M.Schulz, S.Kinne, M.Chin

outline

- **what is AeroCom ?**

- **recent achievements ?**

- **highlights from the last annual meeting ?**

- **relevance to ICAP**

- **future plans ?**

what is AeroCom ?

- **an international community initiative to improve aerosol component modules in global modeling**

  - **validate modeling (aspects) via comparisons to quality observations**

  - **understanding / exploring of modeling detail via common experiments**

  - **annual meeting with other modelers and with data suppliers**

  - **participate in assessments (IPCC, HDAP, …)**

 - **data access via the web** *aerocom.met.no/Welcome.html*

recent achievements

- **advancing science**

  - **joint papers**

  - **diversity in modeling** (remains large)

  - **radiative forcing opinions**

  - **vertical distribution** (and transport)

- **organizing science**   *aerocom.met.no/Welcome.html*

  - **improved web-interface**

  - **AeroCom data-base infrastructure**

  - **common experiments**
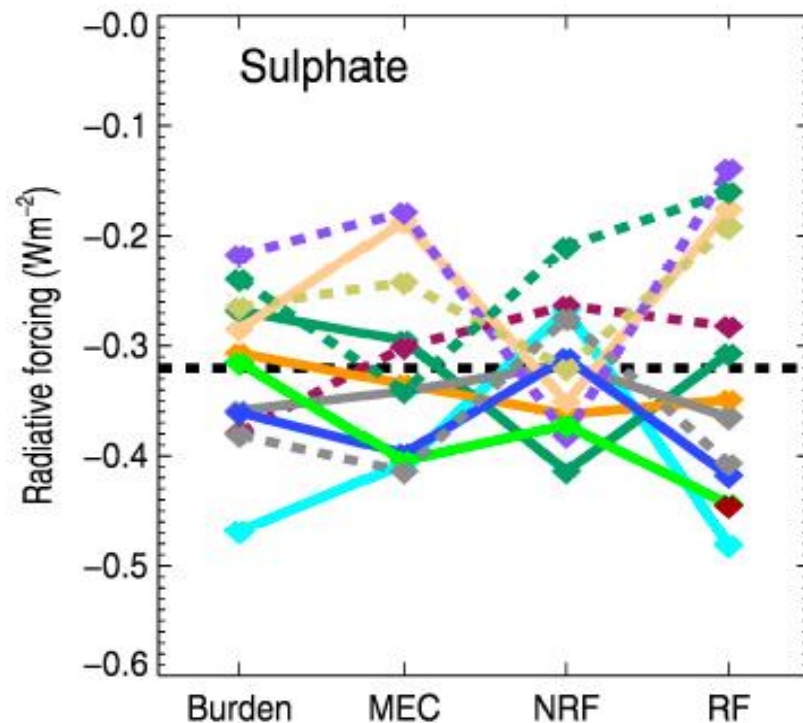
joint 2014 AeroCom papers

- **organic aerosols**
  - K. Tsigaridis et al., ACP accepted
- **black Carbon on snow**
  - C. Jiao et al., ACP *14* (5), 2399-2417
- **size distribution**
  - G. Mann et al*., ACP 14* (9), 4679-4713
- **dust over the Atlantic**
  - D. Kim et al., JGR *119* (10), 6259-6277
- **long-range transport (via radioactive tracers)**
  - N.Kristiansen, in preparation

