MACv2
an AeroCom product

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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

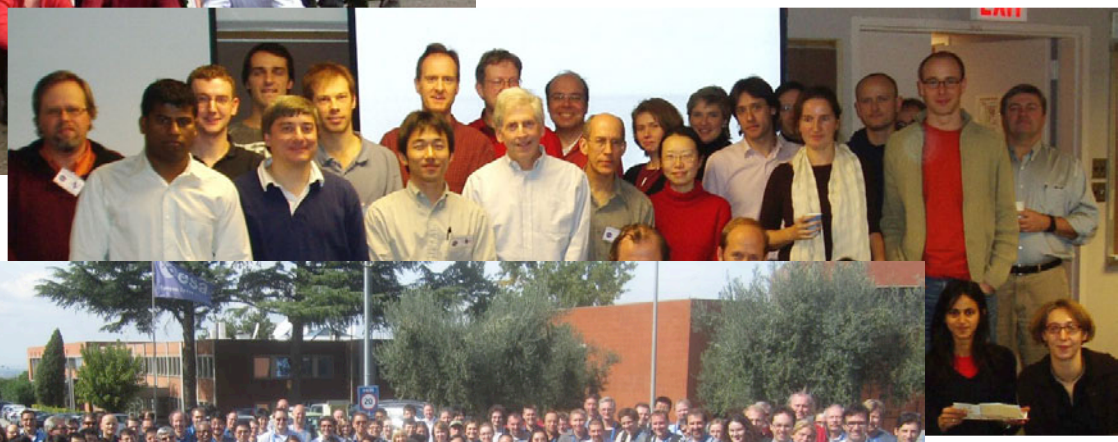
based on community spirit

- 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

2004



… over the years the participation kept growing

2015

… and there always was something to remember

its heart: the data base

http://aerocom.met.no/ ....

maintained by Michael Schulz

- 15 years of collection
  - simulations with complex aerosol modules
    - for data access → jan.griesfeller@met.no
- visual interface for (quick) comparisons
  - to other models / simulations / assimilations
  - to 'observational' data (Aeronet, satellite data)
    - http://aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl
- you are encouraged to work with the data !
  - data are waiting to be analyzed !!!

Max-Planck Aerosol Climatology

ftp ftp-projects.zmaw.de/aerocom/climatology/MACv2_2017

- 1x1 deg global, monthly, aerosol opt. properties
- capturing today's average properties for
  - column amount ('attenuation') AOD
  - column absorption ('composition') AAOD
  - particle 'size' information FMF, Angstrom

– how? …. combine!

- quality statistics from sun-photometer data
- completeness from bottom-up modeling

relying on OBSERVATIONS of AERONET and MAN plus background from modeling (no direct use of satellite data)

AerChemMIP AeroSAT ccmi AeroCom

why MAC ?

