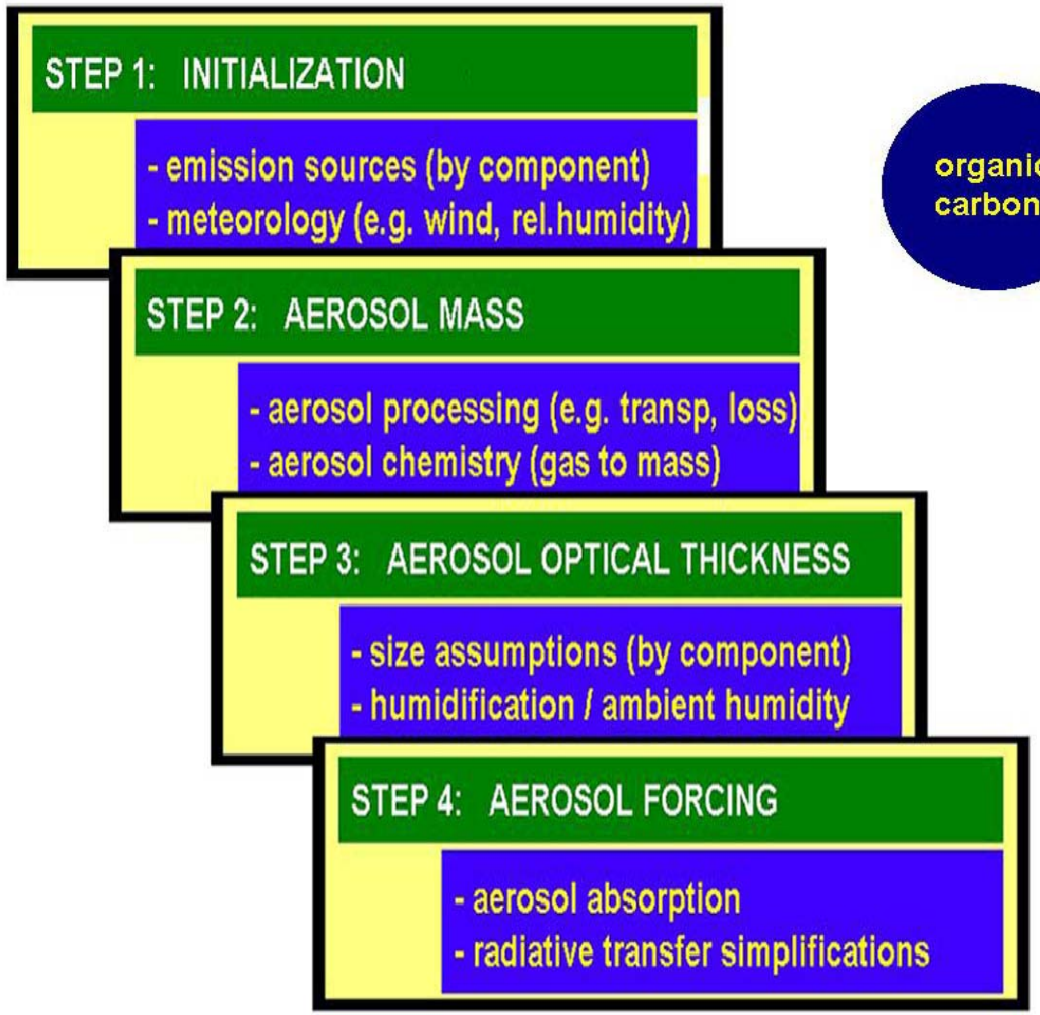
AEROSOL COMPONENT MODELS

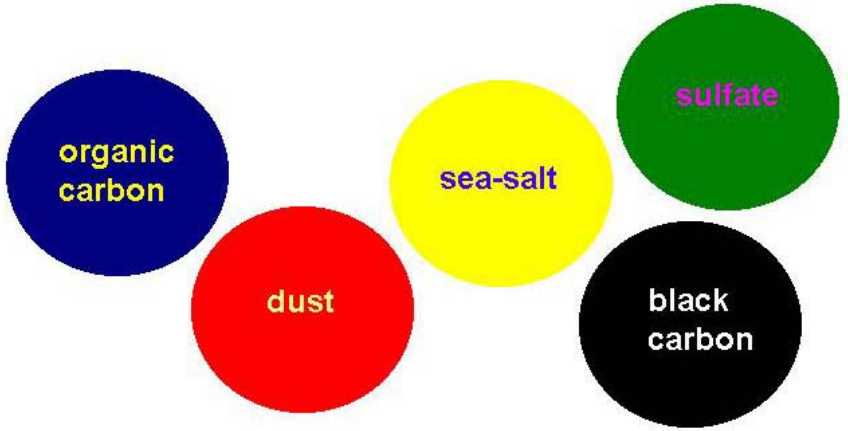
an initial comparison

PARIS

June 2003

AEROSOL in global models