diversity in modeling steps
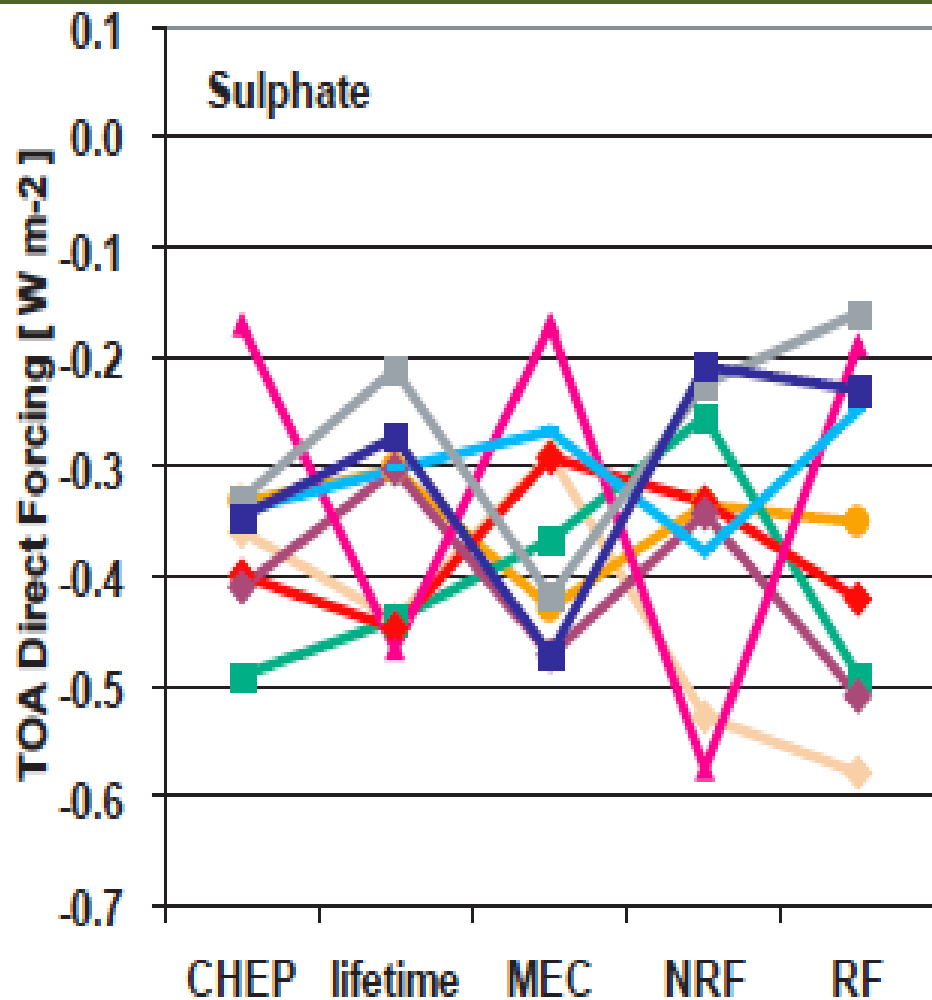