… climate studies require aerosol rad. properties

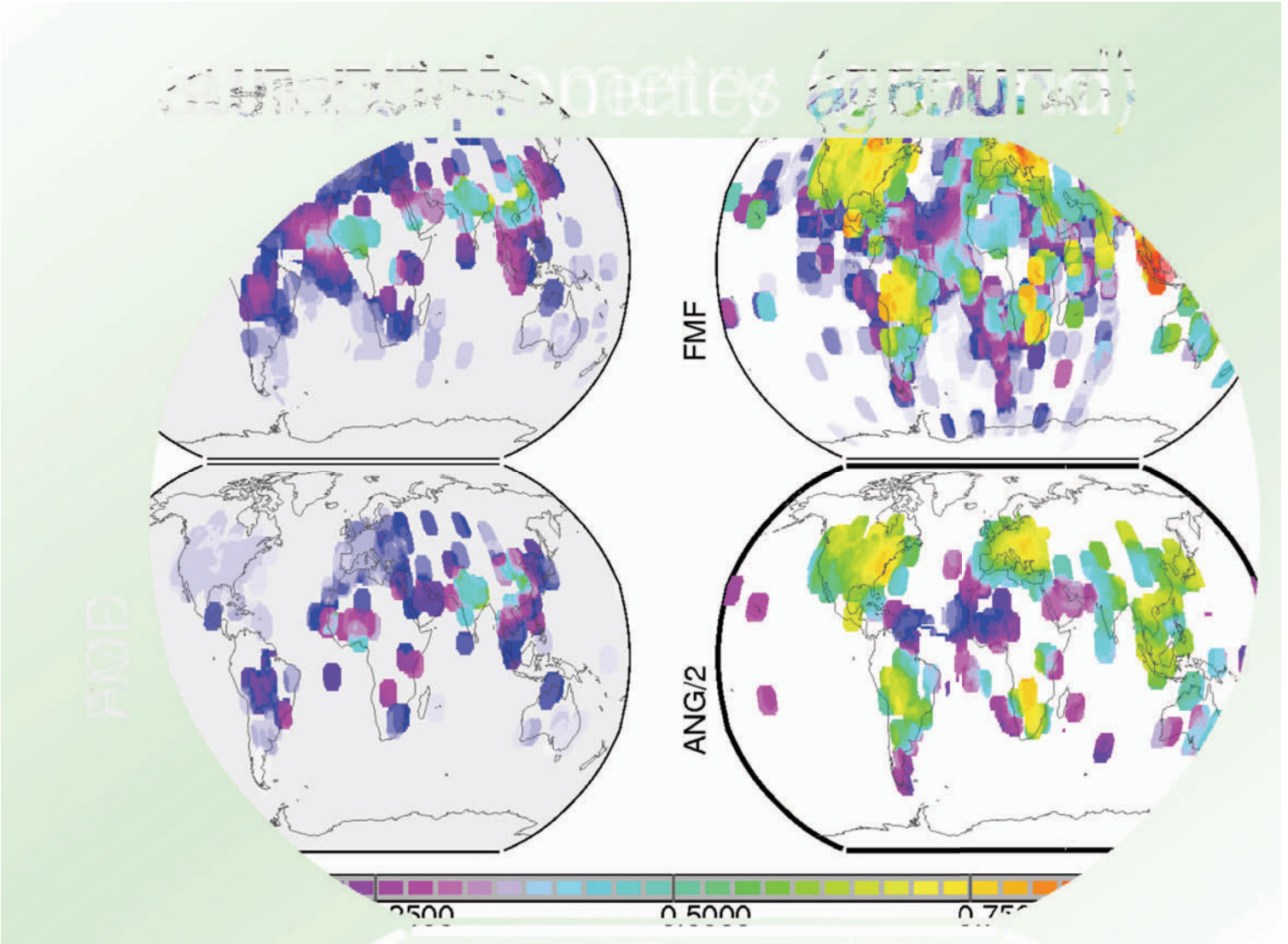
- simulations from global modeling
  - accuracy suffers from input and complexity
  - time-consuming
- prescription by a climatology (e.g. MAC)
  - direct link to observations
  - fast (and simple to implement)

while the climatology can be a nice option in many applications … the reliance on context from global modeling underlines to importance on advancements in detailed aerosol modeling

use observations if you can

AOD

AAOD
(10 times)



FMF

ANG
(div by 2)

