



*Meteorologisk
institutt
met.no*

Requirements on Measurements

modeller's needs.

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Needs?

What for?

- Exceedance information
- Trend evaluation
- Emissions evaluation
- Model evaluation

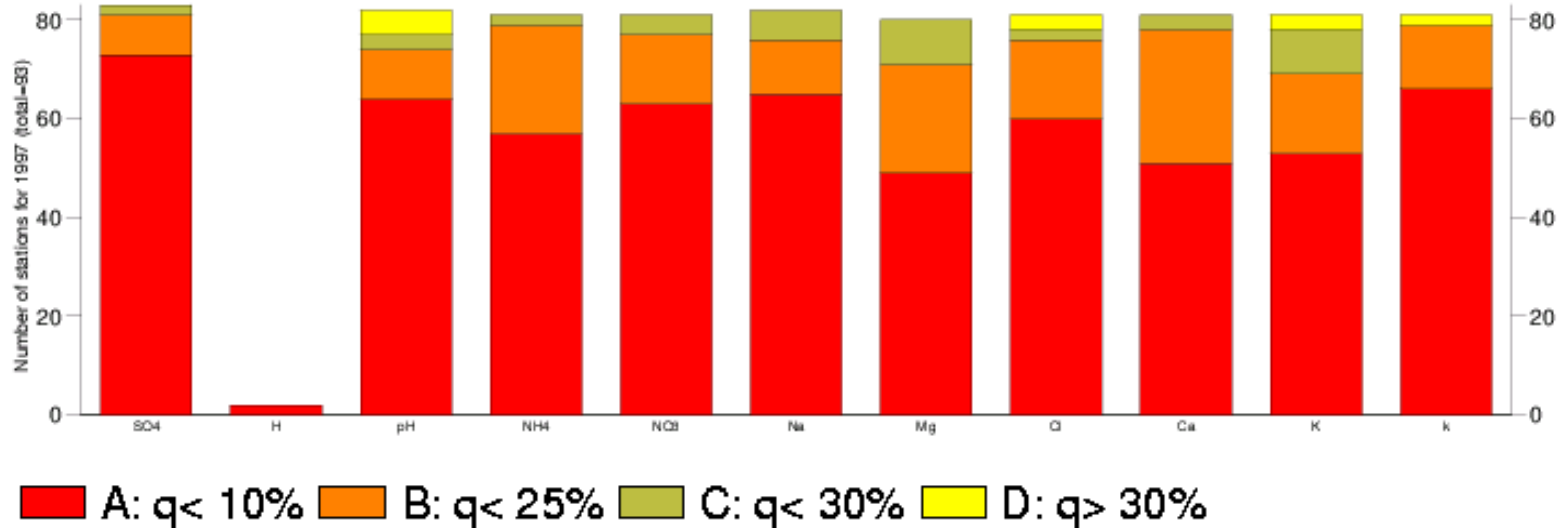
Needs?

Basics:

- Spatial distribution
- Good quality
- Known quality
- Completeness
 - chemical
 - (number?)

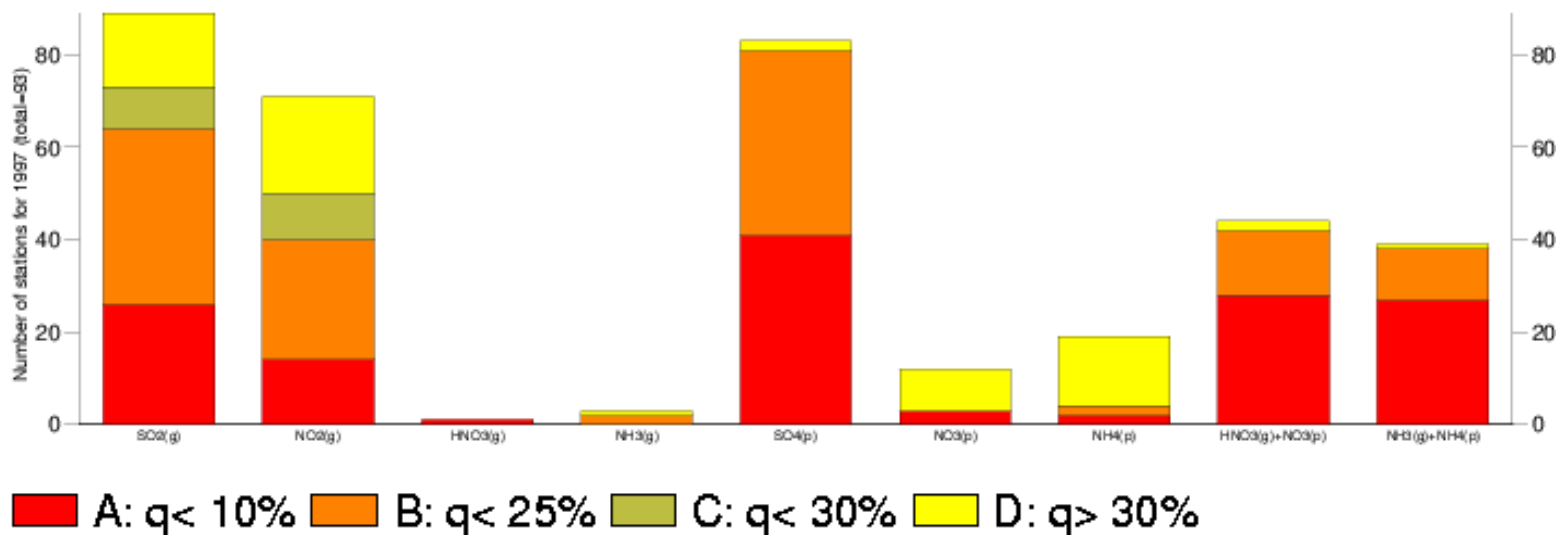
Quality?