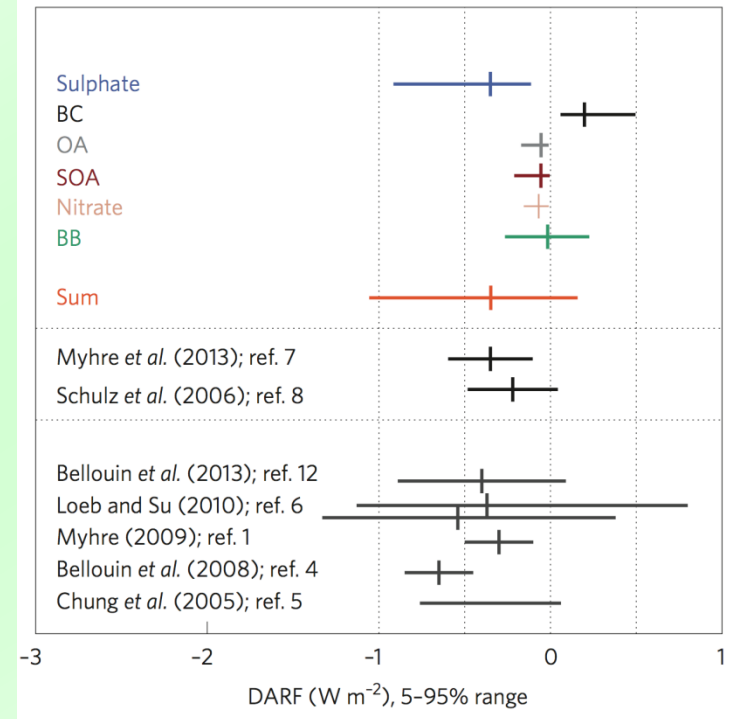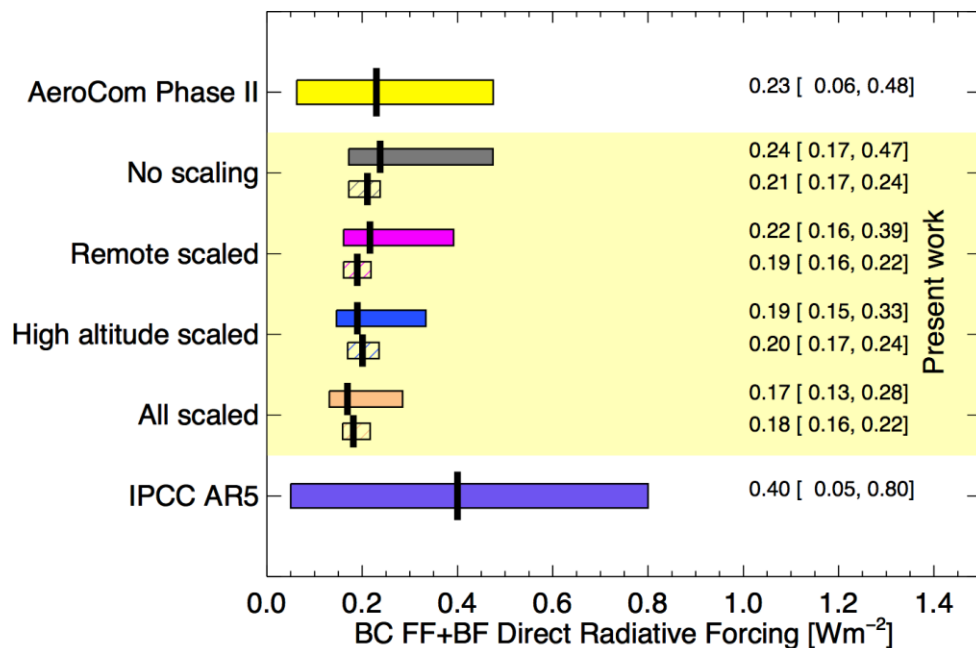