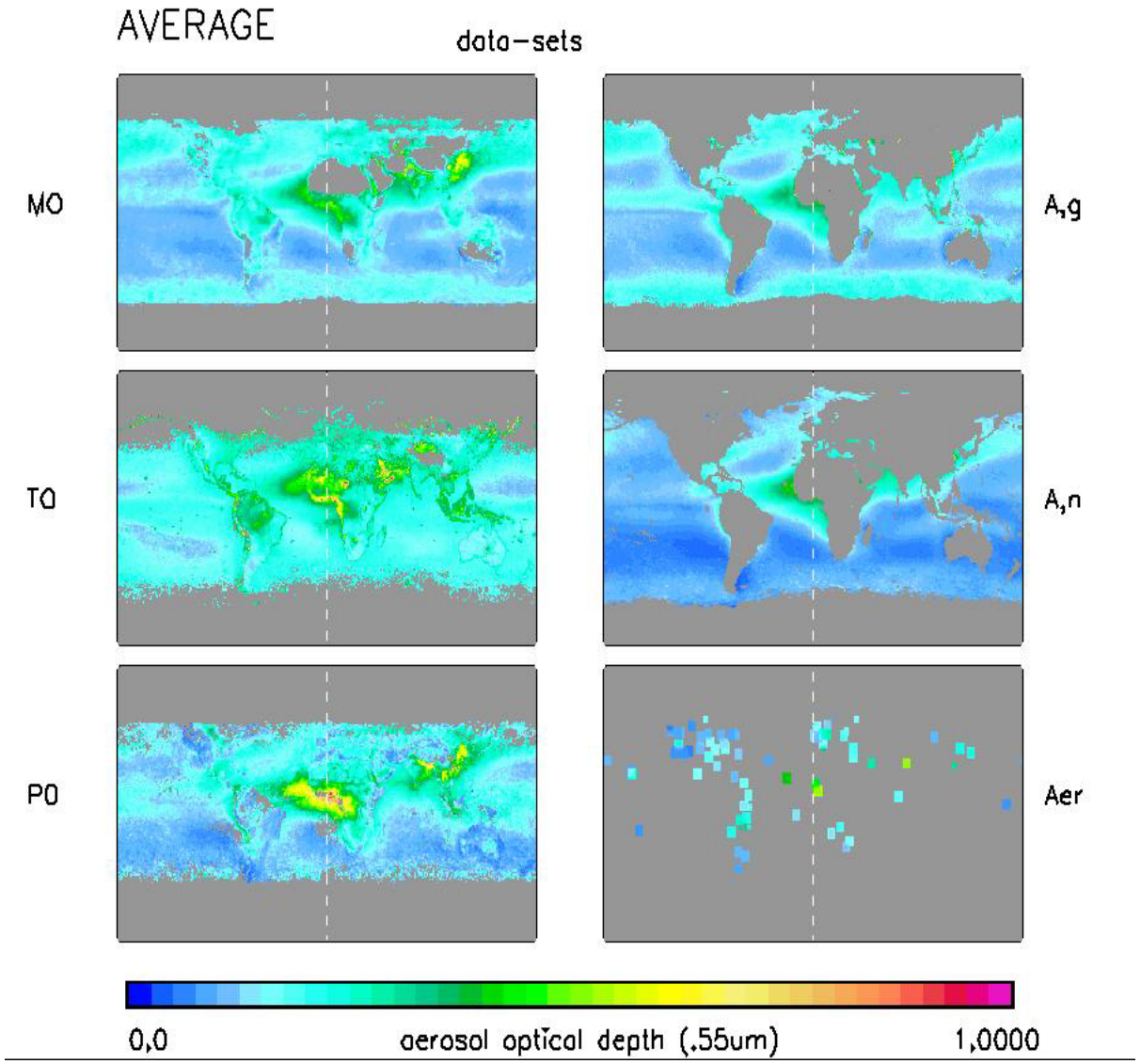
modeling of aerosol climatic impacts is done
- **at coarse resolution *(ca 3*3deg)***
- **in many individual steps**
- **individually by aerosol type**

