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Regional Modelling of Organic Aerosols
Contribution of MET.NO

David Simpson

Norwegian Meteorological Institute and Chalmers Radio & Space Science

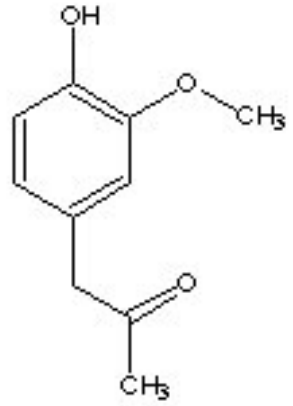
The EMEP SOA model

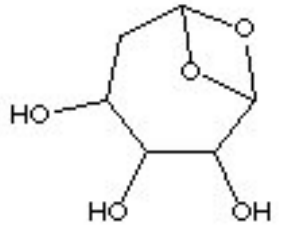
- Components:
  - POC: Primary emissions
  - ASOA: Anthropogenic SOA (from aromatics)
  - BSOA: Biogenic SOA (from terpenes)
  - BGND: Background OC (mix of oil/wood/BSOA)
- Gas/Particle partitioning (Pankow/Kamens-type approach.)
- Detailed α-pinene scheme (Kamens et. al, 1999, Andersson-Sköld and Simpson, 2001).
- 2-product scheme for aromatics (3-methyl-2,5-furandione, tolualdehyde, c.f. Ansari+Pandis, 2000).

EMEP model, cont.

’Explicit surrogate’, e.g. from wood-combustion

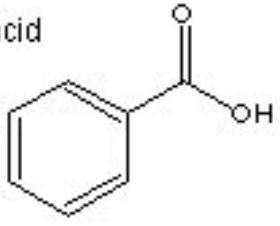
Guaiacyl acetone





Levoglucosan

Benzoic acid

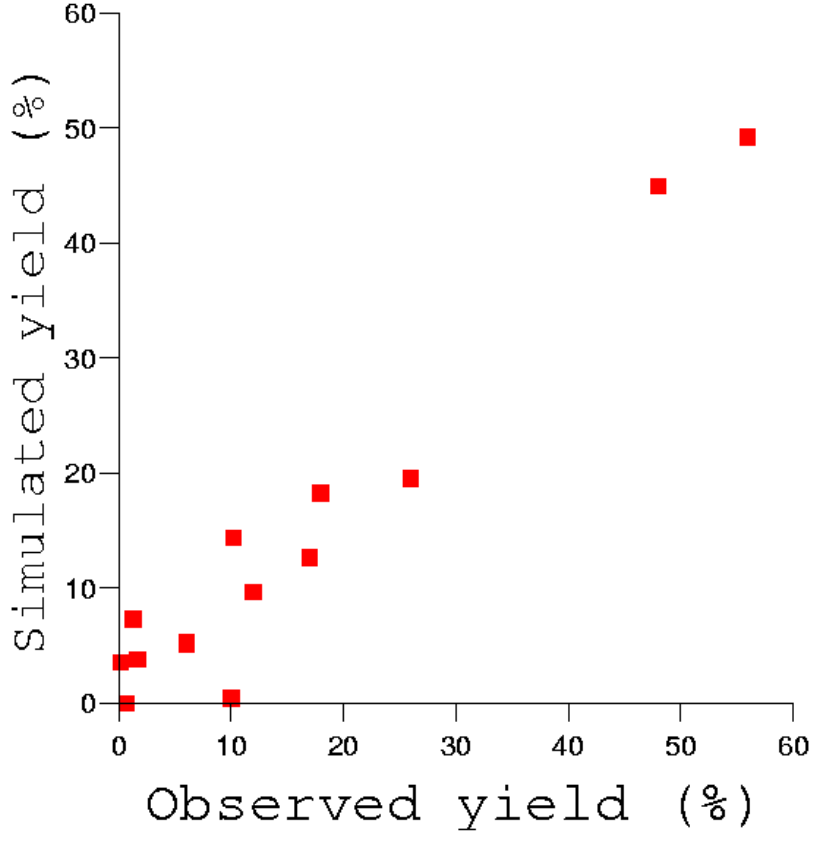


palmitic acid

(hexadecanoic acid)

EMEP model, cont.

