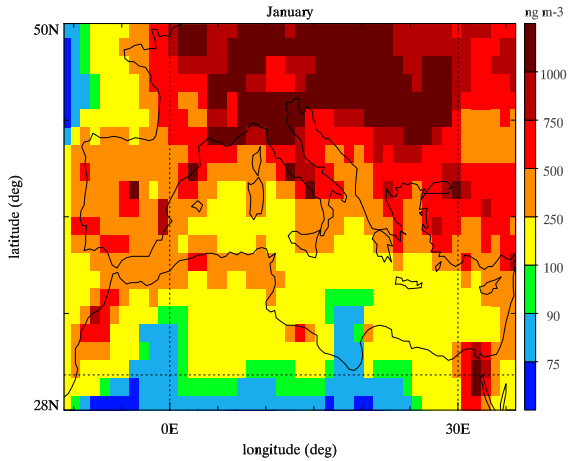
Anthropogenic BC: [Bond et al., 2004]
Biomass burning BC: [Van der Werf et al., 2003]

Ship measurements on Costa Crociera



Eastern Mediterranean,
February 9-20, 2006

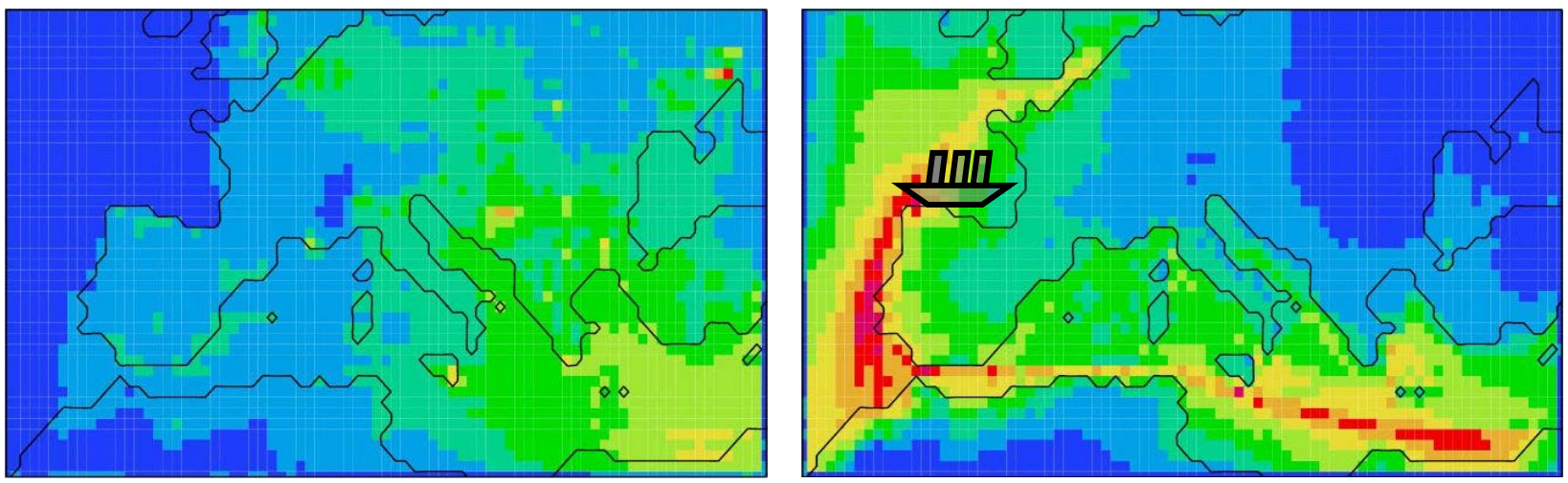
Modelled BC over the Med. Sea



REMOTE: Contribution of Ship Emissions