⇨ **many processes**
⇨ **possibilities for errors**

AOT data-sets

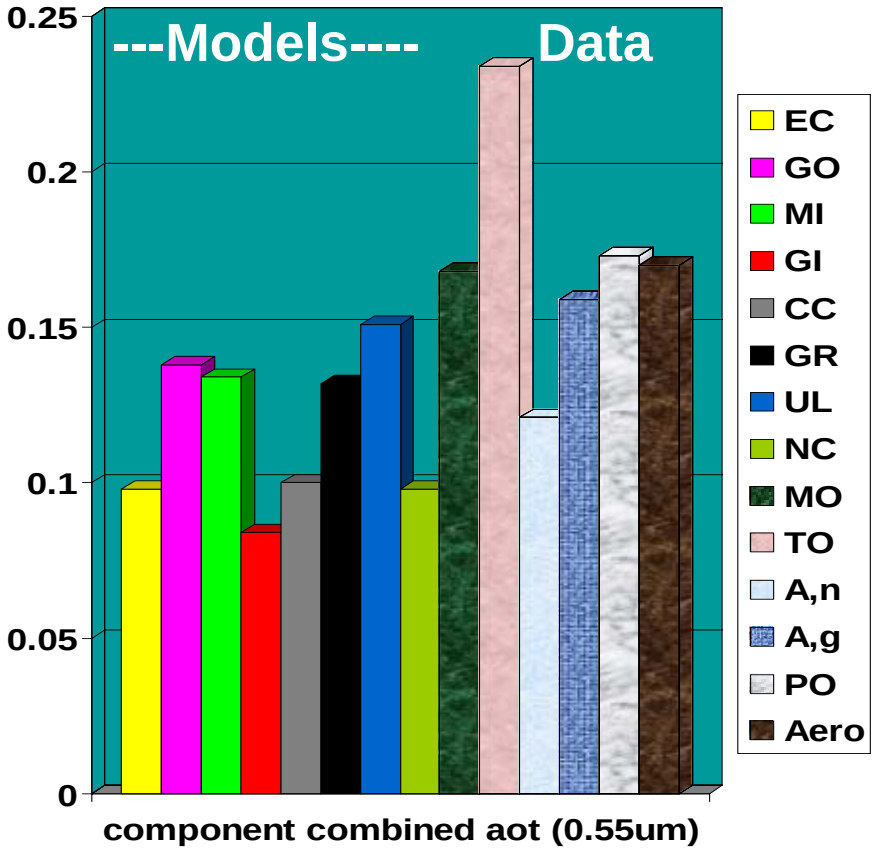
- **satellites:**
  - **MODIS**
  - **TOMS**
  - **POLDER**
  - **AV. 2Ch**
  - **AV. 1Ch**
- **ground:**
  - **AERONET**