Gas/Particle partitioning + detailed α-pinene chemistry.
Evaluated against smog-chamber



EMEP SOA Model:

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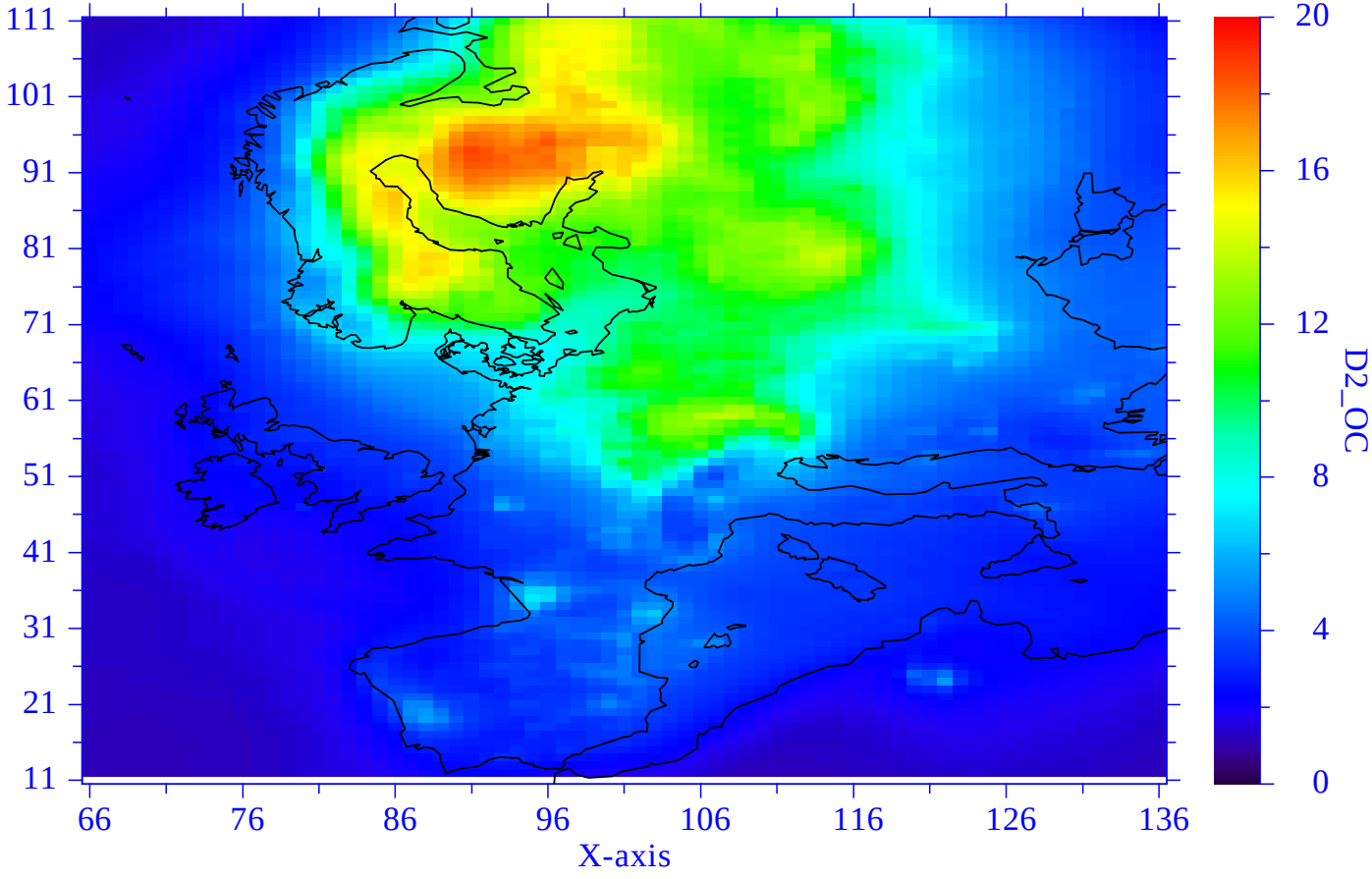
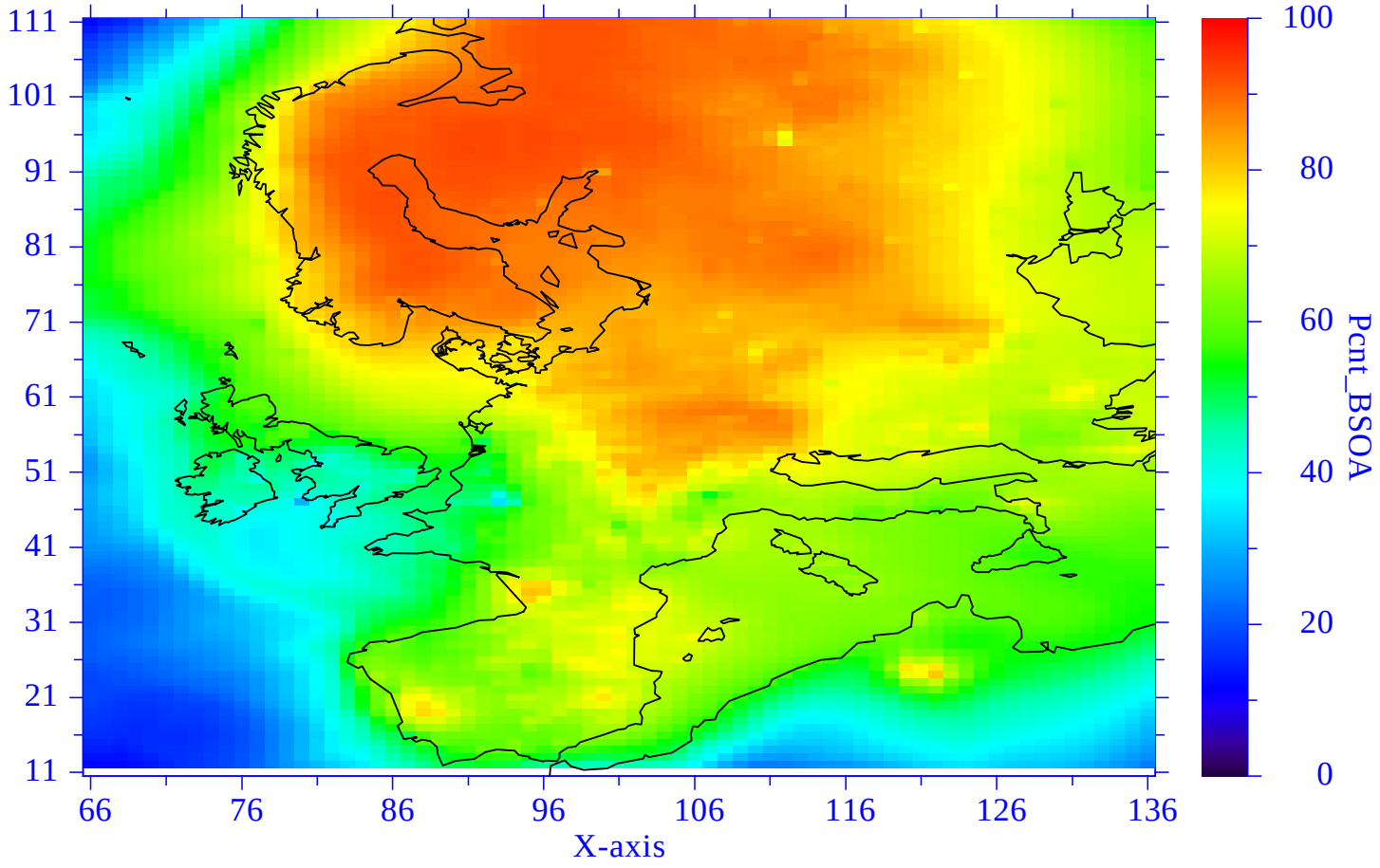
Results: Annual Average OC, year 2002 (ug/m3)