Partitioning SO_x emissions into land and water sources

Sulfate aerosol concentration, surface level, summer 2002



42% of surface sulfate from land emissions

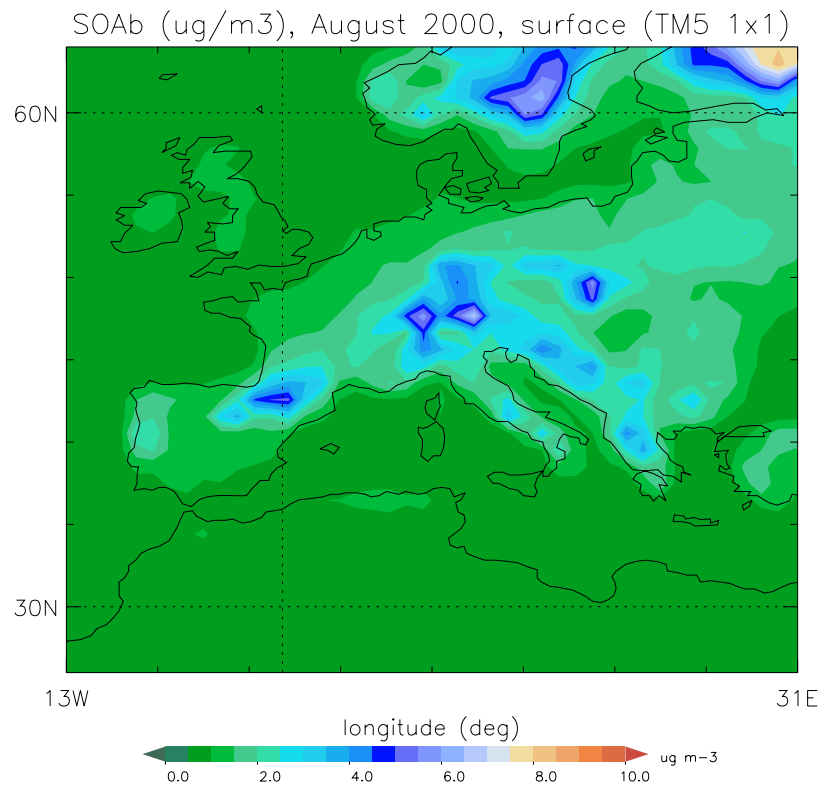
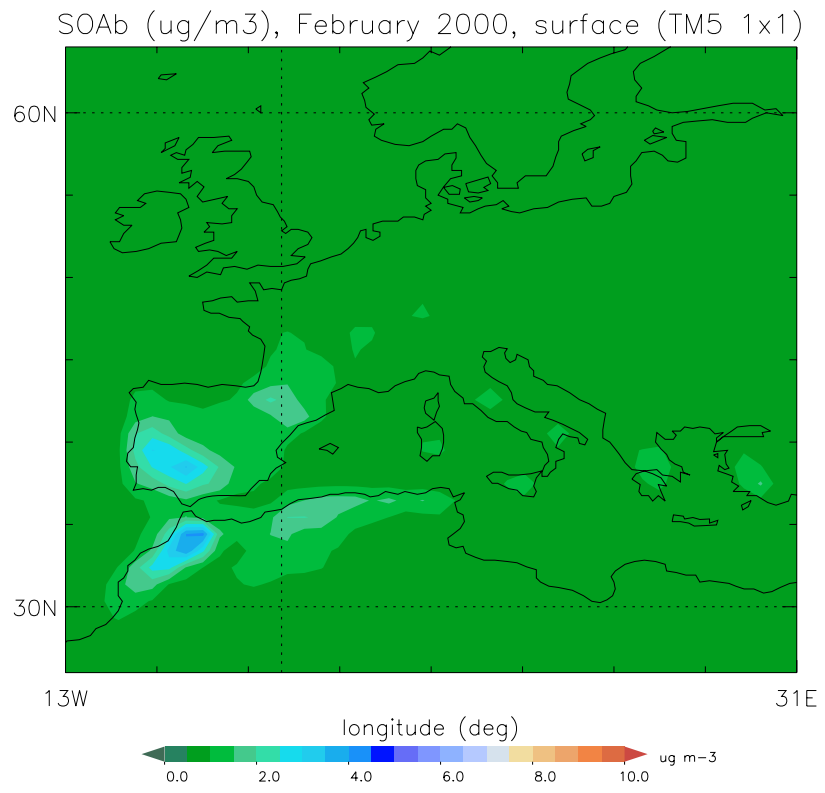
58% of surface sulfate from ship emissions