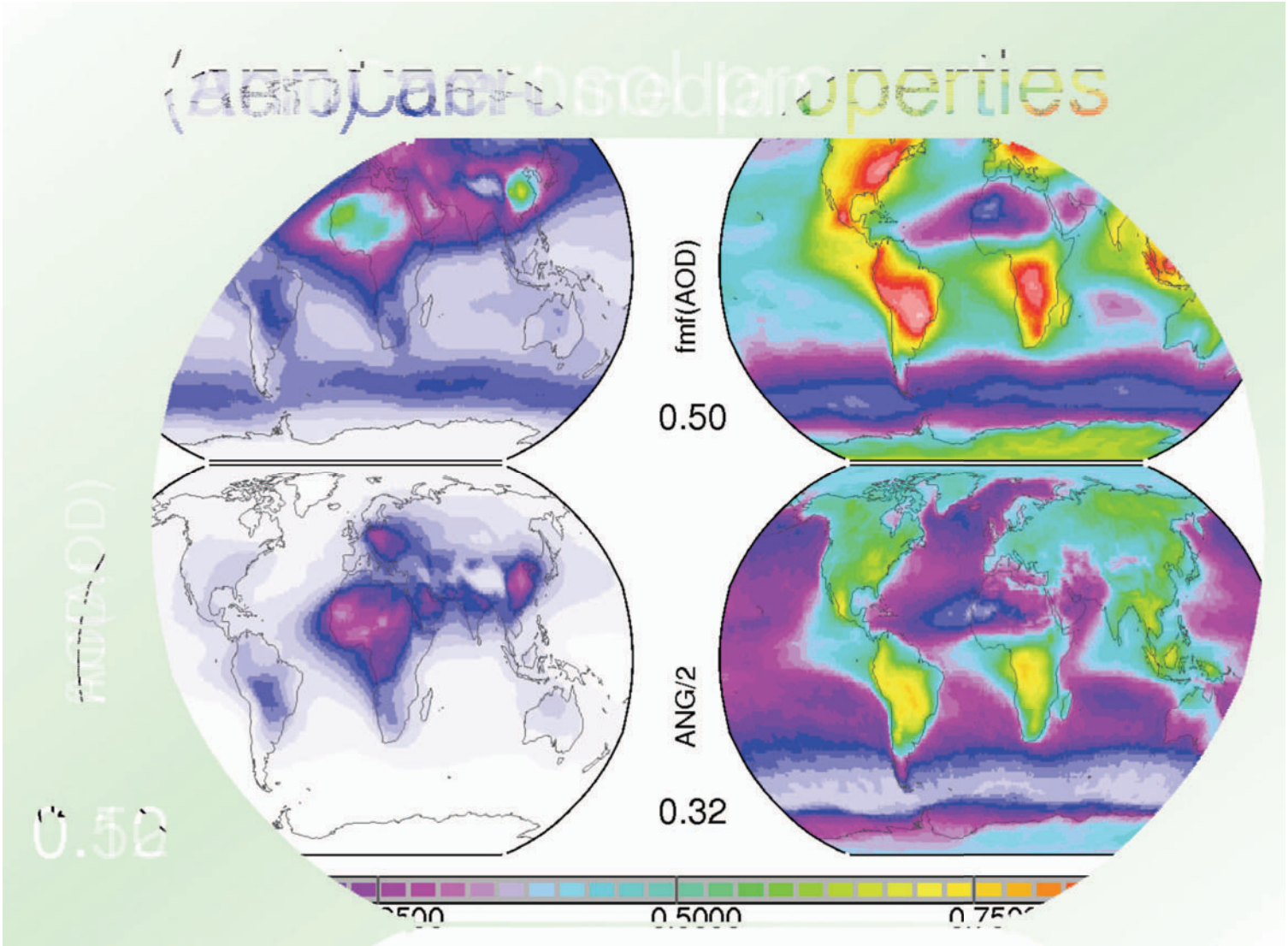
annual means

complete modeling

AeroCom

AOD

AAOD
(10 times)