QA classification of EMEP precipitation network, 1997 (93 stations)



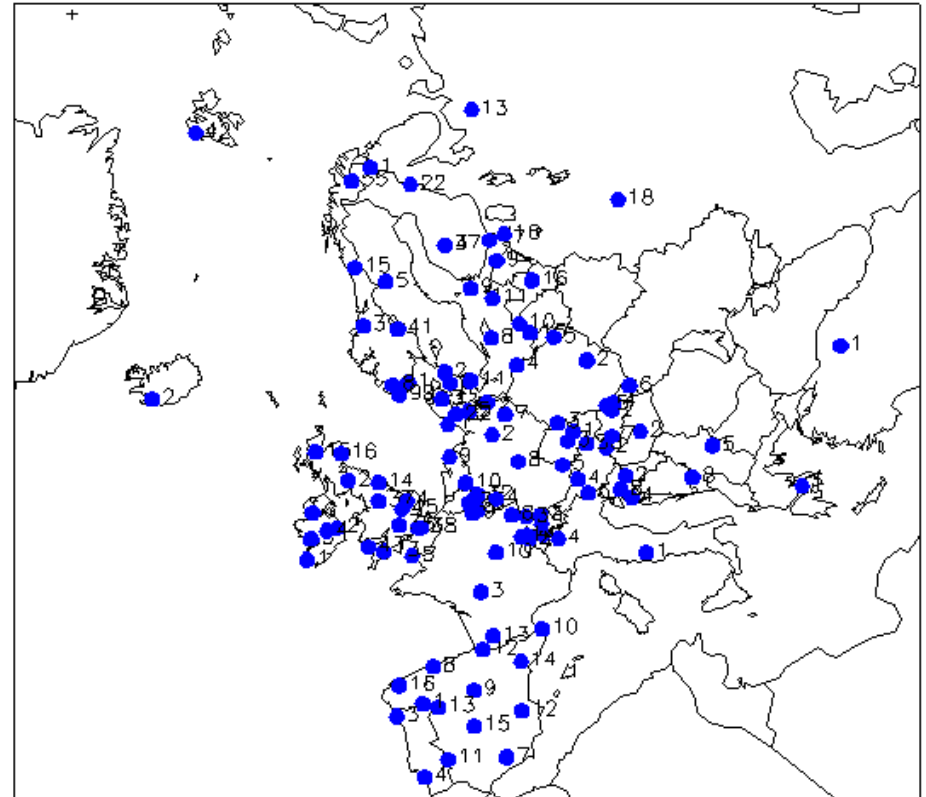
Quality - Air

QA classification of EMEP air chemistry network, 1997
(93 stations)



SO₂ and SO₄

Well described?



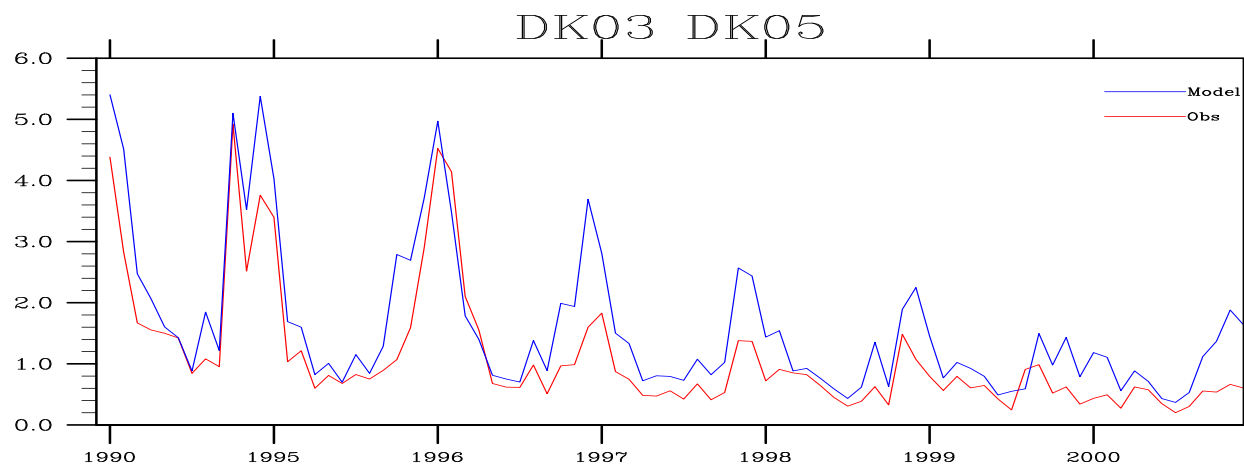
Issues?

E.g. Co-deposition?