AeroCom I
Schulz et al. ACP 2007

AeroCom II
Myhre et al. ACP 2013

direct radiative forcing

- **Samset et al.,** *Nat Clim Ch, 2014, 4 (4), 230-232*
    - **more uncertain**
    - **role of BC**

evaluate vertical distribition
against CALIOP   *(Koffi et al in preperation)*

GLOBAL ANNUAL

$Z_{\alpha\ (0-6\ km)}$

CALIOP (2007−2009): 1.37
GISS−ModelE: 1.22
GOCART: 1.84
SPRINTARS: 0.96
LSCE: 1.51
GMI−MERRA−v3: 1.53
ECHAM−HAM: 1.32
PNNL: 1.31
GISS−MATRIX: 1.03
Oslo_CTM2: 1.45
HadGEM: 1.24
CAM4_Oslo: 1.68

Altitude a.s.l. (km)

Normalized extinction coefficient (km^{-1})
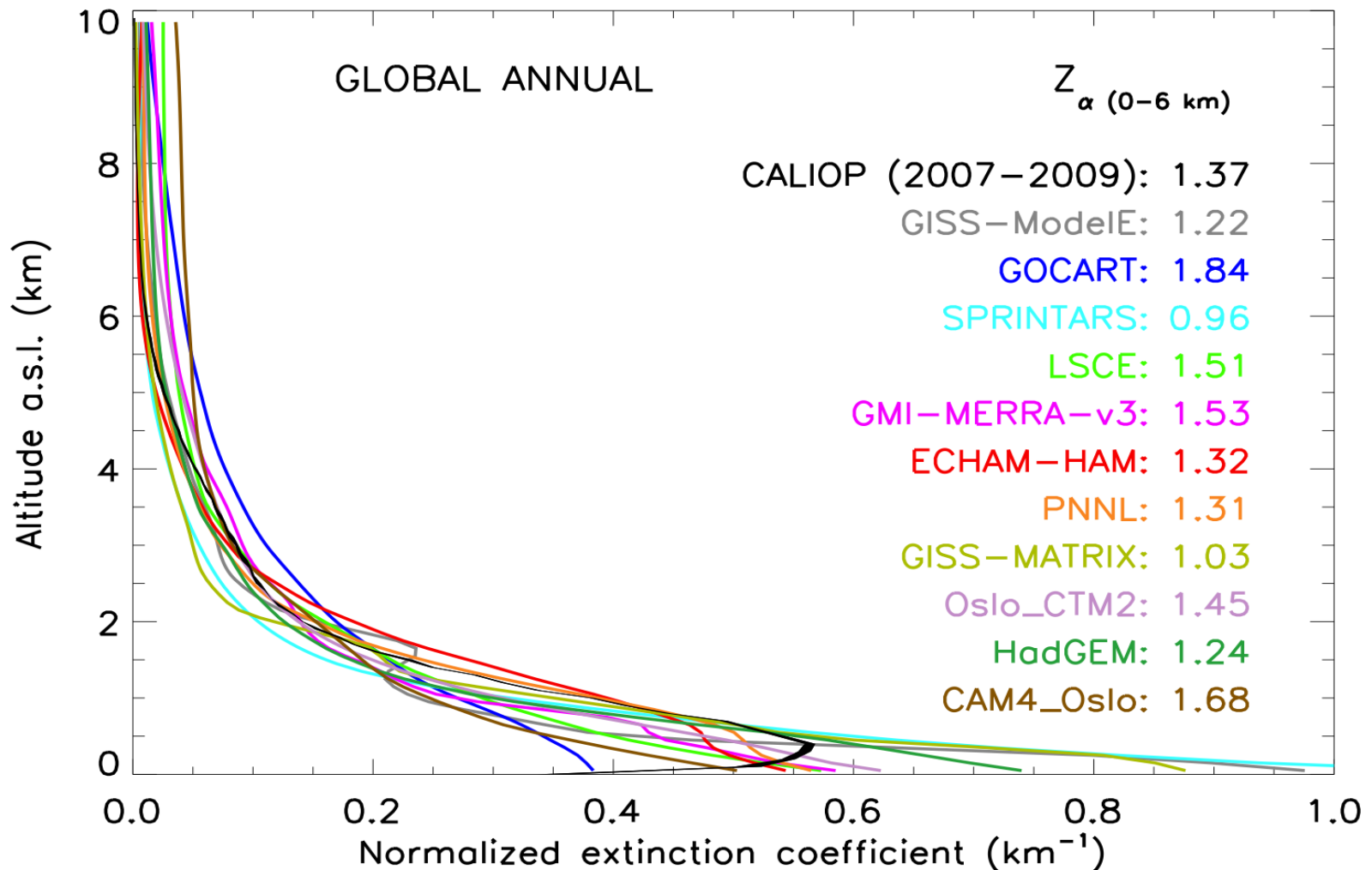
improved webpage

- **Aerocom.met.no/Welcome.html**
  - **better (text-) explanations**
  - **global netcdf attributes revealed**
  - **subsets by projects / publications indicated**
  - **reference data detail is displayed**
  - **comparability tool (to assure fair comparisons)**
  - **difference and correlation maps**
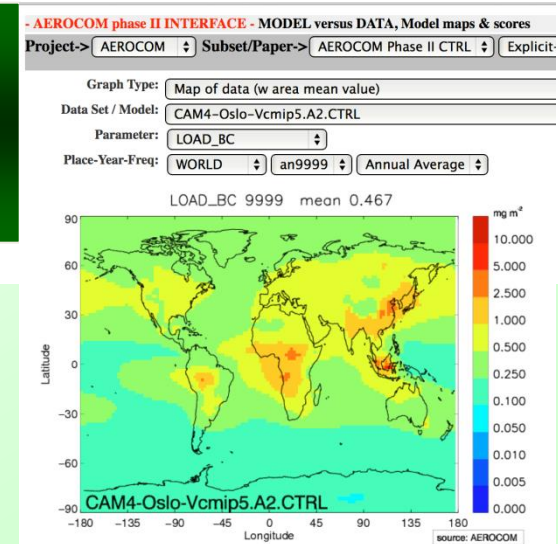
try the website and its updated features

michael.schulz@met.no is asking for your feedback!