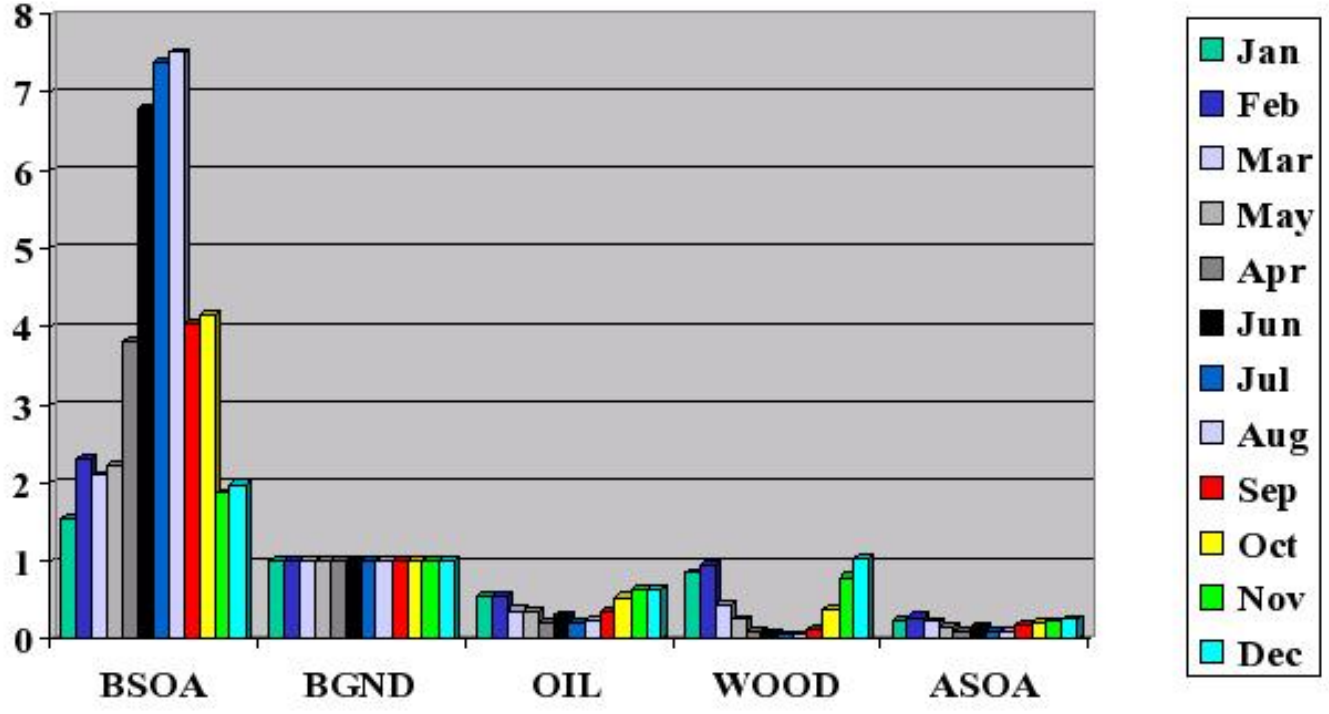
BSOA contribution

BSOA/OC (%)



Seasonal contributions:

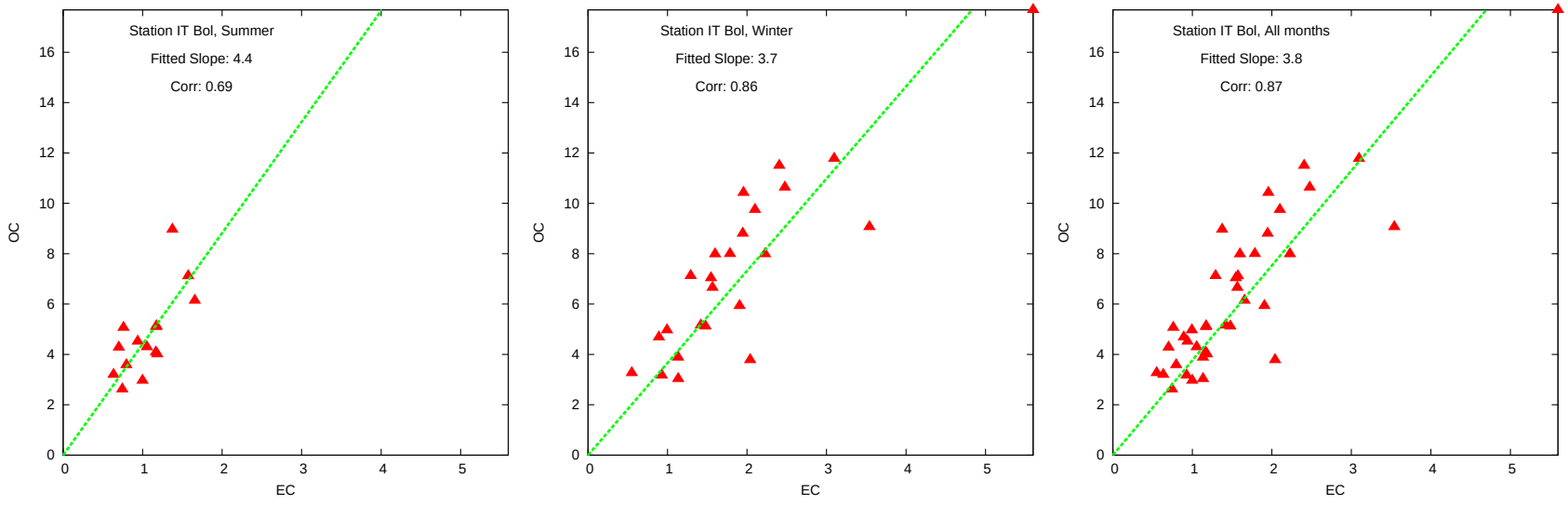
K-Puzsta, Hungary:



Note: The BGND contribution is held fixed in the model.

Summer max in Obs.?

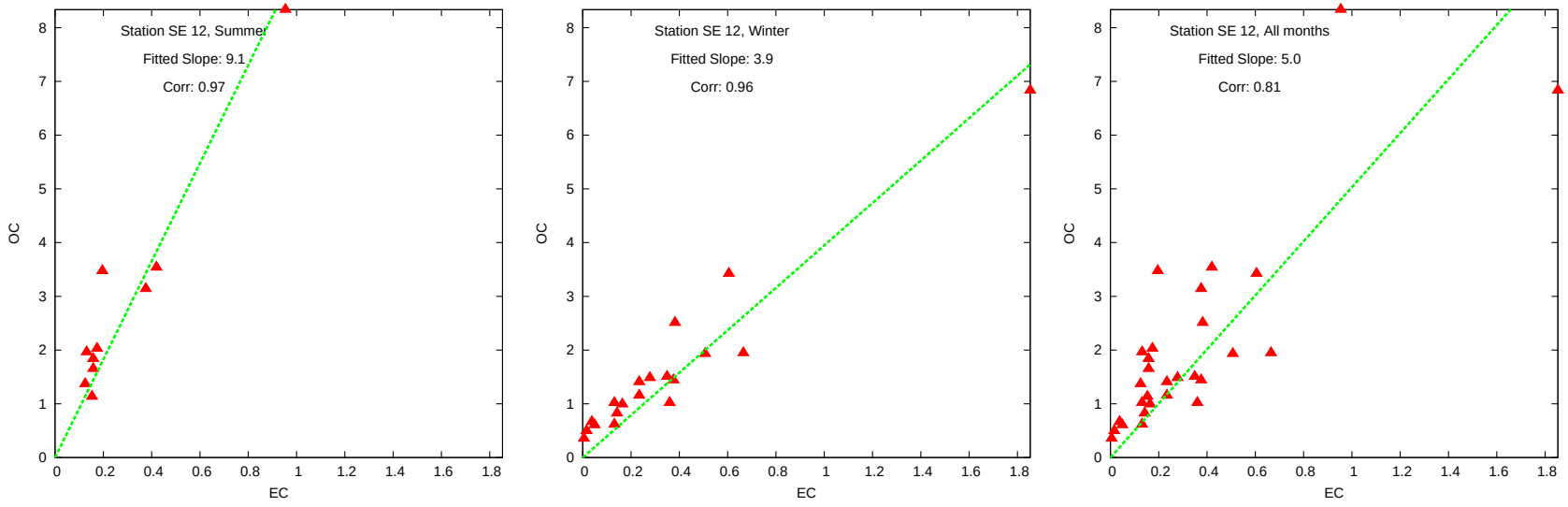
Belogna, Italy:



Not here! Slope very similar in all seasons.

summer max, cont.

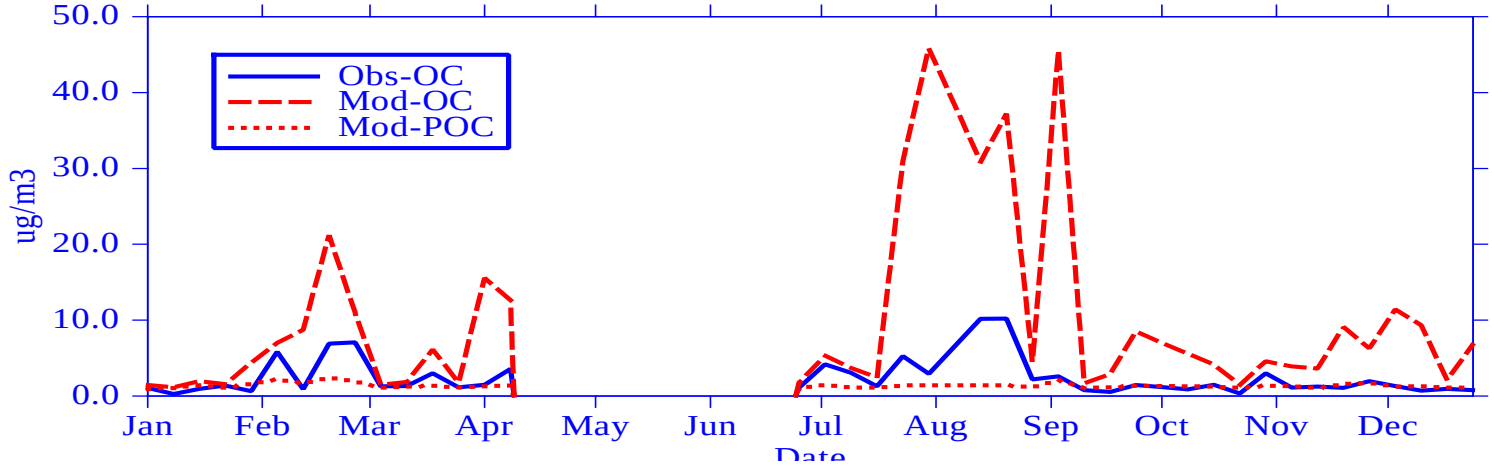
Aspvreten, Sweden:



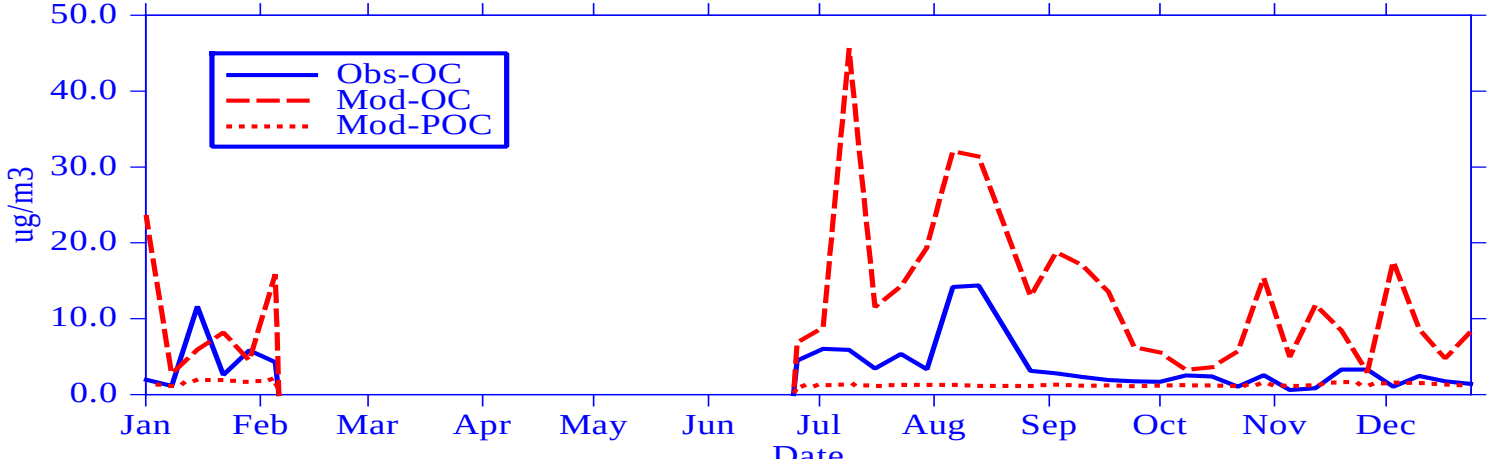
But here! Slope very different! Why?

OC? (NILU EC/OC data)

NO:

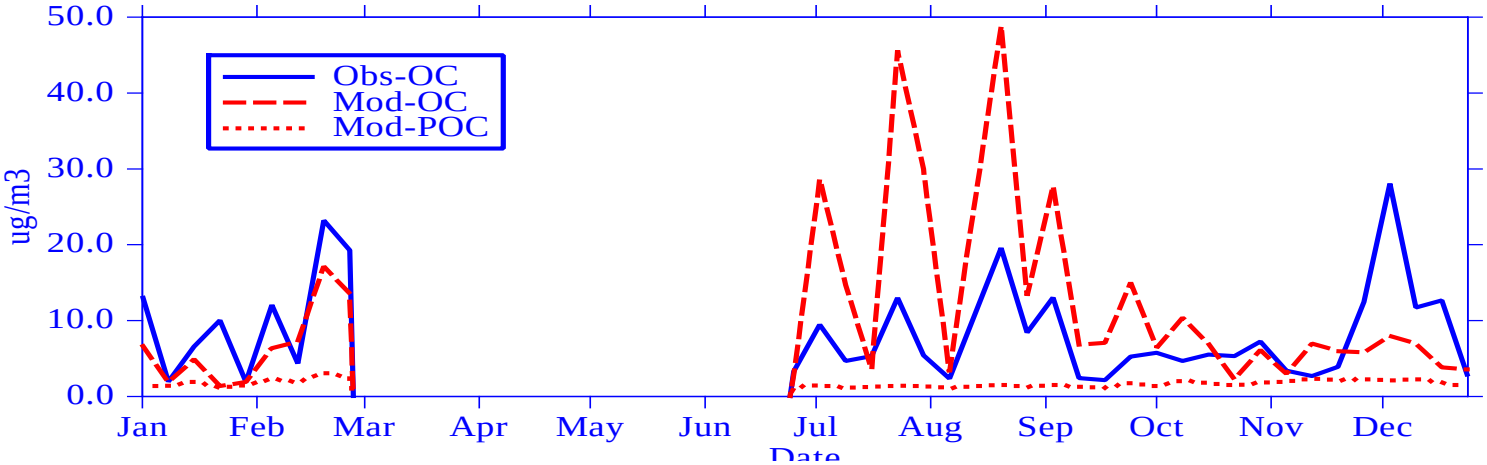


SE:

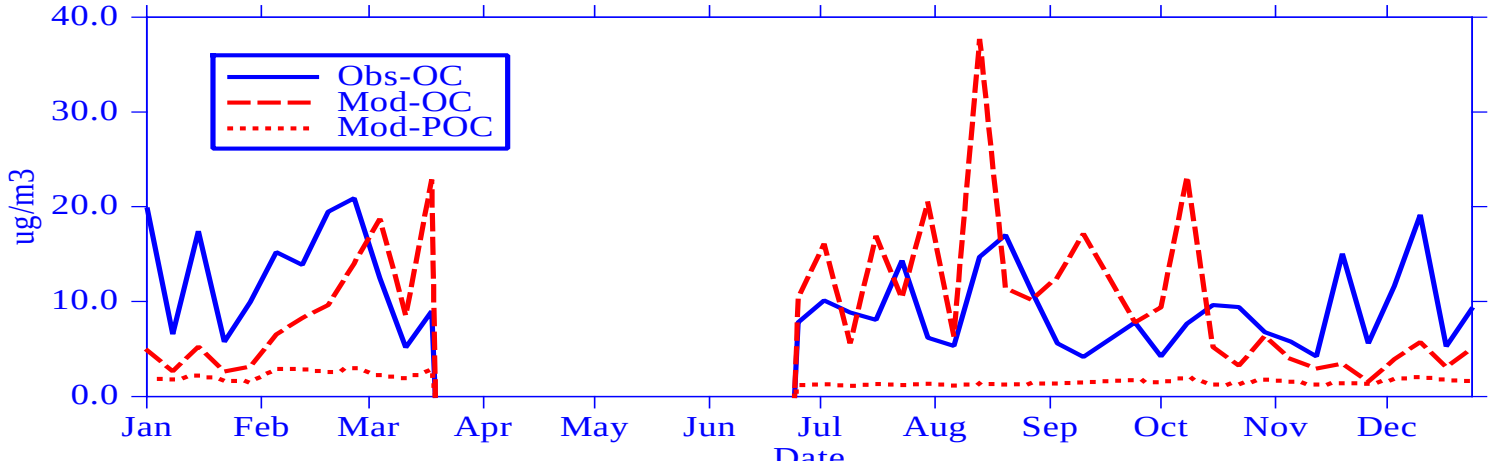


OC cont.

DE:


Obs-OC
Mod-OC
Mod-POC
ug/m3
50.0
40.0
30.0
20.0
10.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date

AT:


Obs-OC
Mod-OC
Mod-POC
ug/m3
40.0
30.0
20.0
10.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date

Comments on OC/EC

- For many sites there is hardly any difference in summer/winter OC/EC ratios
- Sites in warmer locations show small differences, e.g. AT, IT, PT - this does not directly support ideas of a large biogenic contribution
- Greatest differences in "cold" regions? Why?
  - Greater biogenic SOA in Northern Europe?
  - More primary biogenic OC in Northern Europe?
  - Greater condensation?
  - Artefacts in remote regions? (e.g. absorption on quartz filters?)

Current Activities

- Revise emission inventories
- Revise ASOA schemes
- Swedish MISTRA project
  - Improve vapour pressure/activity coefficients for OC (UNIFAC)
- EU CARBOSOL project - final months

Conclusions

- Need to reconcile emissions of primary EC with measured values
- Using reasonable OC/EC ratios, this may explain a major fraction of ’missing OC’
- Need co-analysis of OC, EC and other pollutants
- Much more work is needed. To be continued.....