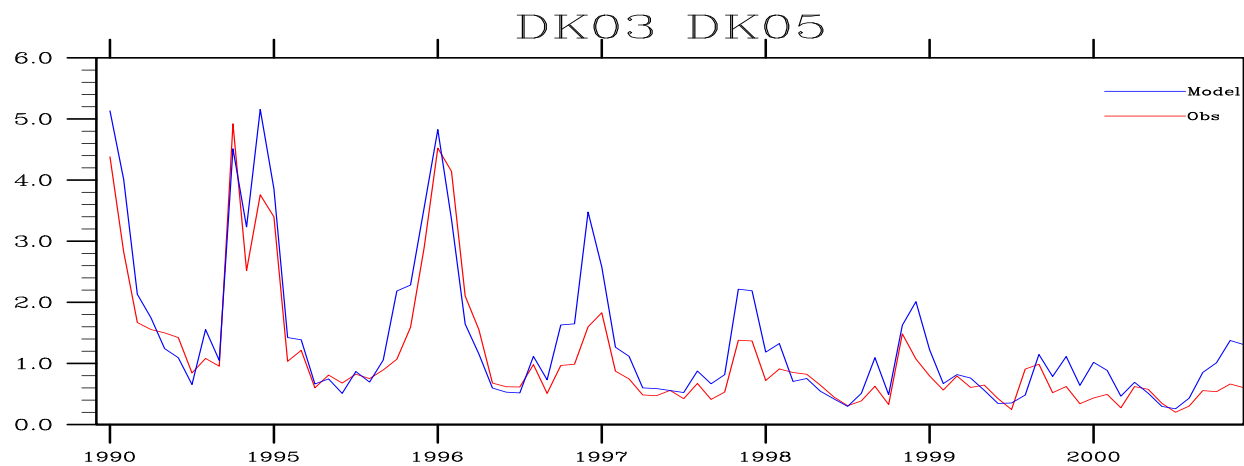
- Process: SO_2 deposition rate increasing in recent years due to higher NH_3/SO_x ratio.
- Evidence: detailed micromet and flux measurements at sites in UK and NL
- Chemical mechanisms maybe known
- Few sites for verification

Co-deposition - Effects

SO₂ Without:



SO₂ With:



SO₂ and SO₄

Conclusions:

- Network adequate for following large-scale trends in SO₂, SO₄.
- Puzzling features remain (e.g. lack of trends in NW UK)
- Gaps:
 - deposition,
 - co-deposition,
 - aqueous chemistry, nonlinearities
- – require flux data, more process oriented studies

SO_2 and SO_4 Cont.

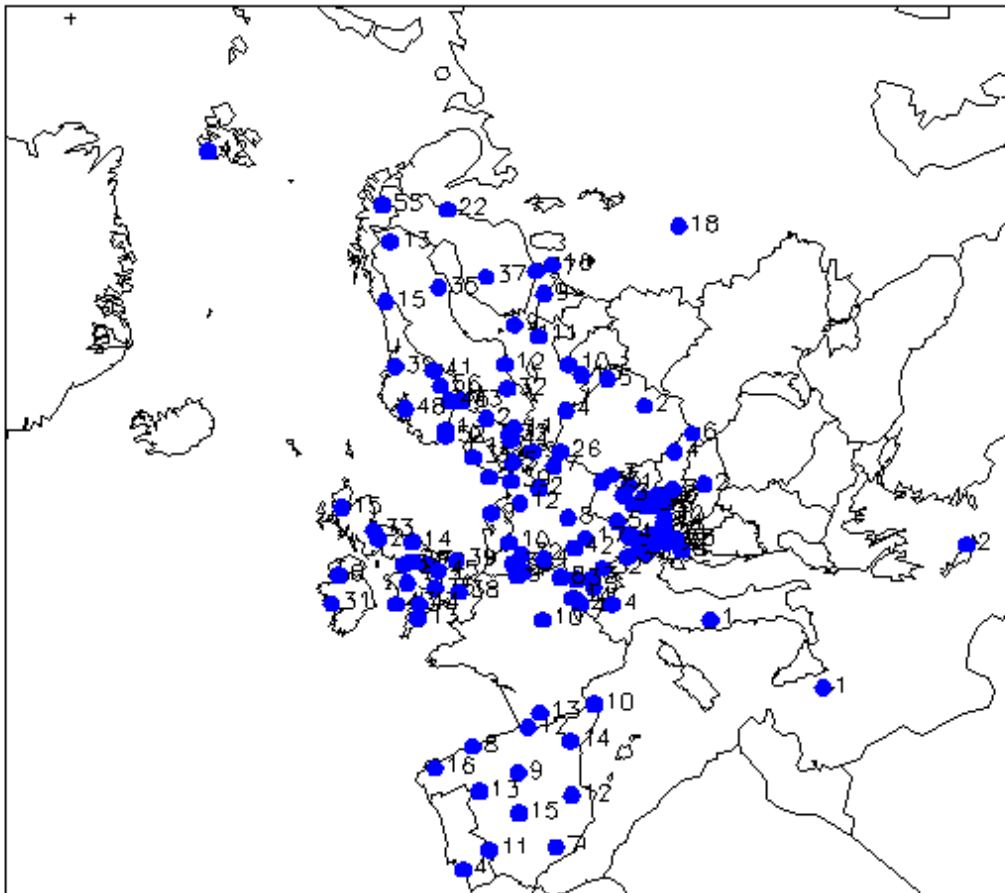
Other important issues:

- global radiation balance
- particle formation
- biosphere-atmosphere exchange (DMS)

The sulphate story continues....