FMF

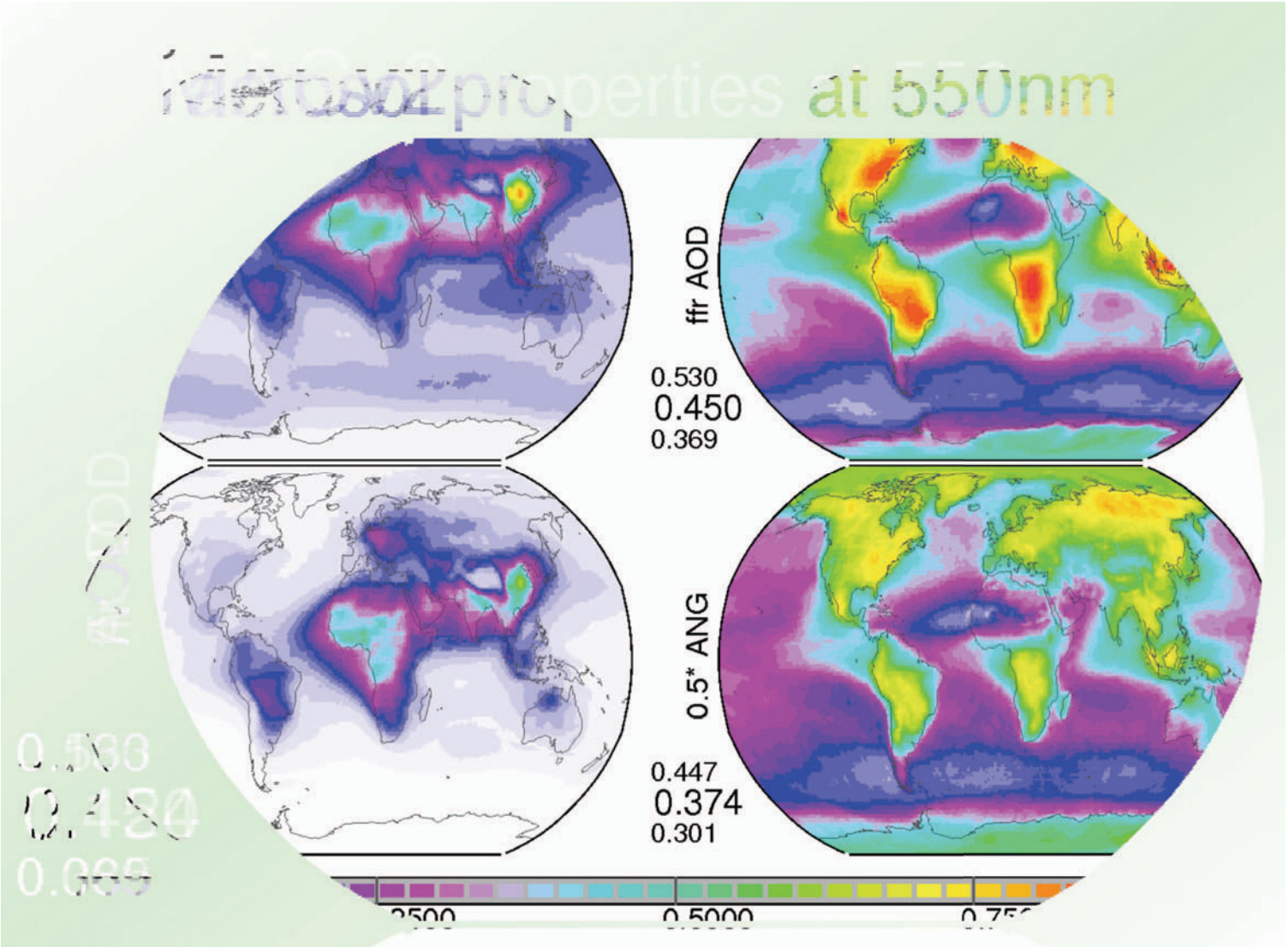
ANG
(div by 2)

annual means

extended with model context → MACv2

AOD

AAOD
(10 times)



FMF

ANG
(div by 2)