data-base infrastructure

- **new manual for data submission**
  - **https://wiki.met.no/aerocom/data_submission**
- **130 have account on "aerocom-users.met.no"**
- **disk area grows to host HTAP and AeroCom III**
  - **now ca 30 TB available**
- **WCS server http://wcs-test.met.no/static/index.html**
  - **needs still content, threads server planned**
- **web interface has now high-quality images, more metadata from netcdf global attributes, faster reaction, subsets introduced**

ongoing AC-III experiments

- **Nitrate comparisons (H.Bian)**
- **Biomass burning experiments (M.Petrenko)**
- **HTAP 2 experiments (M.Chin, M.Schulz)**
- **Lifetime experiments (N. Kristiansen)**
- **Indirect experiments (S.Ghan)**

last meeting's highlights
at Steamboat Sep 2014   *(subjective)*

- **DATA**

  – **3 complementary MODIS retrievals**

  – **AERONET version 3 is coming**

- **MODELING**

  – **common experiments results**

  – **indirect effects remain a challenge**

  – **capability to quantify direct radiative forcing ?**

3 * MODIS

- **combined** (better coverage) **product is available**
  - **dark target / deep blue merge (via NDVI data)**

66% case envelope of AOD 'error',
± (0.03 + 10% *AOD), for ocean
± (0.05 + 15% *AOD), for land

- **dark target coll.6**
  - **MxD04_3K (a new 3 km aerosol products)**
  - **"distance to nearest cloud" pixel information**
  - **assisting in an alternate (better) VIIRS product**

- **deep blue coll.6**

+/-(0.03+20% *AOD), for land

  - **Improved models, pixel uncertainties**

- **MAIAC   …. probably too slow for NRT**
  - **better surface, will provide pixel uncertainty**

AERONET version 3

- **offers high quality (~ level 2.0) in NRT !**

  - **automated algorithm delivers AODs and α at Level1.5 statistically close to current Level2.0**

  - **stable thin cirrus clouds is better identified**

  - **variable fine-mode AOD (currently wrongly filtered) will be restored in the data base**

- **MAN**

Cruise tracks and daily averages of aerosol optical depth at 500 nm (squares are colored with respect to AOD values, i.e. blue – AOD<0.10 green – 0.1≤AOD<0.2 yellow – 0.2≤AOD<0.3 orange – 0.3≤AOD<0.5 red – 0.5≤AOD<0.7 purple – AOD≥0.7)
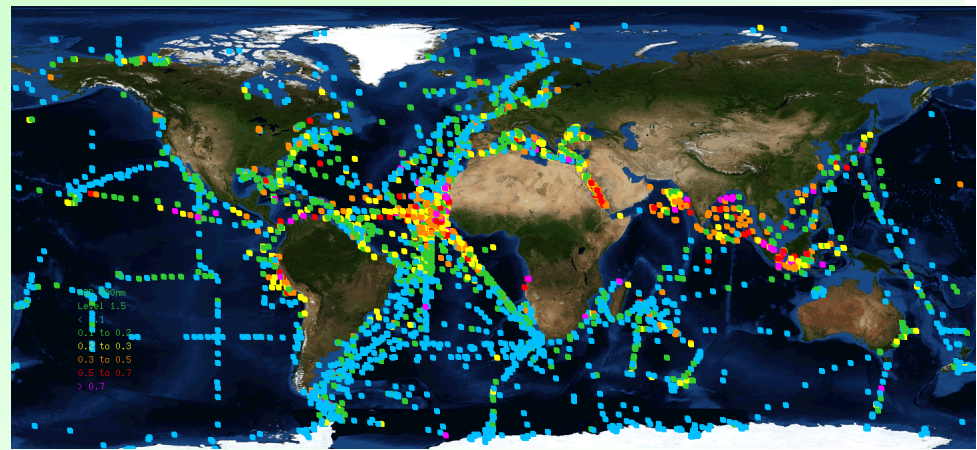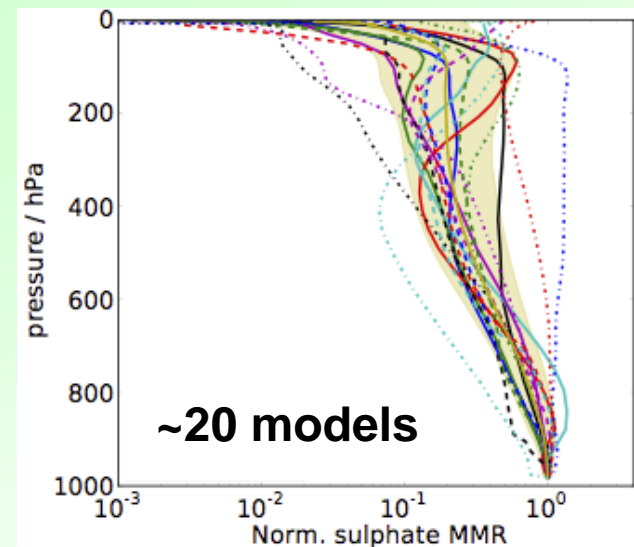
common experiments