Ozone

Well described?



Ozone

Issues?

- Surface sites suggest upward trend
- Some mountain sites suggest upward trend
- Aircraft data suggest upward trend (?)
- Sondes suggest downwards trend

Needs:

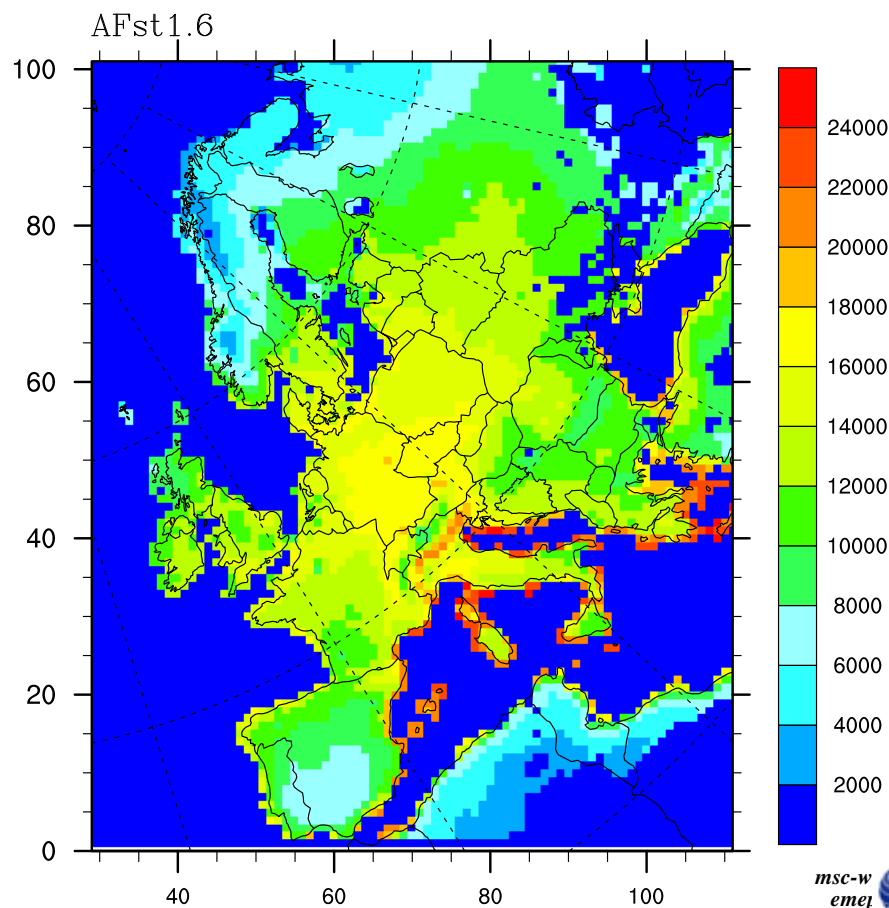
- careful evaluation of available measurements and new vertical profile data
- consistent long-term measurements

Ozone cont.

New concepts:
ozone flux
to vegetation
(AFstY)

⇒ Need:

- flux monitoring
- Process studies



Ozone cont.

Other issues?

- Limited evaluation of ozone precursors (esp. VOC, biogenics)
- Poor knowledge of precursor NO_y composition (PAN, HNO₃)

VOC

Very valuable -
– only check on VOC emis-
sions

Limited spatial coverage



VOC cont.

Required for:

- Ozone precursor: Verification of model and emissions
- SOA precursor: terpenes or?

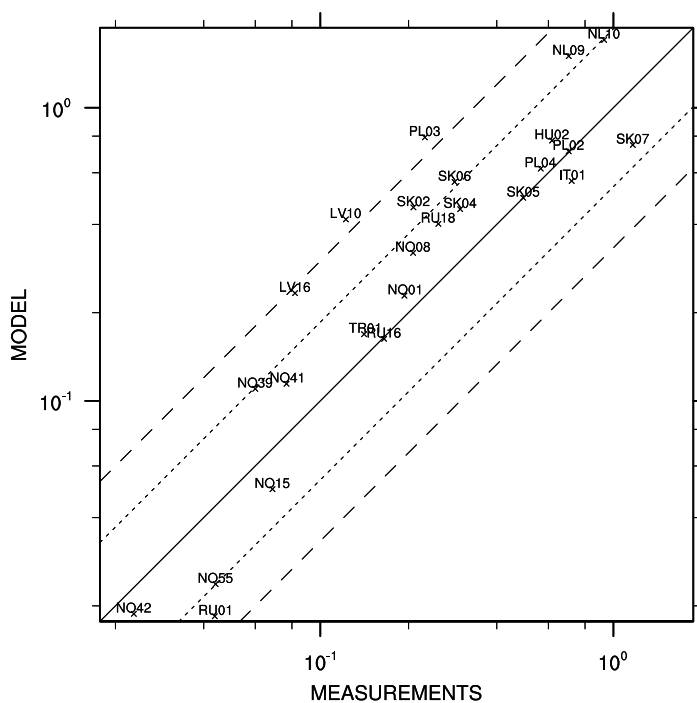
Issues:

- Need to cover wider range of VOC
- Tackle C6+
- Identify tracer species (other RCHO, glyoxals,...)

