



AeroCom

review

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<http://aerocom.met.no/Welcome.html>

What is AeroCom

- an (basically) unfunded initiative
 - collaborative spirit – no competition
- founded by common interests to advance understanding of model complexity
 - common experiments / (input) emission data
- linking data and simulation groups
 - annual meetings ... now with AeroSAT branch
- open access data archive visualization
 - <http://aerocom.met.no/Welcome.html> (talk to Jan)
- advance (climate) science understanding
 - contributing to IPCC

community spirit

- data and modeling exchange (annual reunions)
- understanding of needs and limitations
- developing relationships / friendships
- sharing and helping (rather than competing)

- **PARIS 2003**
where it started



unforgettable memories



and sad news



Jon Egill Kristiansen





2004

... over the years the participation kept growing

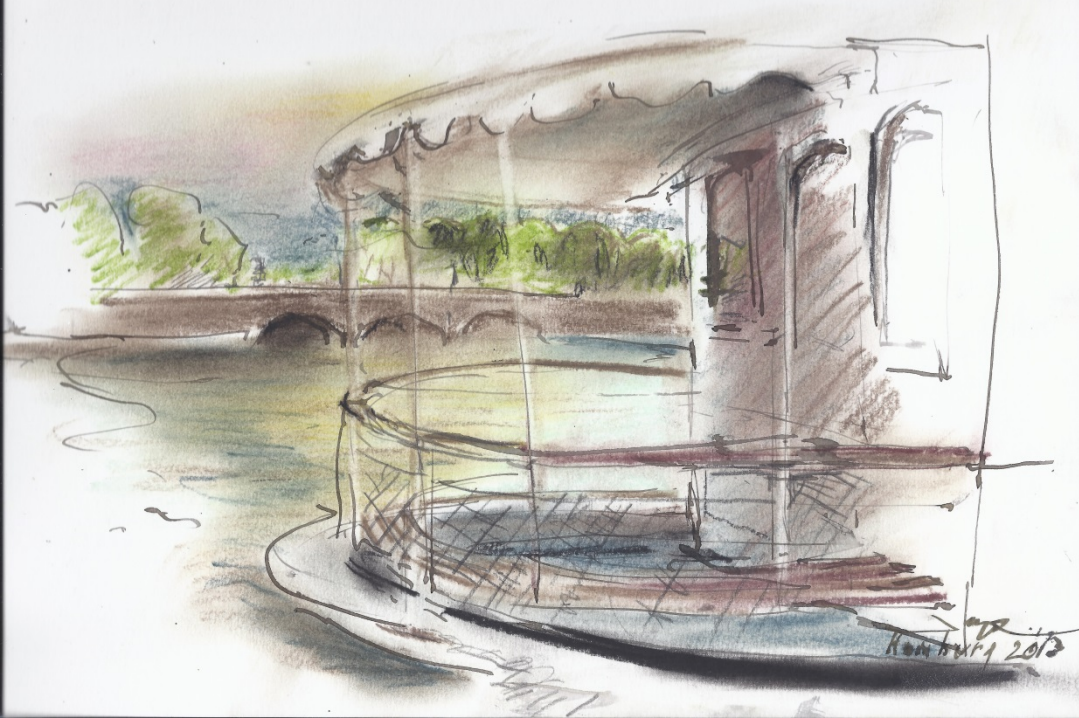


2015





... and there always was something to remember

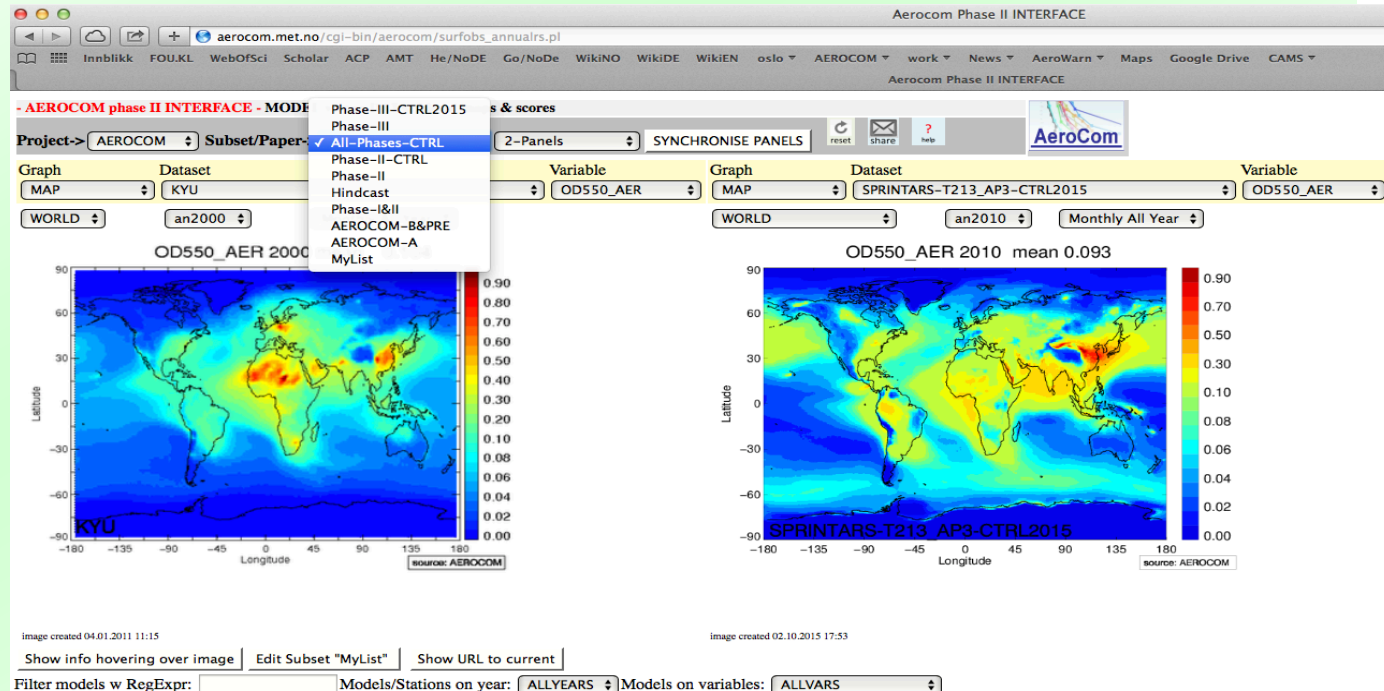


the data base

- 15 years of model simulation collection
 - for data access ... e-mail to Jan G.
- visual interface for (quick) comparisons
 - to other models / simulations / assimilations
 - to observational data (incl. satellite data)
 - http://aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl
- do not forget to upload your data **regularly**
 - netcdf CF ... (when in doubt talk to Jan G.)
 - data-submission <http://aerocom-test.met.no/upload>
- you are encouraged to work with the data !
 - data are waiting to be analyzed !!!
 - If not there ... propose your own experiment

the web-page

- new features of AEROCOM web interface
http://aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl
– try it out ! (ask Jan G. for instructions)
- make selections on the screen
- compare side by side



experiments

- **the ‘important’ reference control experiment**
 - **how does your model change over time**
 - **regular checking will quickly identify issues**
- **control 2015 comparison results (M. Schulz)**
 - **Inter-model variability has NOT decreased**
 - **models did not change in the same direction**
 - **usually model typically biases remain**
 - **surface conc. are not constrained by loads**
- **<https://wiki.met.no/aerocom/phase3-experiments>**