- **lifetime/transport diagnostics** *(Kristiansen)*
  - **cesium attaches to accumulation aerosols (~SO4)**
  - **e-folding lifetime: 12.8 days**
    - **4.1 to 23.7 days (17 models)**
    - **8.9 days for median model**

CTBO sites for validation

- **vertical transport** *(Kipling)*
  - **sulfate mass mix ratio**
    - **vertical distribution varies**

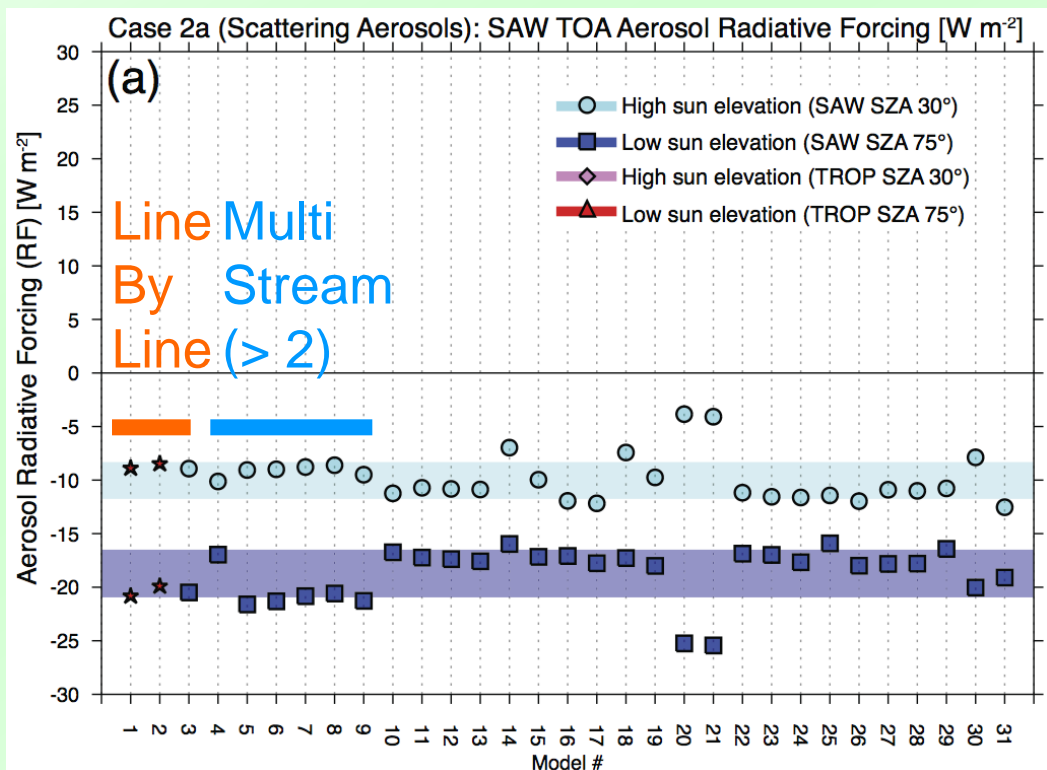**~20 models**

indirect effects (SO4 vs clouds)

- **simple parameterizations are unlikely to work**
  - **dependence not only on aerosol but also on cloud microphysics**