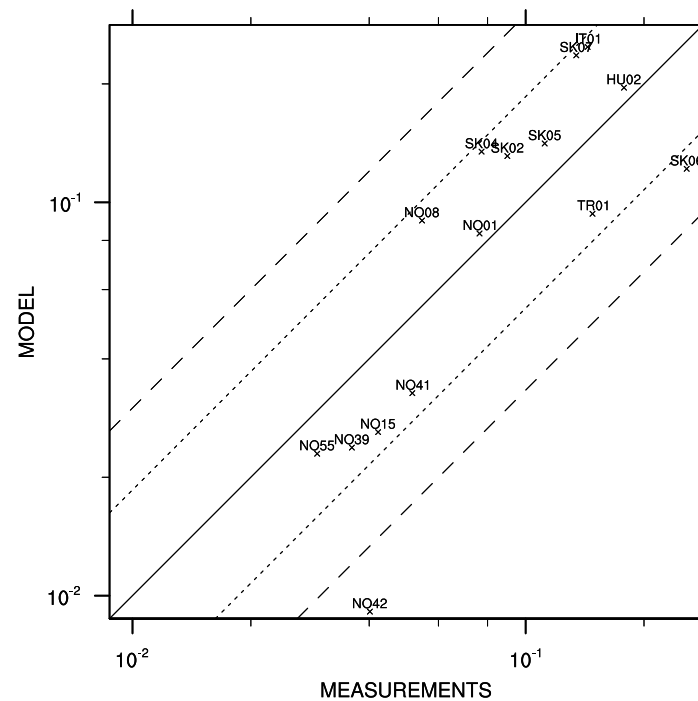
NO_y: Comp with Obs

Nitrate?

NO₃⁻ + HNO₃

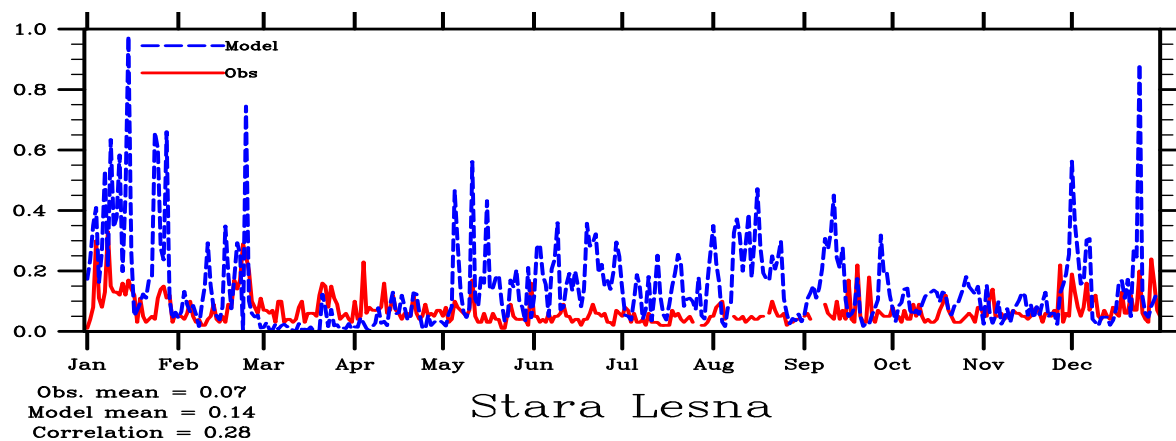
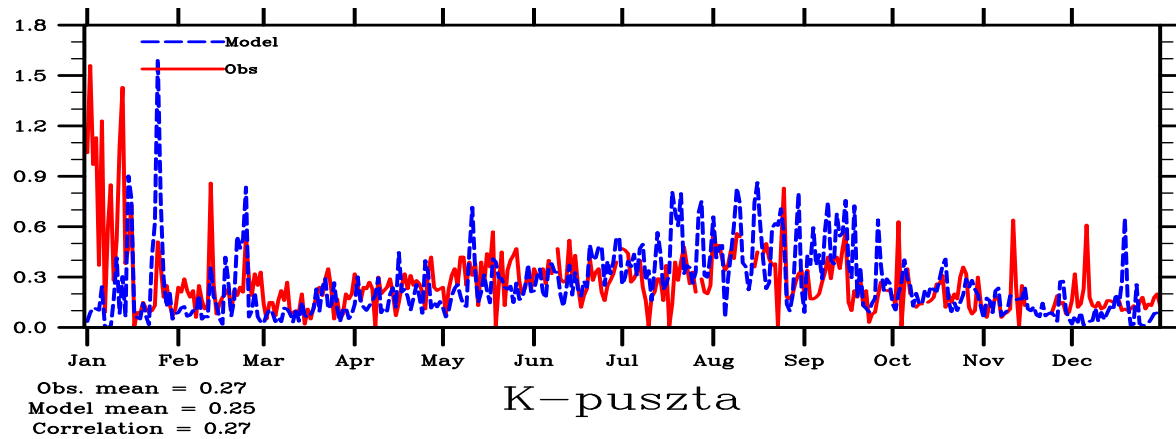