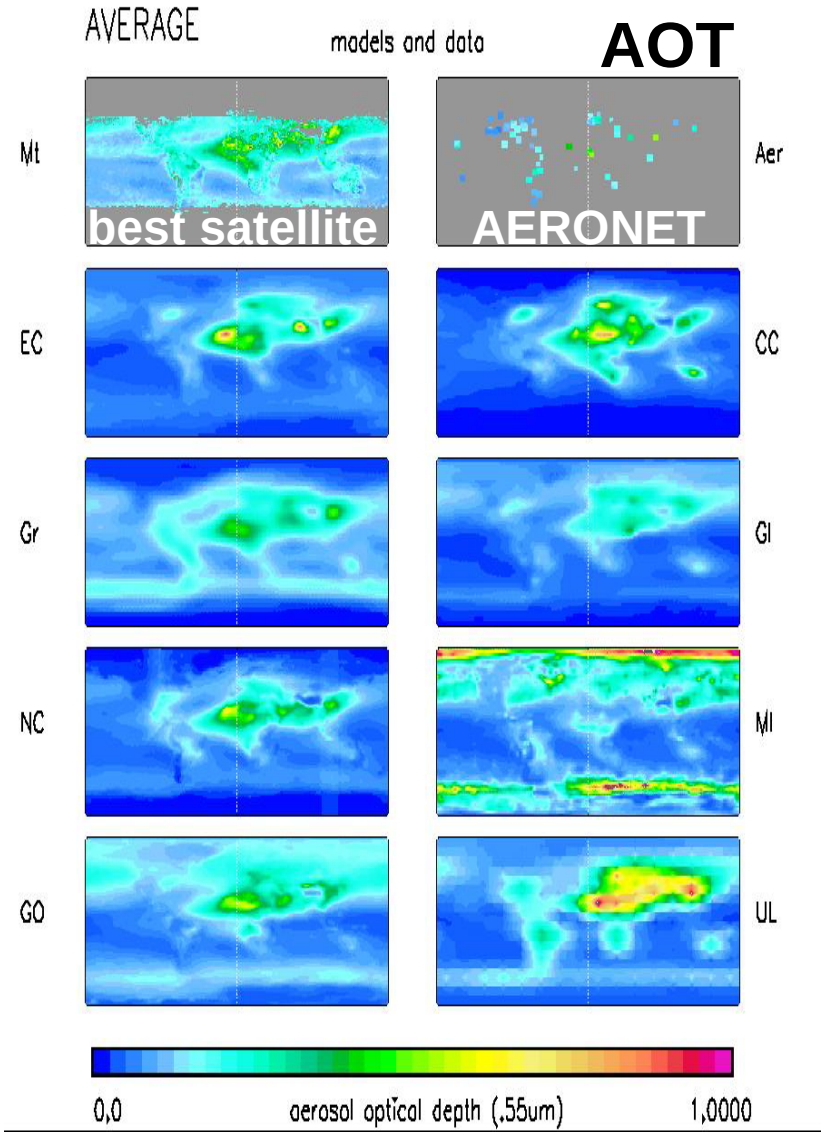
yearly avg.



testing models - PAST

- monthly statistics
  - 8 models !