- **SWCRE increases with + SO_4 in many regions**
  - **mostly moderate LWP (125-300 gm^{-2})**
  - **stronger in Arctic and S. Ocean , N Atl, global**
- **SWCRE decreases with +SO_4 in many regions**
  - **shallow clouds (SW Atlantic, Barbados)**
  - **a cloud burn off mechanism *(e.g. Ackerman)* ?**

direct rad. forcing

- **does aerosol global modeling have the skill?**
  - **still the need to check capability and ancillary data**

- **Randles 2013**
  - **RT method**
- **Stier 2013**
  - **ancillary data**

Case 2a (Scattering Aerosols): SAW TOA Aerosol Radiative Forcing [W m^{-2}]

(a)

Legend:
- High sun elevation (SAW SZA 30°)
- Low sun elevation (SAW SZA 75°)
- High sun elevation (TROP SZA 30°)
- Low sun elevation (TROP SZA 75°)

Line Multi
By Stream
Line (> 2)

Aerosol Radiative Forcing (RF) [W m^{-2}]

Model #

~20 different radiatiev transfer schemes

relevance to ICAP

- **AeroSAT** — **a branch of AeroCom**

  to address satellite data issues
  - **lead by T. Holzer-Popp and R. Kahn**

  - **address satellite data pixel uncertainty**
  - **compare satellite products**
  - explore aerosol type capabilities
  - compare to no satellite aerosol data
 - Identify useful climate data records

pixel uncertainty

- **there is the recognition in satellite remote sensing to address** **user demand** **on error**

- **… but there are problems**
  - **only addressing known unknowns**
  - **applied 'jacobians' assume gaussian distr.**
  - **no std. definitions in place to report errors**

  - **how to quantify level 3 uncertainty ?**
  - **how are different errors distributed?**

- **your input and ideas to… Povey@atm.ox.ac.uk**

compare satellite products

- **the GEWEX aerosol panel has looked at level 3 AOD products**
  - **simular patterns**
  - **sign.differences**
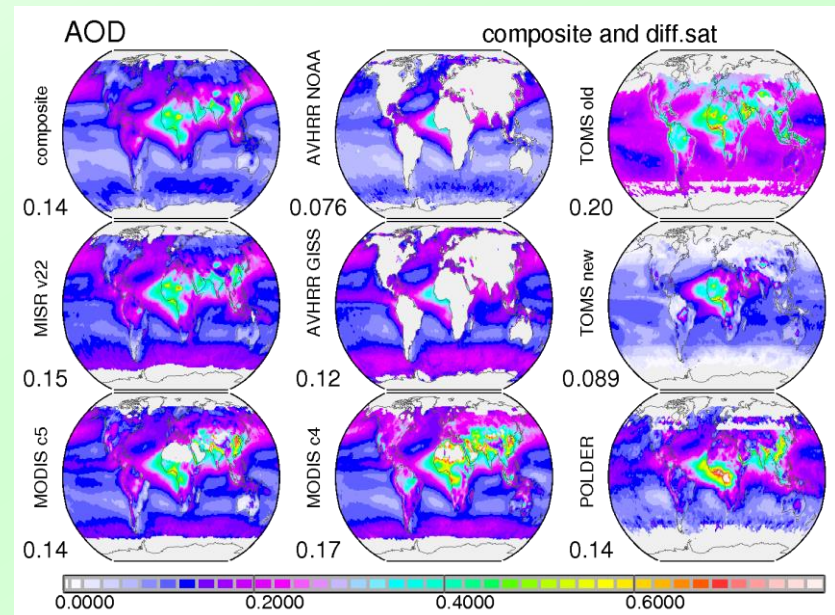
- **future GEWEX comparisons will turn to level 2 aerosol products and their uncertainty**
  - **ESA's aerosol CCI effort is motivated to assist**