Marmer and Langmann, 2005

Biogenic SOA

(Tsigaridis and Kanakidou, ACP, 2003)

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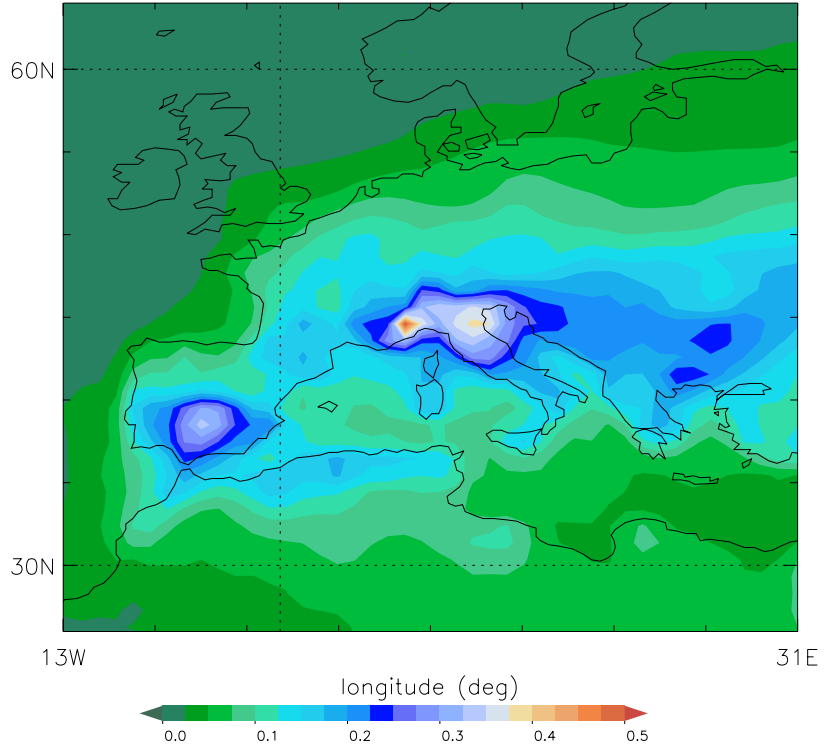
BVOC: GEIA [Guenther et al., 1995]
Anthropogenic BC/POC: [Bond et al., 2004]
Vegetation fire BC/POC: [Van der Werf et al., 2003]

Anthropogenic SOA

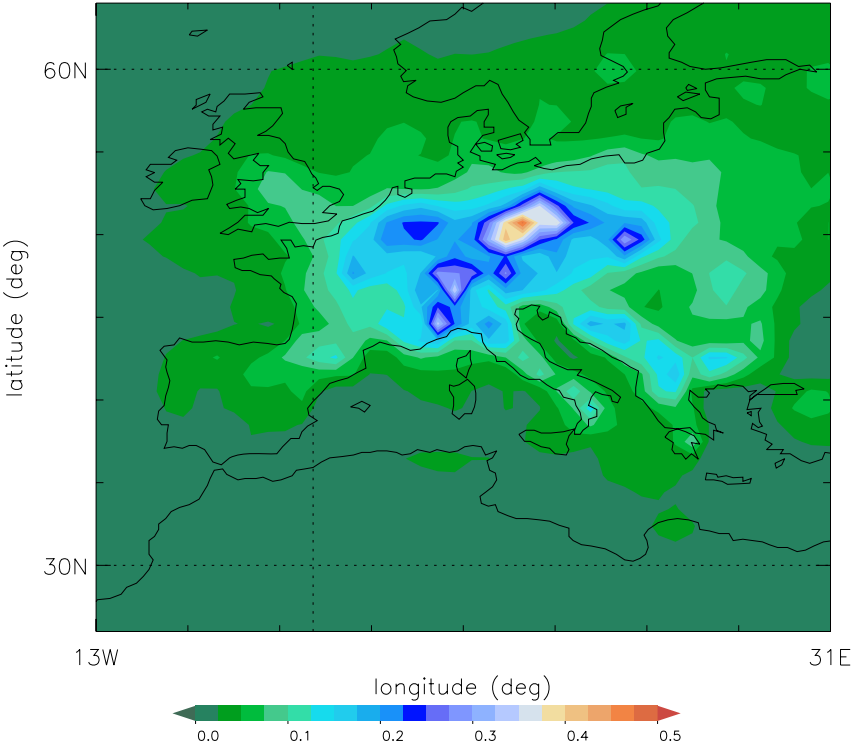
(Tsigaridis and Kanakidou, ACP, 2003)