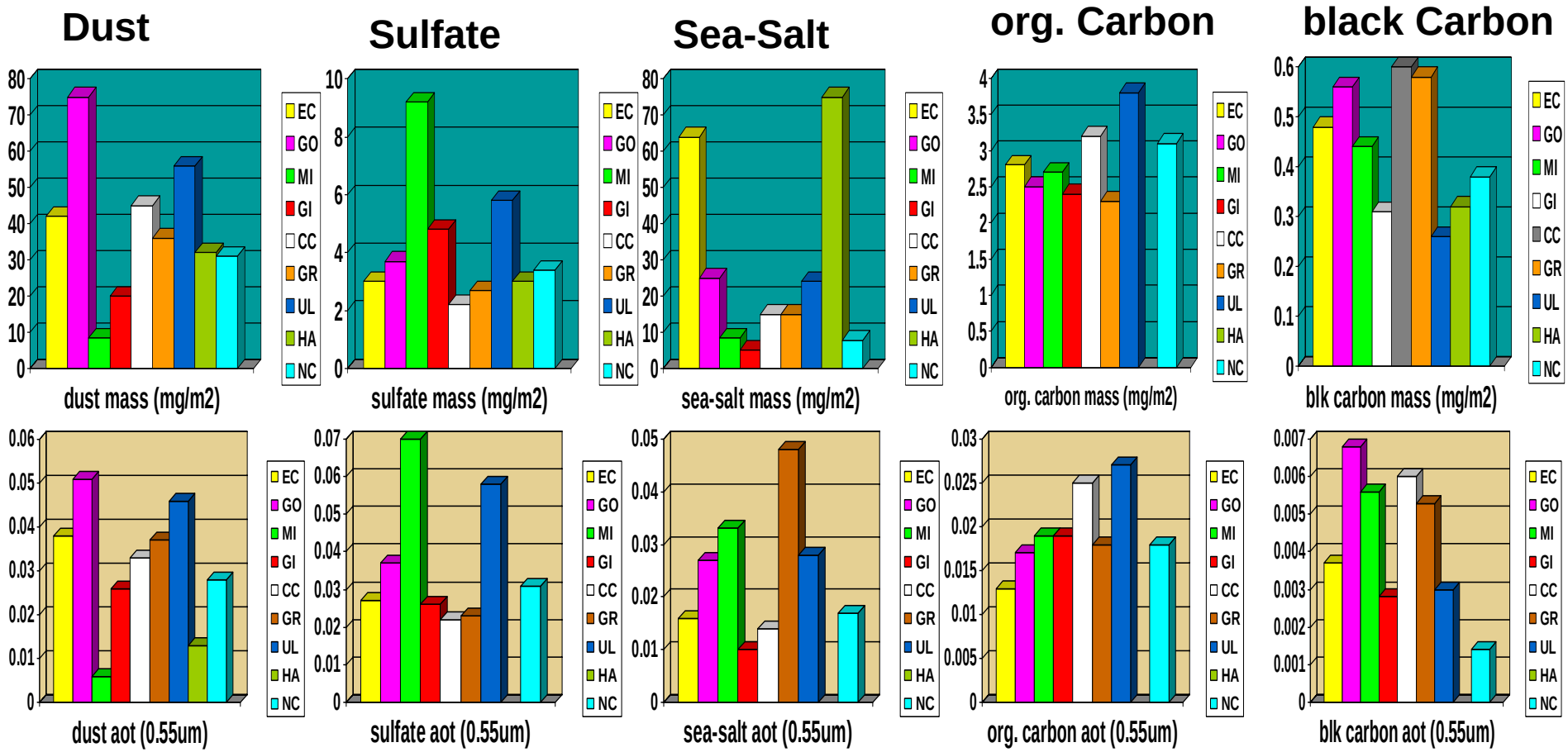




testing models - PAST

- **Consistency?**

… just look at global averages for mass *(turquoise background)* **and opt.depth** *(brown background)* **… and differences in mass → aot !**



first Impressions

- **Models agree on**
  - high carbon in central Africa (~ 60%)
  - high sulfate for Europe and E.Asia (~ 45%)
  - dominant sea-salt in mid-latitudes of the SH
  - dominant dust over N.Africa and central Asia
- **Models disagree on**
  - source strength for dust and for biomass burning
  - carbon contrib. for tropics and over urban regions
  - transport (contributions in off-source regions)
  - sea-salt contributions over oceans

Relative Model Tendencies

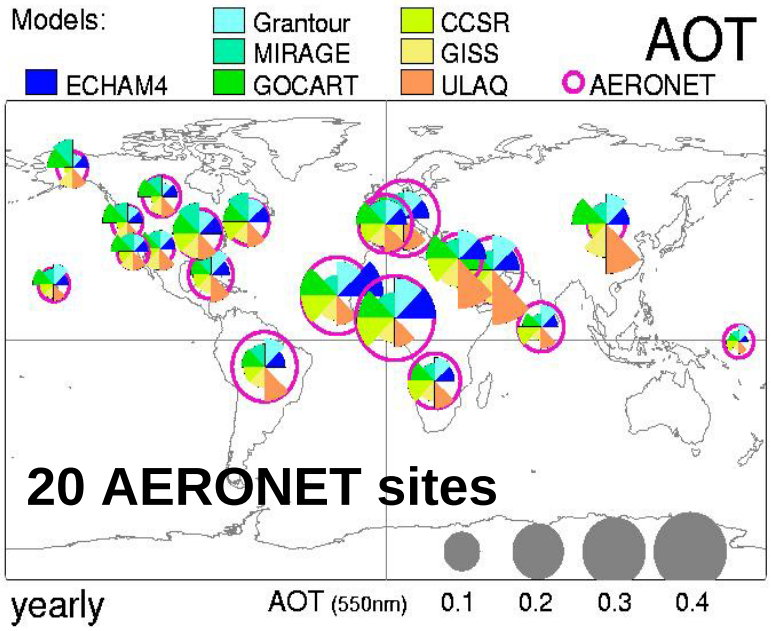
- **ECHAM4** strong *du*- seasonality, low *ss* and *bc* MEE, rh-sensitivity
- **GOCART** strong transport, strong *du*, strong *oc*-, *bc*- seasonality
- **MIRAGE** strong *su* *(+oc),* weak on trop.sources, high lat. bias
- **GISS** low on mass (except for *su*), strong *du* MEE
- **CCSR** strong *oc*-, *bc*-, *du*- seasonality (+ sources), weak transport
- **Grantour** lowest *oc/bc* -mass ratios, strong *ss* MEE and opt.depth
- **ULAQ** strongest *su*-, *oc*- urban sources, weak transport (*bc*)
- **NCAR** weak *bc*, low *oc und bc* MEE, high *ss* MEE
- **HadHam** strong *su*- seasonality, weak on *bc*