future plans

- **preparing for IPCC 6 (and the MIPs)**

- **updating the diagnostics**

- **next events**
  - **Dec 2014   AGU fall session**
  - **Oct 2015   next annual meeting**
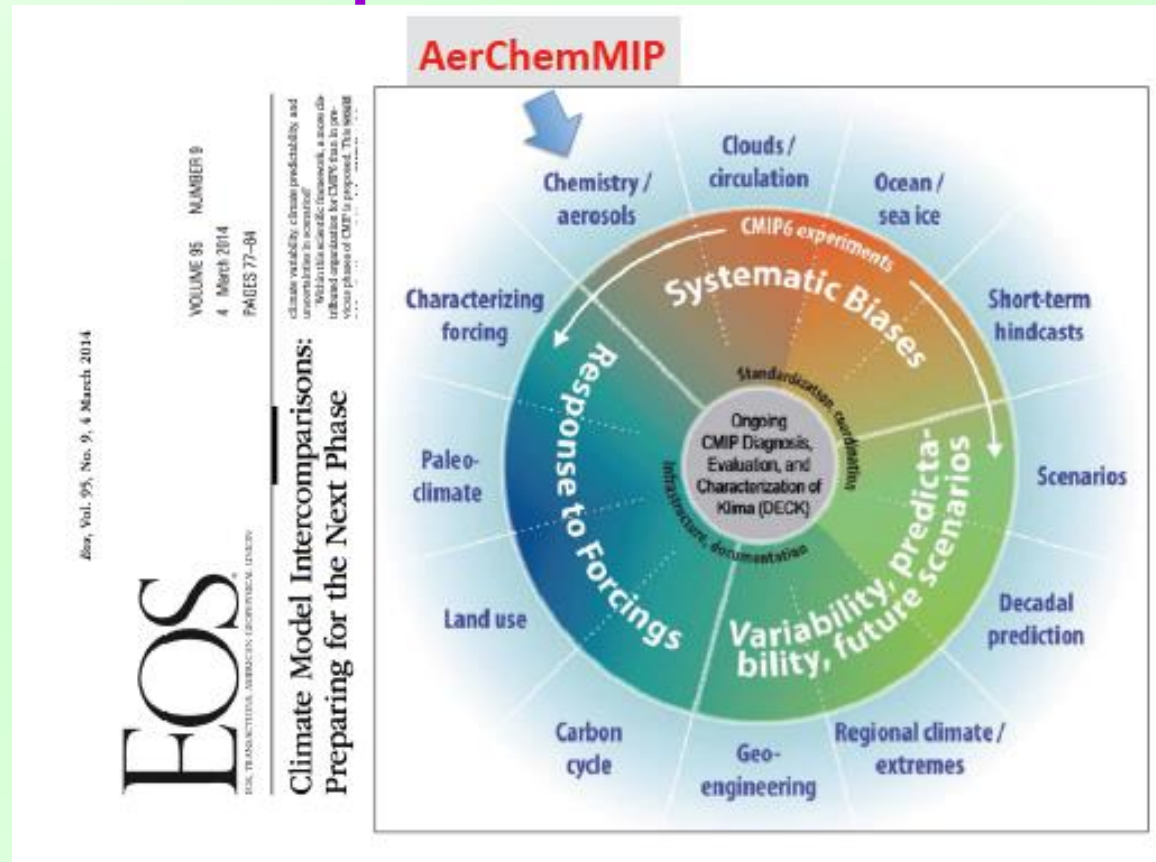
preparing for IPCC 6

- **AerChemMIP**

  – **planning on common experiments and diagnostics**

  role of

  short lived forcers ?
  natural aerosol ?
  biochem coupling ?
  feedbacks ?

new diagnostics
motivated by AeroCom P3 / AerChemMIP

Forcing: Triple/Extra call for radiation for GCM type models
 within AerChemMIP diagnostic packages: see afternoon

COSP-aerosol Working group on defi... ...mentation, coding work cooperation, P Stier ...

Surface site extractions a... ...MIP Ogren, Schulz

Aircraft simulator fo... ...g model runs (covering 10 y)
S S... ...tler, G Chen,

BB and nitra... ...ments CMOR tables are soon ready, Priorities empha...zed in HTAP-AeroCom master table

QuickCheckList an ascii list of "file names" required

plans for **webinars** on how to implement diagnostics in a model

14ᵗʰ AeroCom workshop
jointly with CCMI (AerChemMIP and AeroSAT)

in **ITALY**

5.10. – 9.10. 2015

**Frascati (AeroCom)
and Rome (CCMI)**

USA

China

Monday	Tuesday	Wednesday	Thursday	Friday
AeroCom	AeroCom	AerChemMIP	AeroCom	…..AEROSAT

AeroCom host: ESA & Simon Pinnock
CCMI host: CNR & Federico Fierli