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SOAa (ug/m3), February 2000, surface (TM5 1x1)



SOAa (ug/m3), August 2000, surface (TM5 1x1)

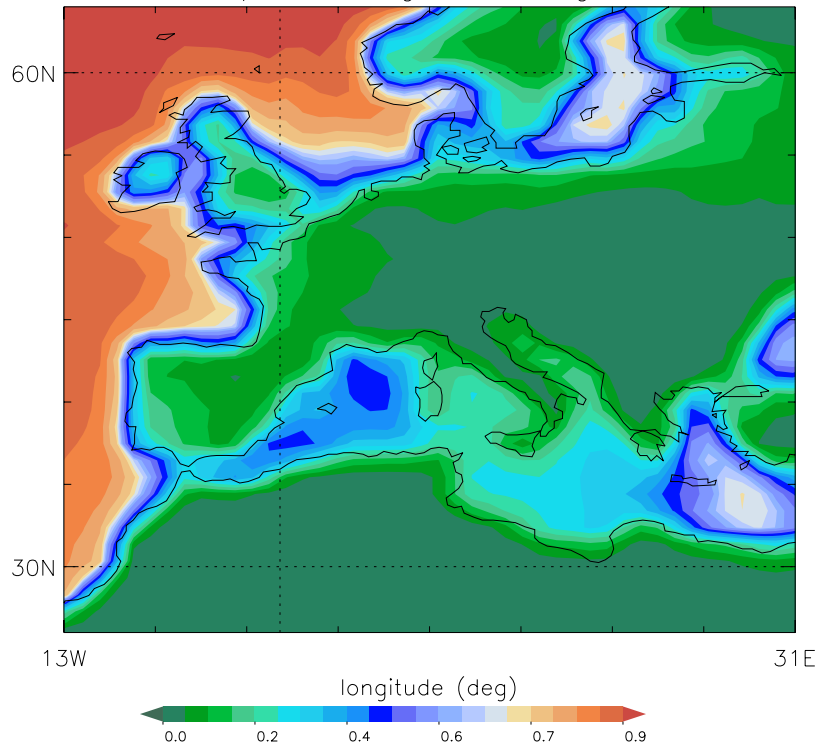


AVOC: EDGAR v 2.0 [Olivier et al., 1996]