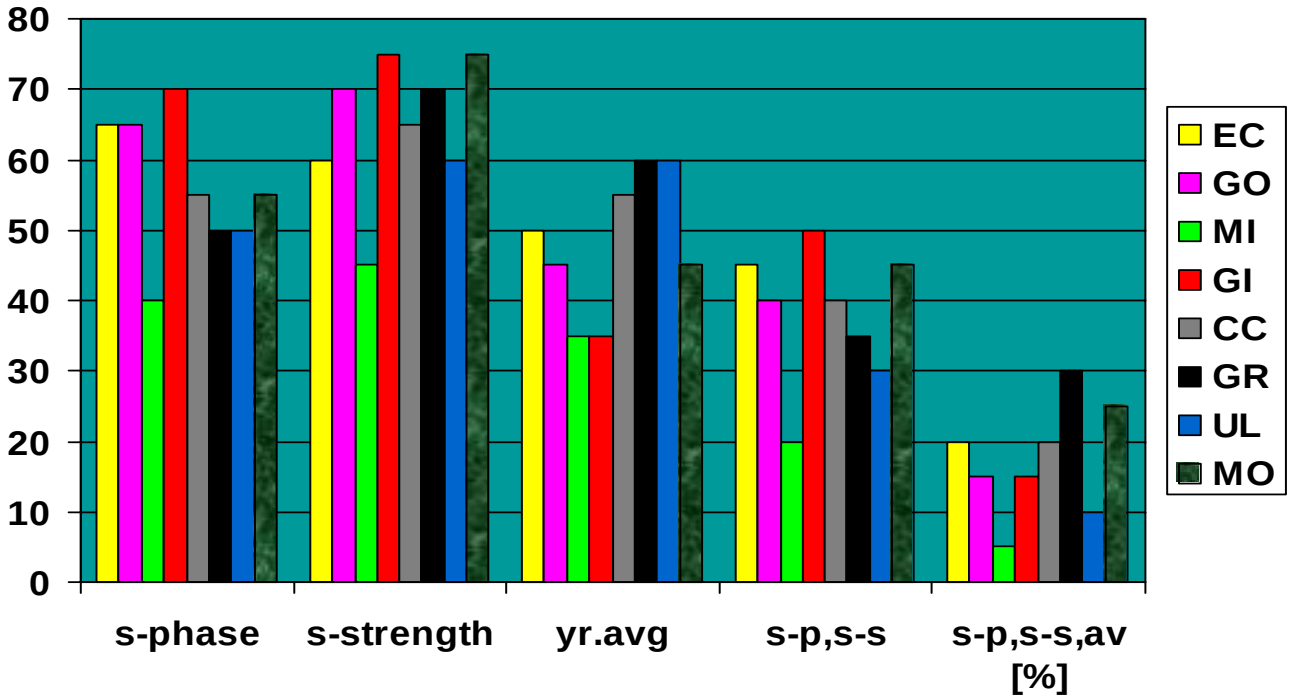
su -sulfate, *du* -dust, *ss* -seasalt, *oc* -org.carbon, *bc* -black carbon

Quantification

- local -

- % hits vs AERONET -aot
  - Yearly average: +/- 20%
  - Season-phase: +/- 1 month
  - Season-strength: +/- 50%