HNO₃



NO_y: Comp with Obs

Total-nitrate can hide problems, or good performance:



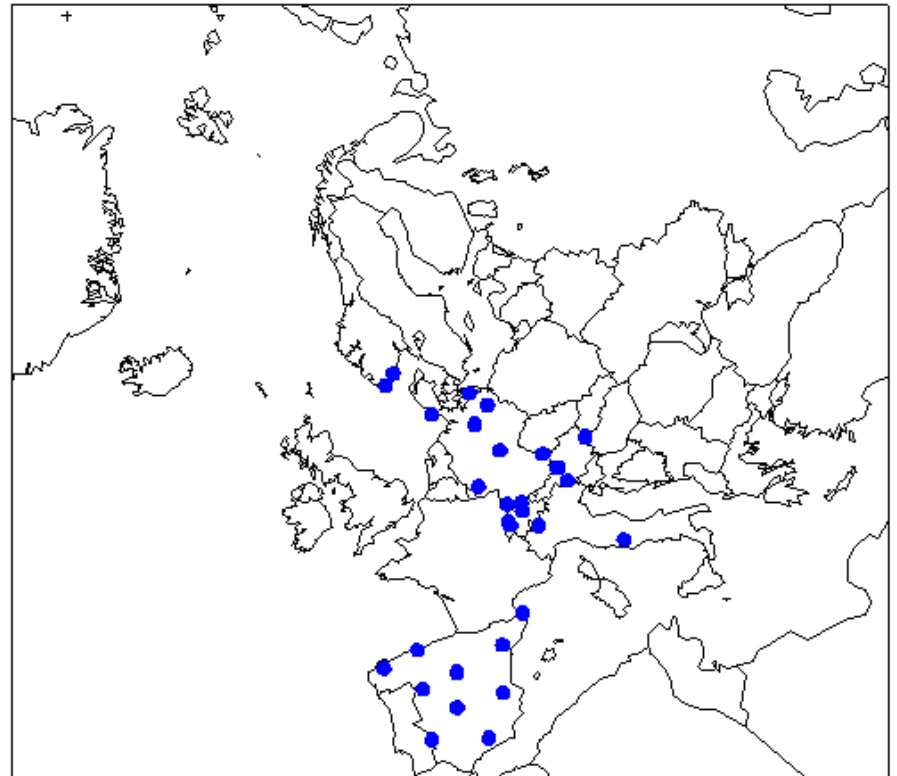
NO_y, NH_x

Conclusions:

- HNO₃ and NO₃ are very different
- NH₃ and NH₄ are very different
- Speciated data essential!

Particles?

Needs -
too many to mention?!

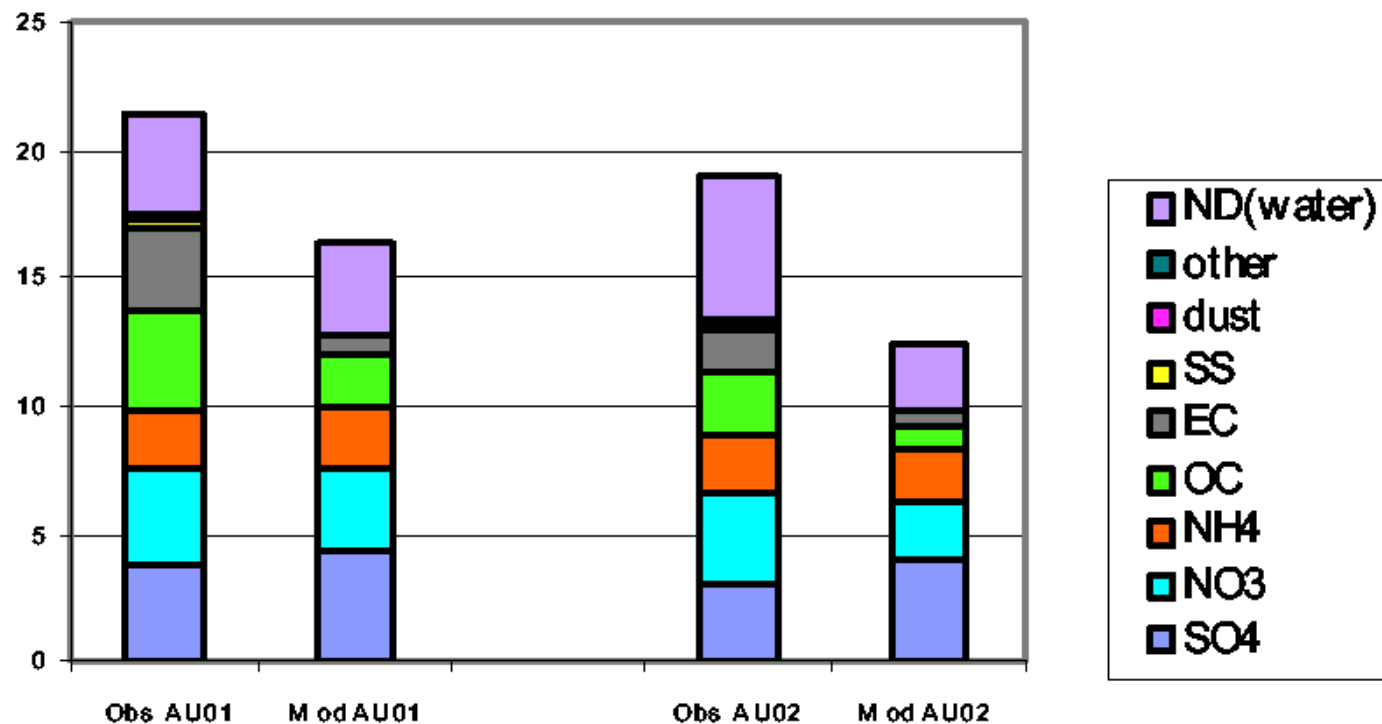


Particles?