(other) ongoing experiments

- **AeroCom phase III experiments**

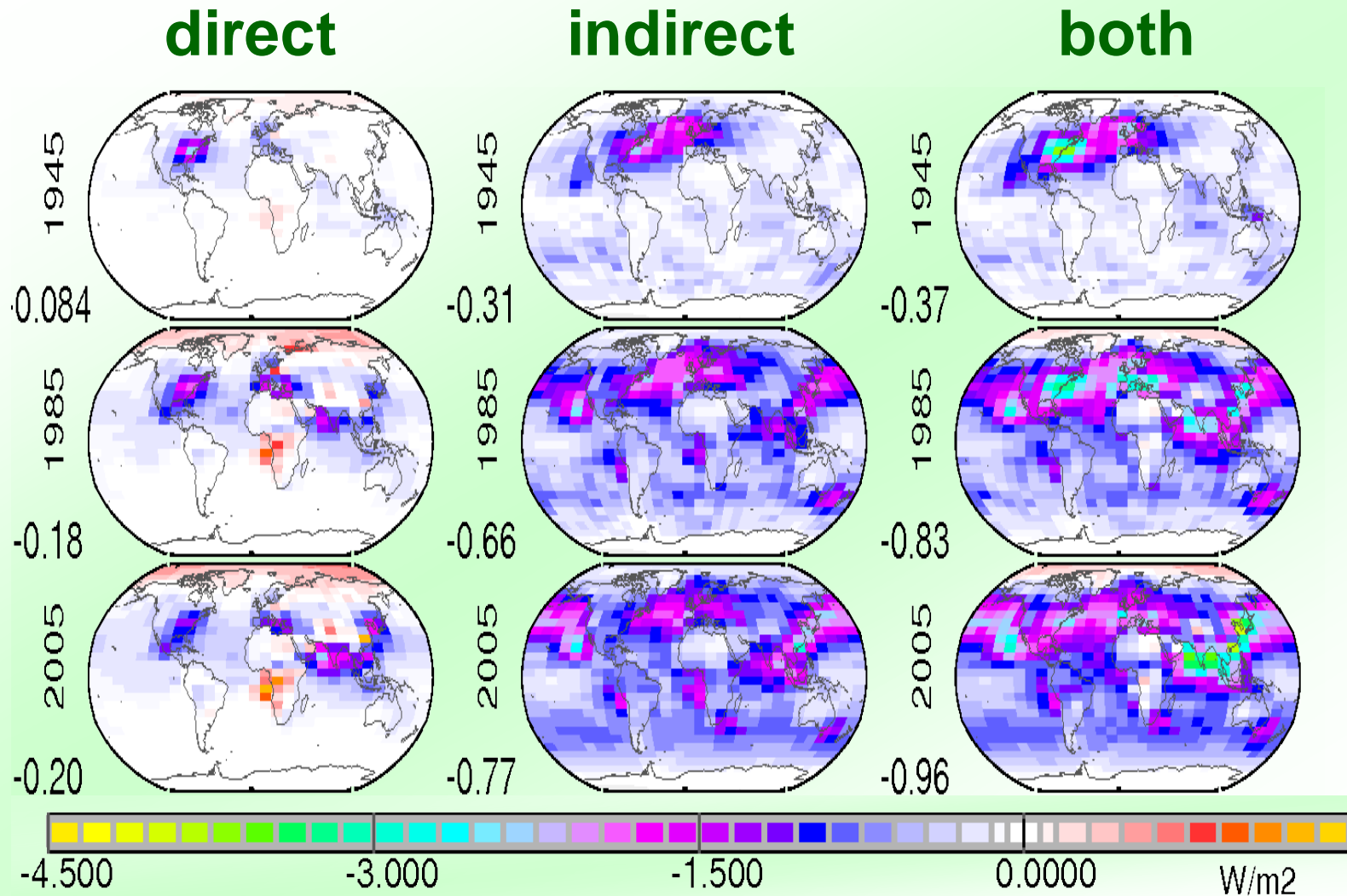
- Betsy Andrews vs in-situ ground concentr.
- Nick Schutgens vs remote sensing data
- Paul Ginoux dust experiment
- Bjorn Samset precipitation / at poles
- Mariya Petrenko biomass burning
- Huisheng Bian nitrates
- Gunnar Myhre (direct) radiative forcing

climate understanding

- **impacts on TOA radiation**
 - aerosol impacts are small compared to clouds
 - ... but aerosol is partially anthropogenic !
 - **anthropogenic added aerosol cools**
 - direct effect (by aerosol presence) ca - 0.3 W/m²
 - indirect effect (via changed clouds) ca - 1.0 W/m²
 - compare to anthropogenic GH impact **+ 2.8 W/m²**
- global ann averages
- **aerosol impact regional distribution ?**
 - **changes over the last decade ?**