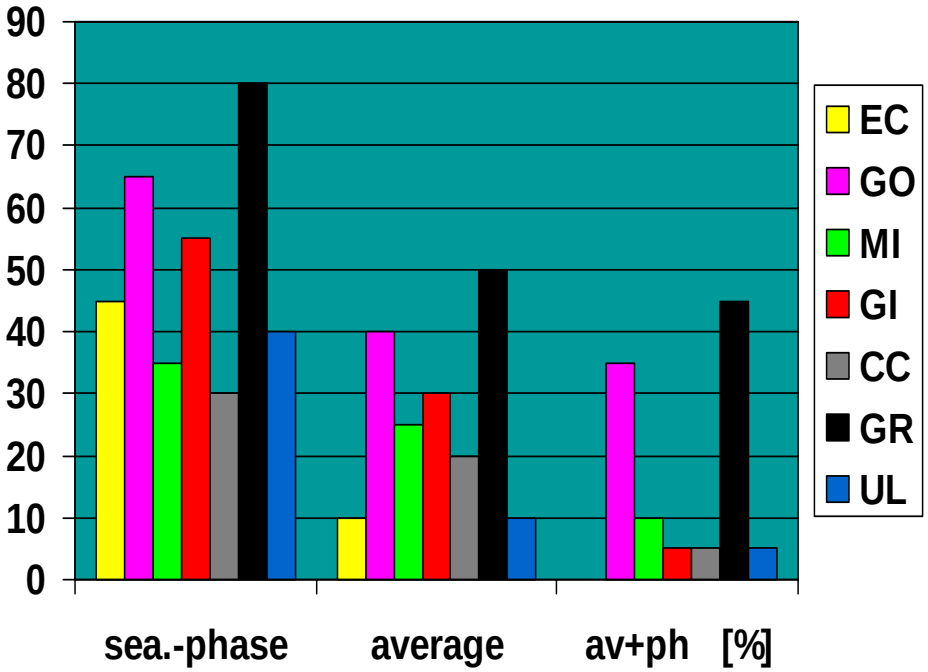


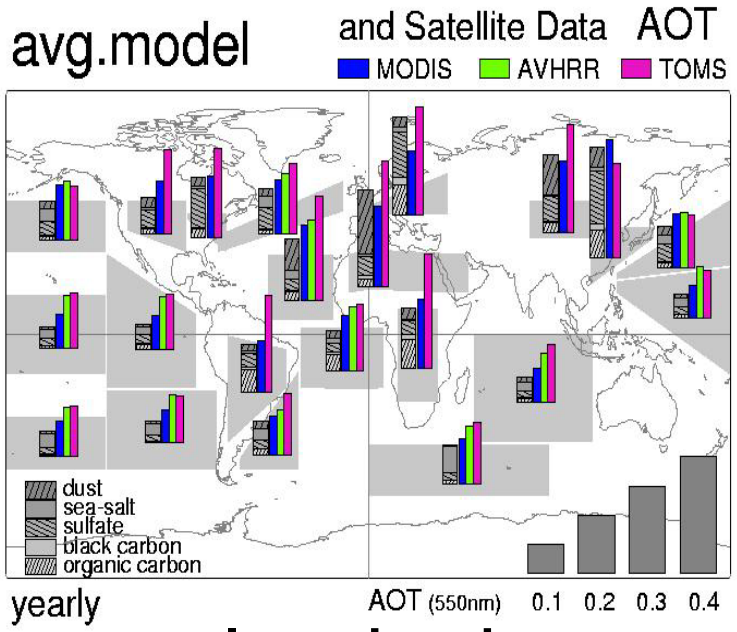
MODIS aots are usually larger than aots from AERONET ***(..mainly due to snow in winter)***

Quantification

- regional -

- **% hits vs MODIS/TOMS- aot**
  - **Yearly average: +/- 20%**
  - **Seasonality phase : +/- 1 month *(for 3mo-avg max)***





evaluated regions

- ***most models predict lower aots than MODIS/TOMS***
- ***discrepancies are largest in remote regions (sea-salt size?)***
- ***but larger simulated aots for Europe (old outdated sources?)***

TOPICS

- ***Compare size assumptions for aerosol types***
  - ***reduce differences in the MASS to AOT conversion***
- ***Remove size ambiguity from rel.hum fields?***
  - ***prescribe relative humidity fields (ECWMF) in aot conversions***
- ***Aerosol vertical distribution and lifetime?***
  - ***compare for simulations with identical sources / sizes***
- ***What is known about removal processes?***
  - ***compare for simulations with identical sources / sizes***
- ***Is the chemistry (gas to particle) correct?***
  - ***compare results with and without chemistry***