annual means

particularly useful with extra help

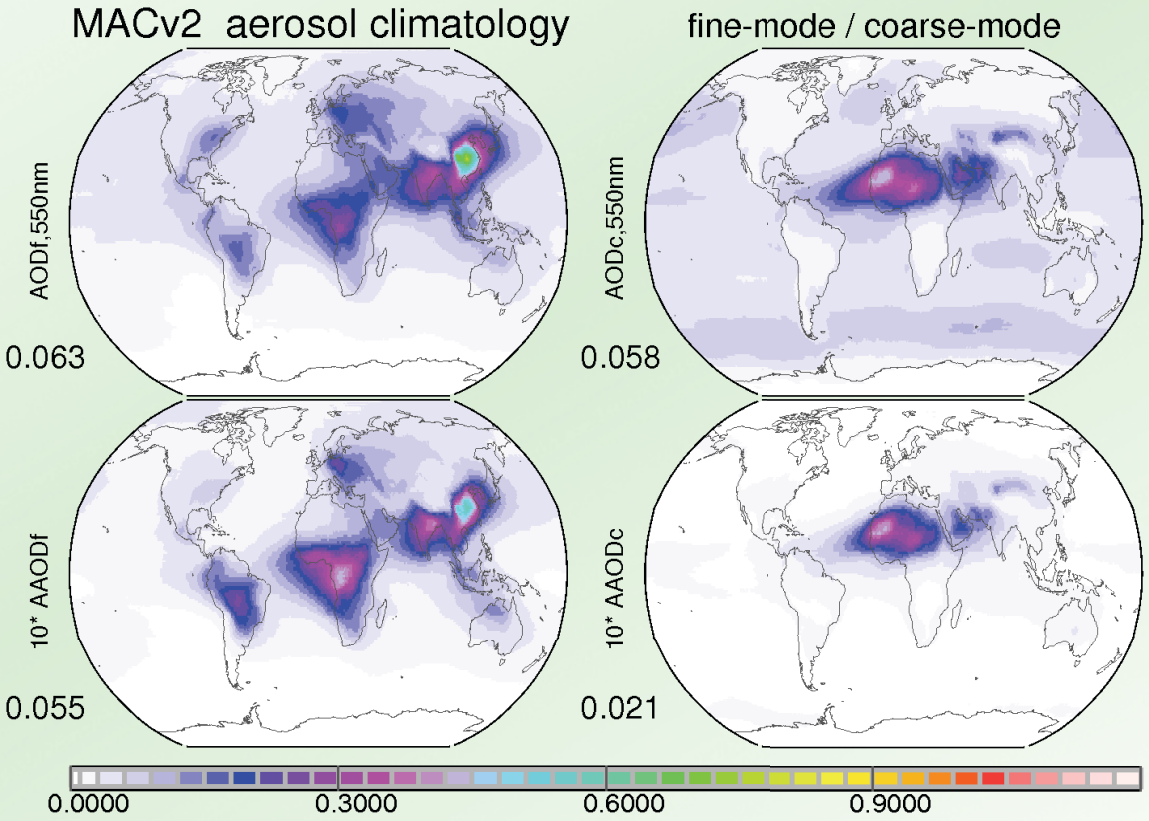
- to make it useful for climate applications
  - anthropogenic fraction
    - fine-mode only (no anthrop dust)
  - temporal variability (seasonality)
  - temporal variability (inter-annual)
    - only anthrop AOD change (const coarse-m.)
  - spectral variability
  - vertical distribution
  - microphysics (fine-mode size → CCN conc.)
    - changes to low cloud properties

ver.2 vs ver.1 (what changed?)

- merge absolute quantities, now in two steps
  - not relative properties (SSA, FMF, …)
- use MAN data over oceans
  - reduced dep. on modeling
- use a different (higher) PI fine-mode state
  - anthropogenic AOD dropped by 30%
- outcome
  - AOD remains similar, but anthrop AOD smaller
  - AAOD is much stronger
    - less direct forcing (-0.5W/m2 to -0.2Wm2)

recent ver.2 update (what changed?)

- **better absorption attribution to size-modes**
  - **allows now to quantify aerosol components**