spatially uneven impacts

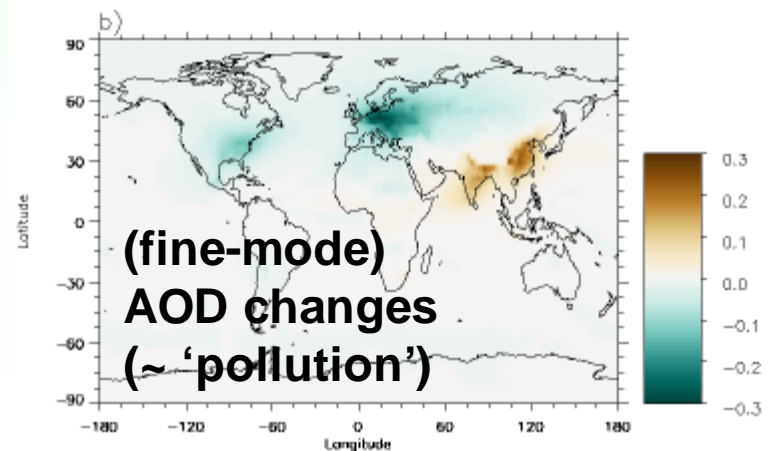
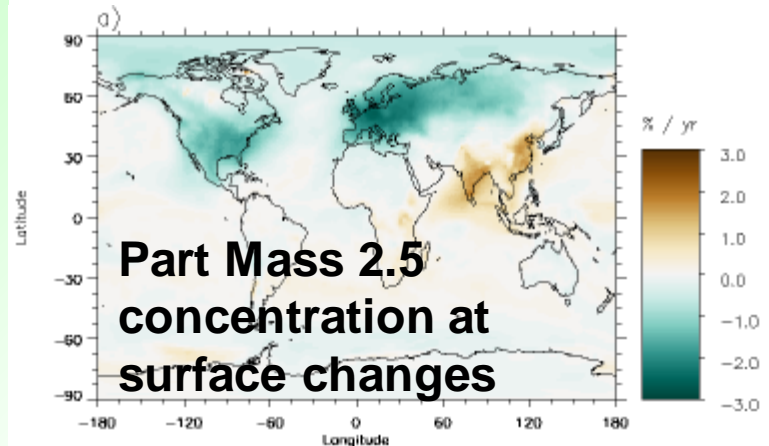
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(direct) trends ?

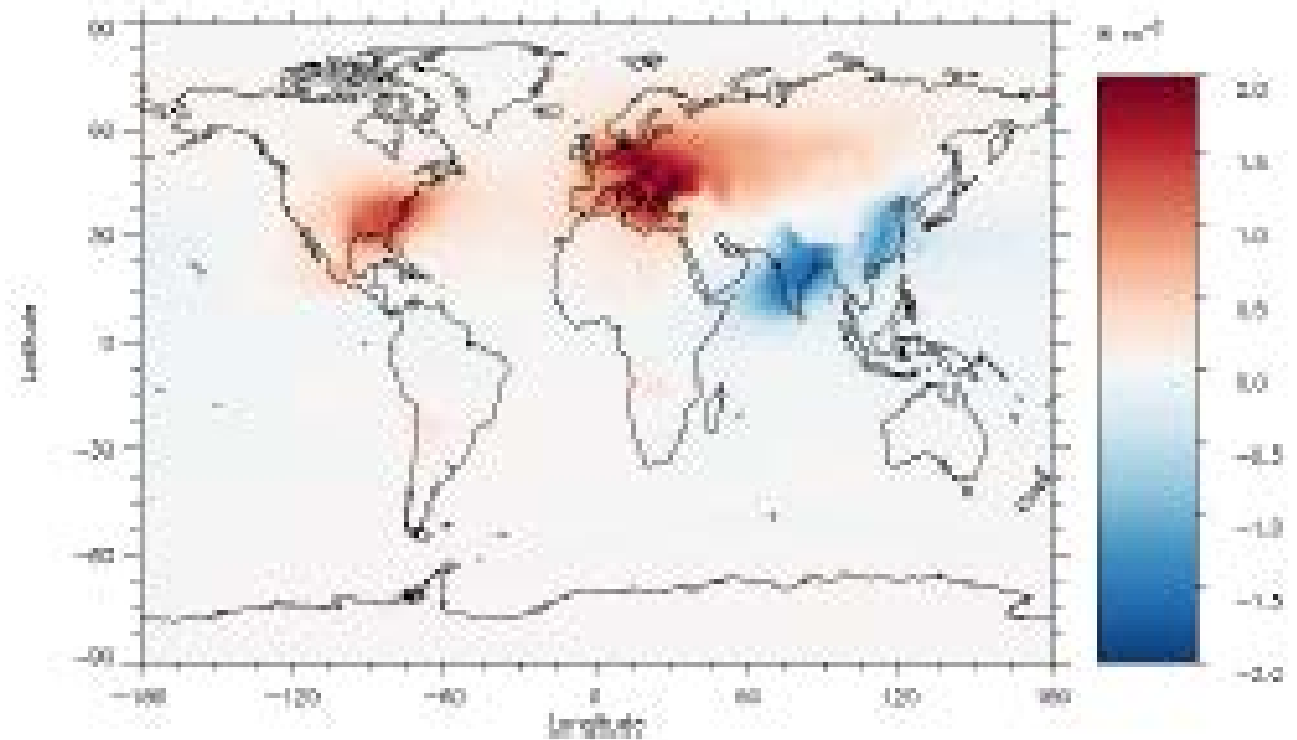
- aerosol has many flavors
- natural...
 - (most) dust, sea-salt
- anthropogenic
 - BC (over clouds) → **warming**
 - SO₄, NO₂, OM → **cooling**
 - regional pollution shifts
 - less over EU /USA
 - more SE Asia
 - direct impact changed ?