First requirement - chemical speciation:

(AUPHEP, Tsyro, 2004)

PM2.5, Austria

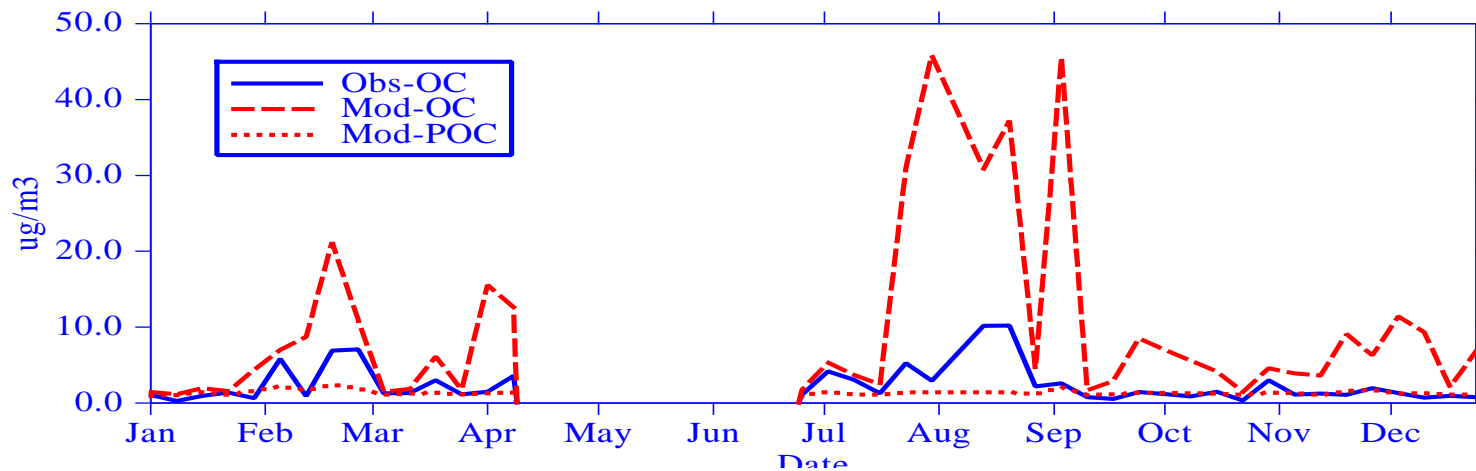


– need to understand where problems lie

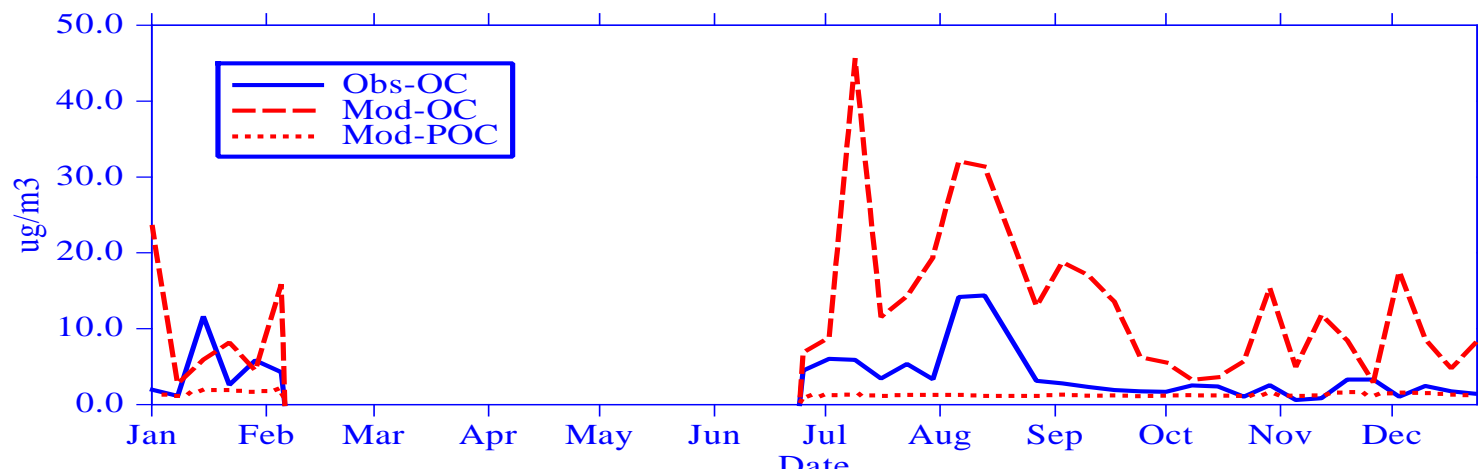
OC? (NILU EC/OC data)