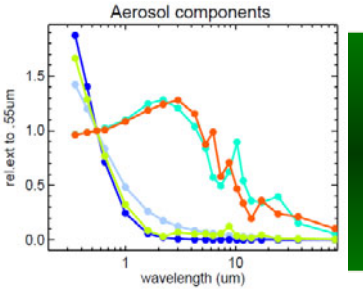
fine AOD 50%

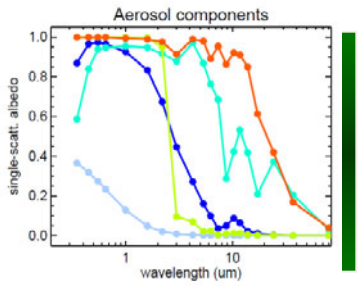
coarse AOD 50%

fine AAOD (10 times) 70%

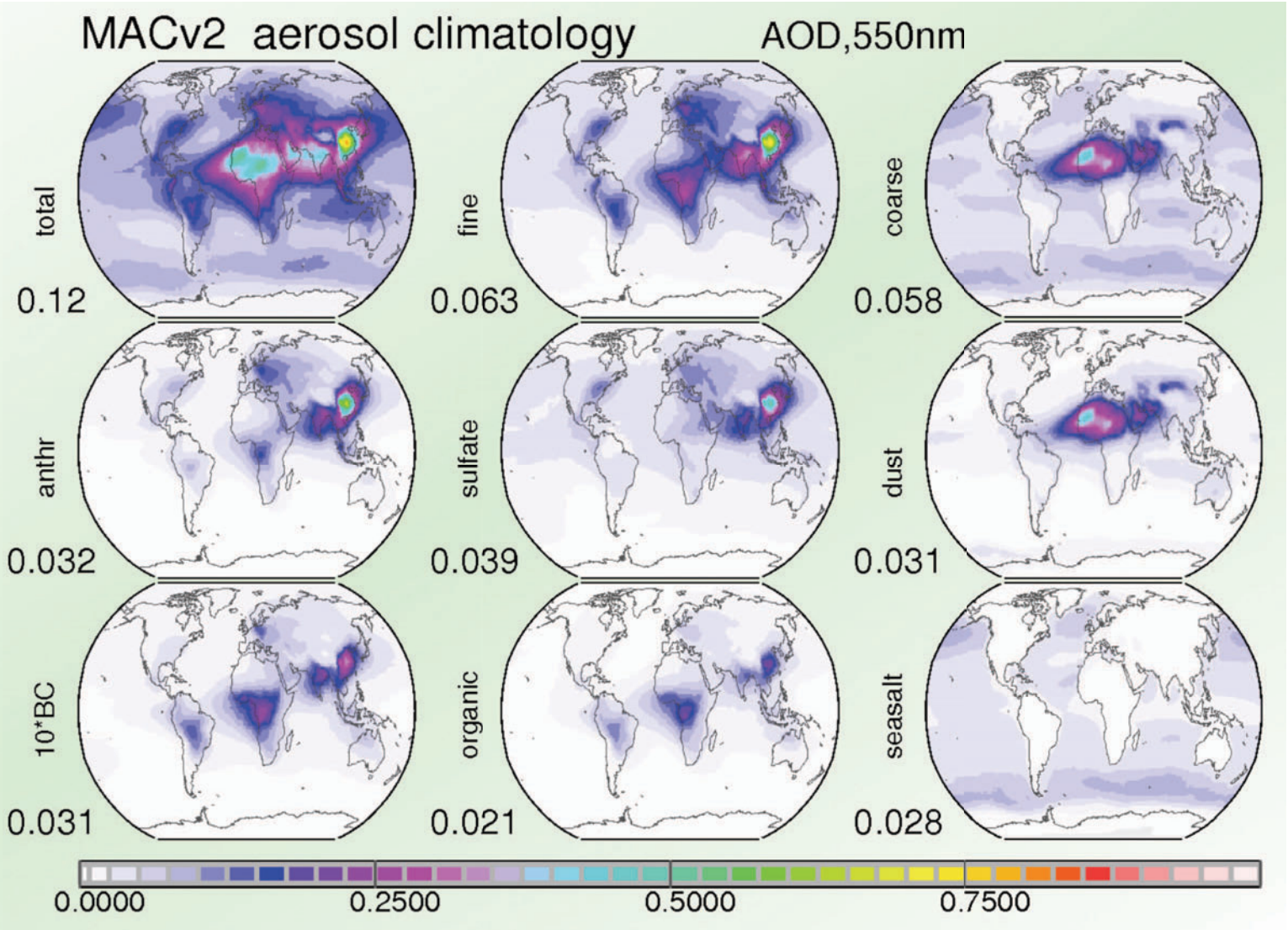