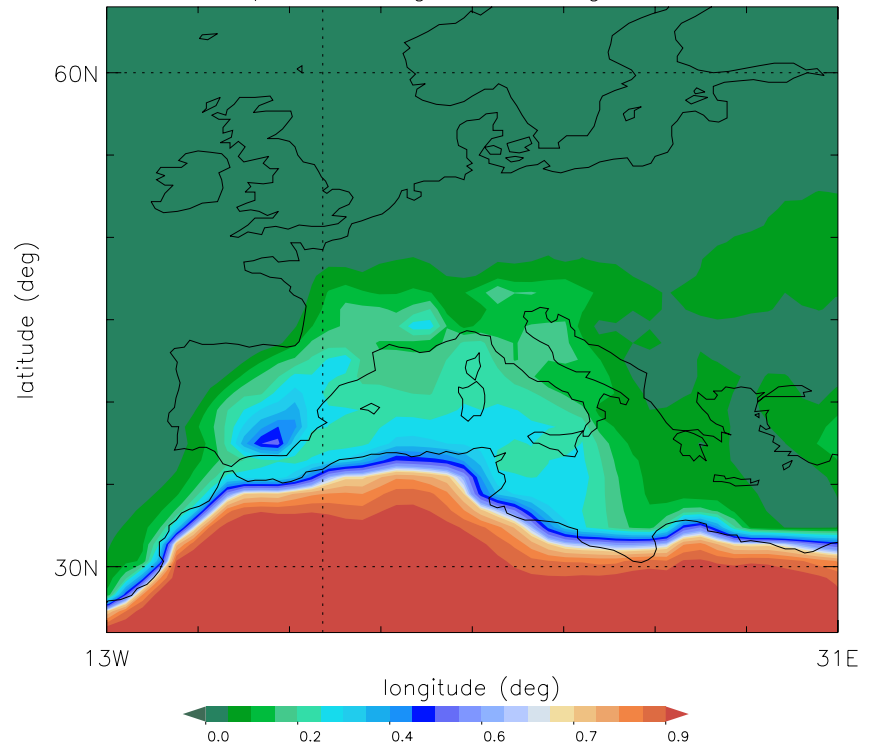
Sea salt and dust

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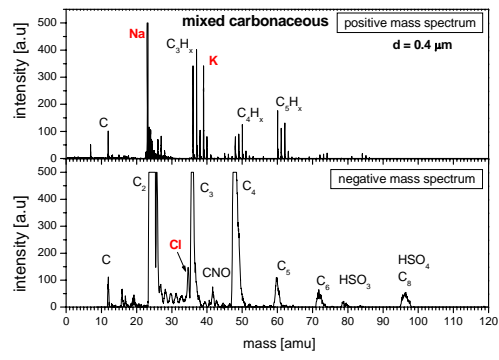
SEA_SALT/PM10, August 2000, ground level



DUST/PM10, August 2000, ground level

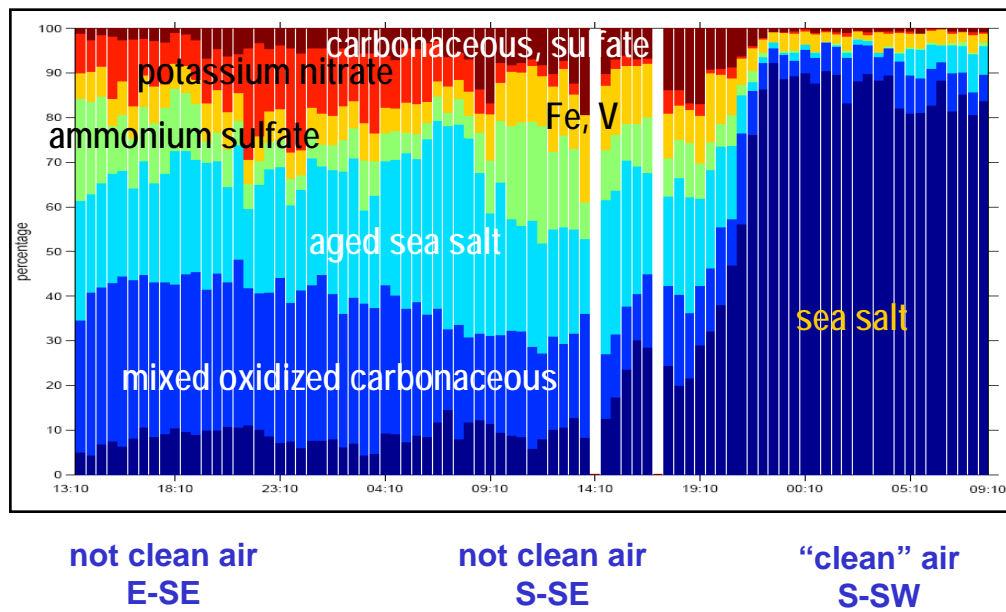


SPASS



Sea salt (fresh & aged)	72 %
Carbonaceous	15 %
- mixed with sea salt	2 %
- oxidized, mixed with K, Na, sulfate, NH ₄	11 %
- mixed with sulfate, K	2 %
K, small Na	11 %

timeline of particle classes



Aerosol composition (300nm – 3µm, particle numbers) as analyzed with the SPASS for **clean sector periods**.

MAP project