NO:

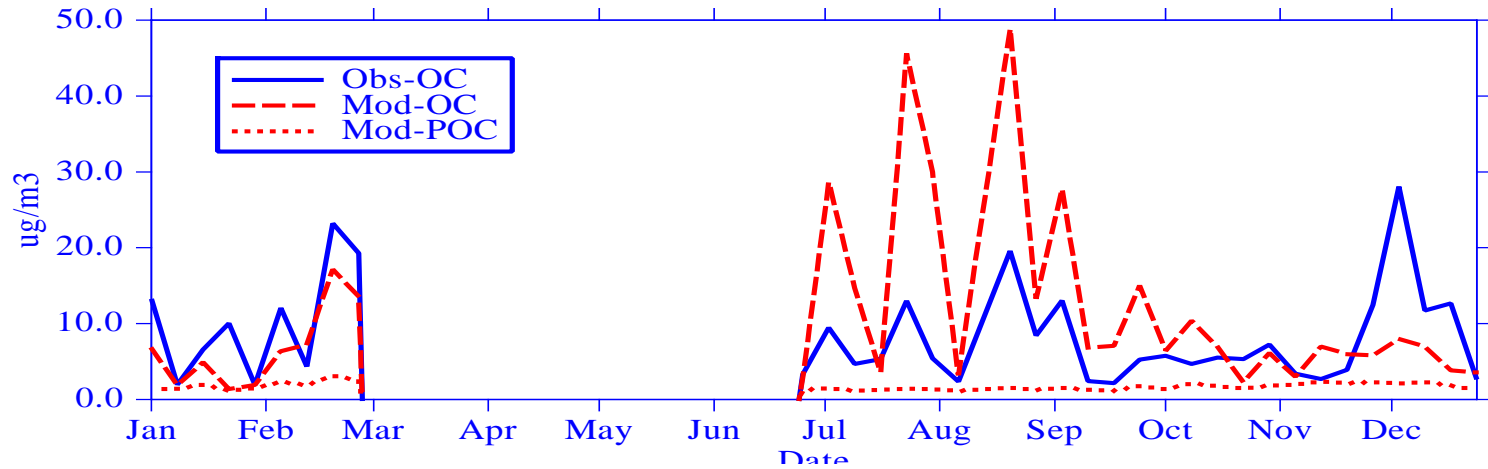


SE:

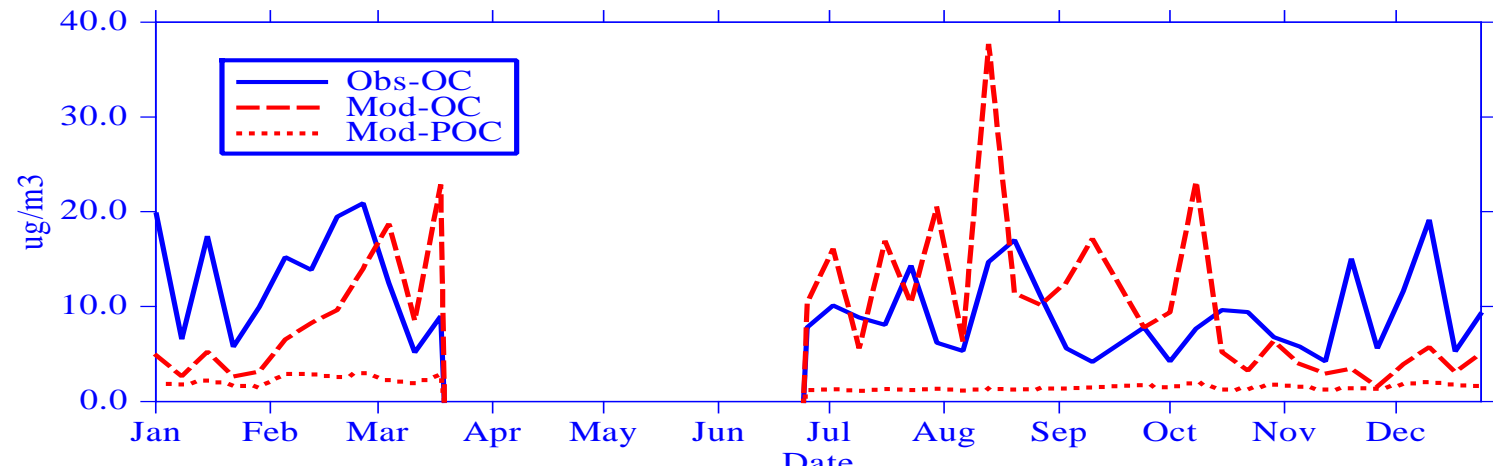


OC cont.

DE:



AT:



PM cont.

Needs:

OC/EC

Size distributions

C14

Growth rates

Water solubility

Tracers (levoglucosan, K, elements)

.... systematic studies to understand sources

Conclusions: Needs

Main problems identified?

- Particle composition and sources
- N-chemistry
- Biosphere-atmosphere exchange (fluxes, co-deposition, BVOC)
- Trends (ozone)
- POPs?

Conclusions: cont.

- Process understanding essential for further model development
- Quality/Completeness at supersites essential for process understanding
- Full compliance with EMEP monitoring strategy would provide very useful data even from levels 1&2.
- Link to national and international programmes and research essential