multi (6)-model 1990-2015
aerosol hindcast simulations
G.Myhre et al, ACP



sulfate forcing trends -

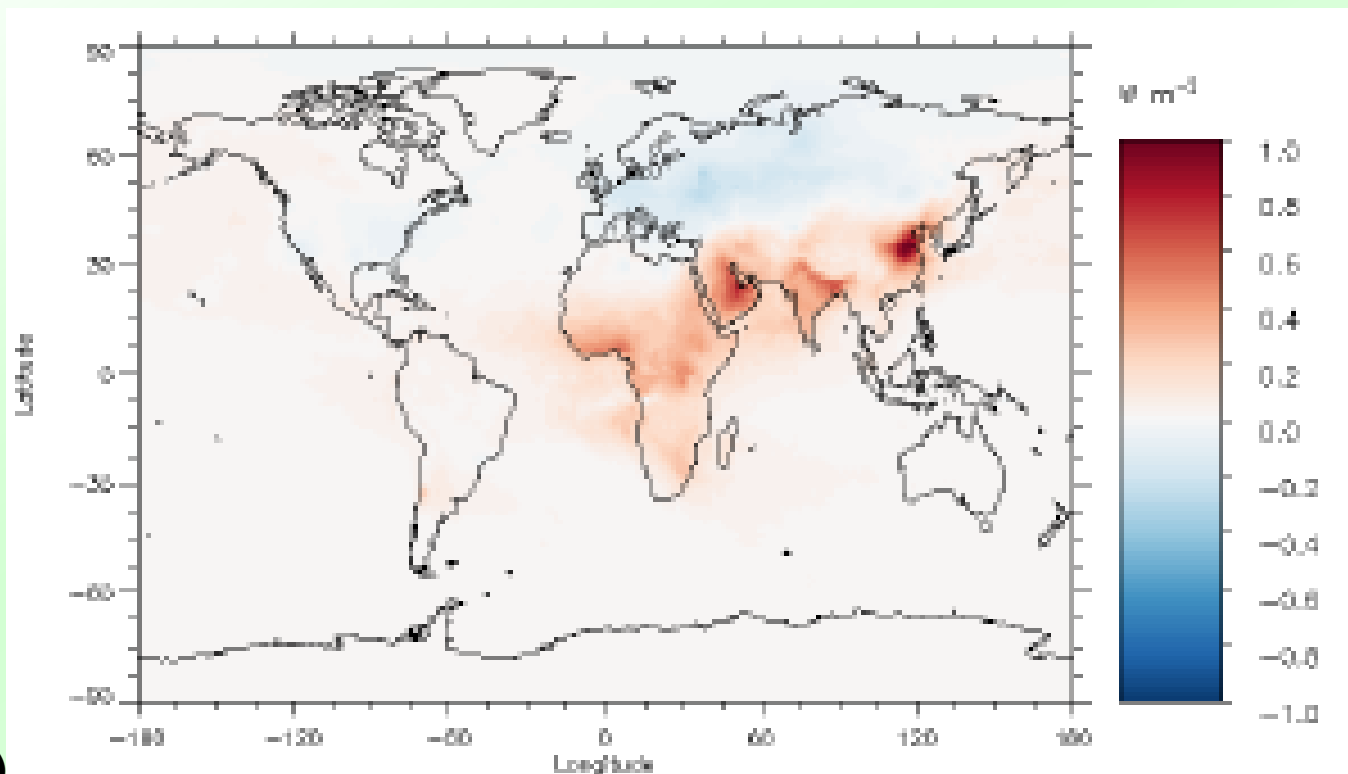
- US/EU sulfate reductions: **warming trend**
- SE ASIA sulfate increases: **cooling trends**