coarse AAOD (10 times) 30%

AOD by components

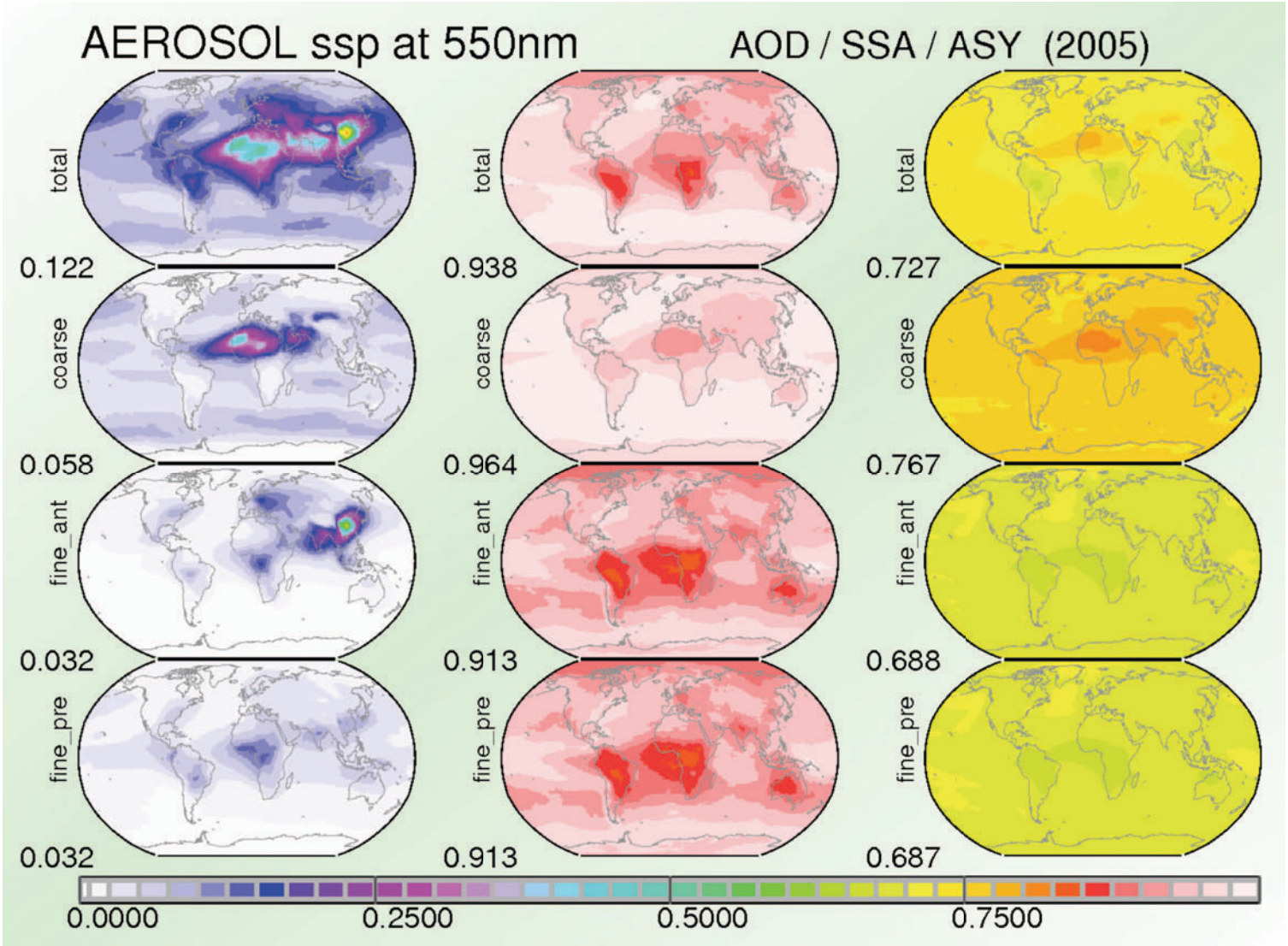




- **BC** black carb
- **OC** org. carb
- **SU** sulfate
- **DU** dust
- **SS** seasalt