1990-2015 direct
SU forcing changes
(6 AeroCom models)
G.Myhre et al, ACP

BC forcing trends +

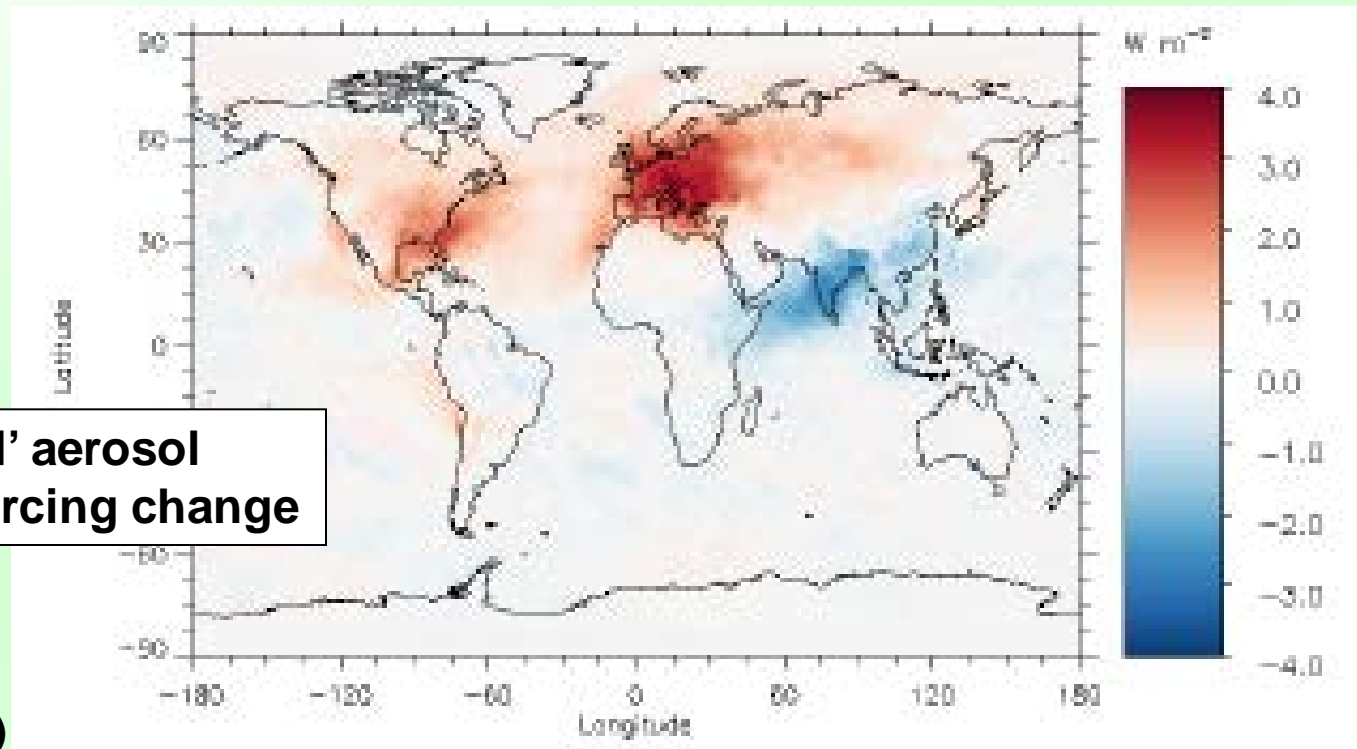
- US/EU weak reductions: **cooling trends**
- SE ASIA strong increases: **warming trend**



1990-2015 direct
SU forcing changes
(6 AeroCom models)
G.Myhre et al, ACP

direct forcing trends +

- aerosol direct climate cooling has decreased over the last 15 year ... still a weak cooling



overall 'simulated' aerosol direct radiative forcing change

1990-2015 direct forcing changes
(6 AeroCom models)
G.Myhre et al, ACP

summary on trends / next

for global annual averages ...

- even though aerosol AOD has not changed significantly over the last 15 years, aerosol direct forcing decreased (ca -0.5 to -0.3 W/m²)
 - main reason: less SU, more BC
- but:
 - indirect impacts are potentially much larger and uncertain → Minghuai Wang
 - are these simulations based results consistent with observations → Mian Chin

extras

new current research branches

- aerosol and environmental properties
 - aerosol and the hydrological cycle
 - indirect effects (clouds and precipitation)
 - volcanic CCN testbeds
- aerosol temporal change
 - more than 15 years of advanced satellite data
 - MODIS (VIIRS), MISR, ATSR (SLSTR), CALIPSO,
 - more than 20 years of ground remote sensing
 - AERONET, BSRN clear-sky solar radiation