AOD SSA ASY rad. transfer needs



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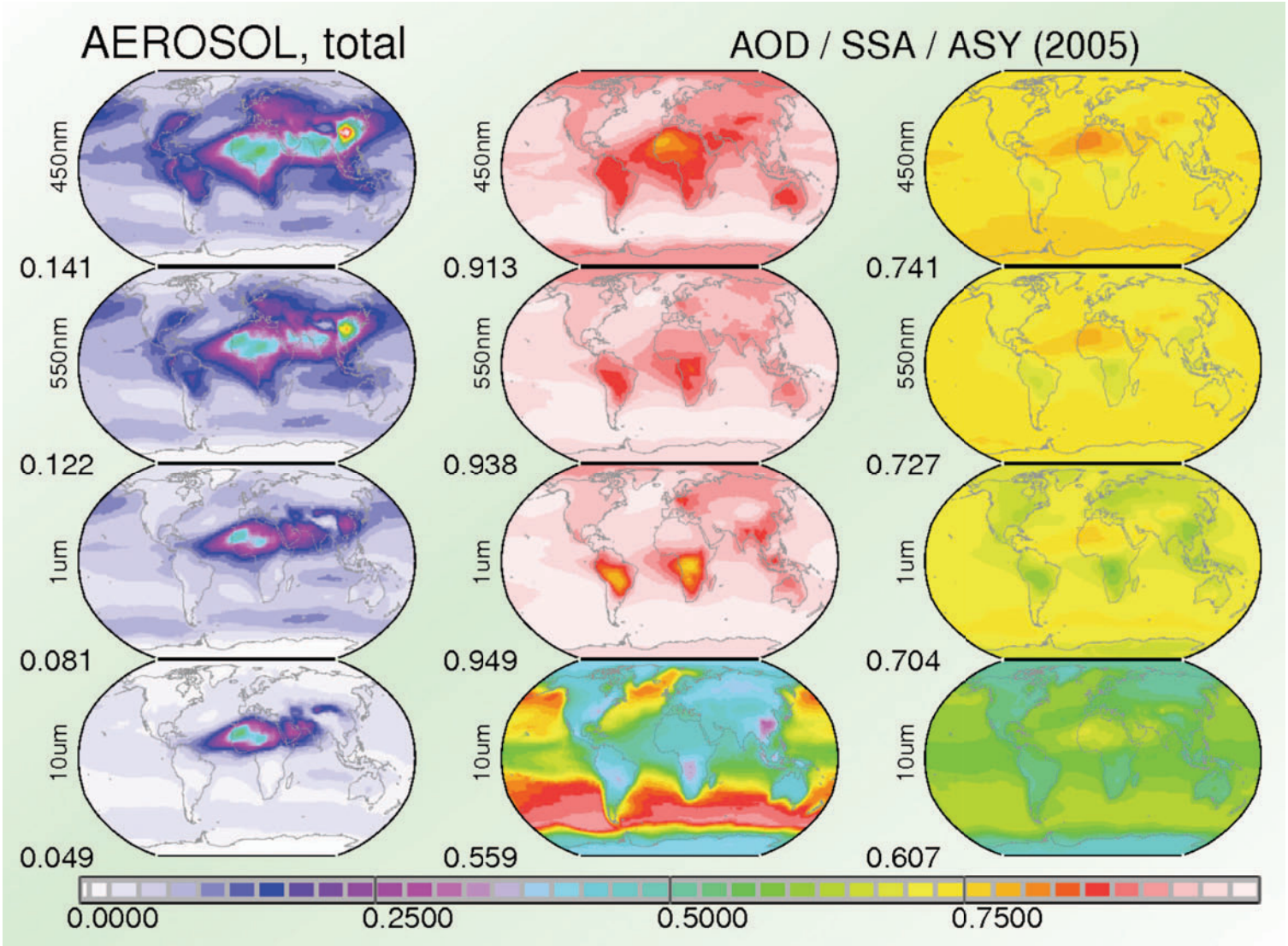
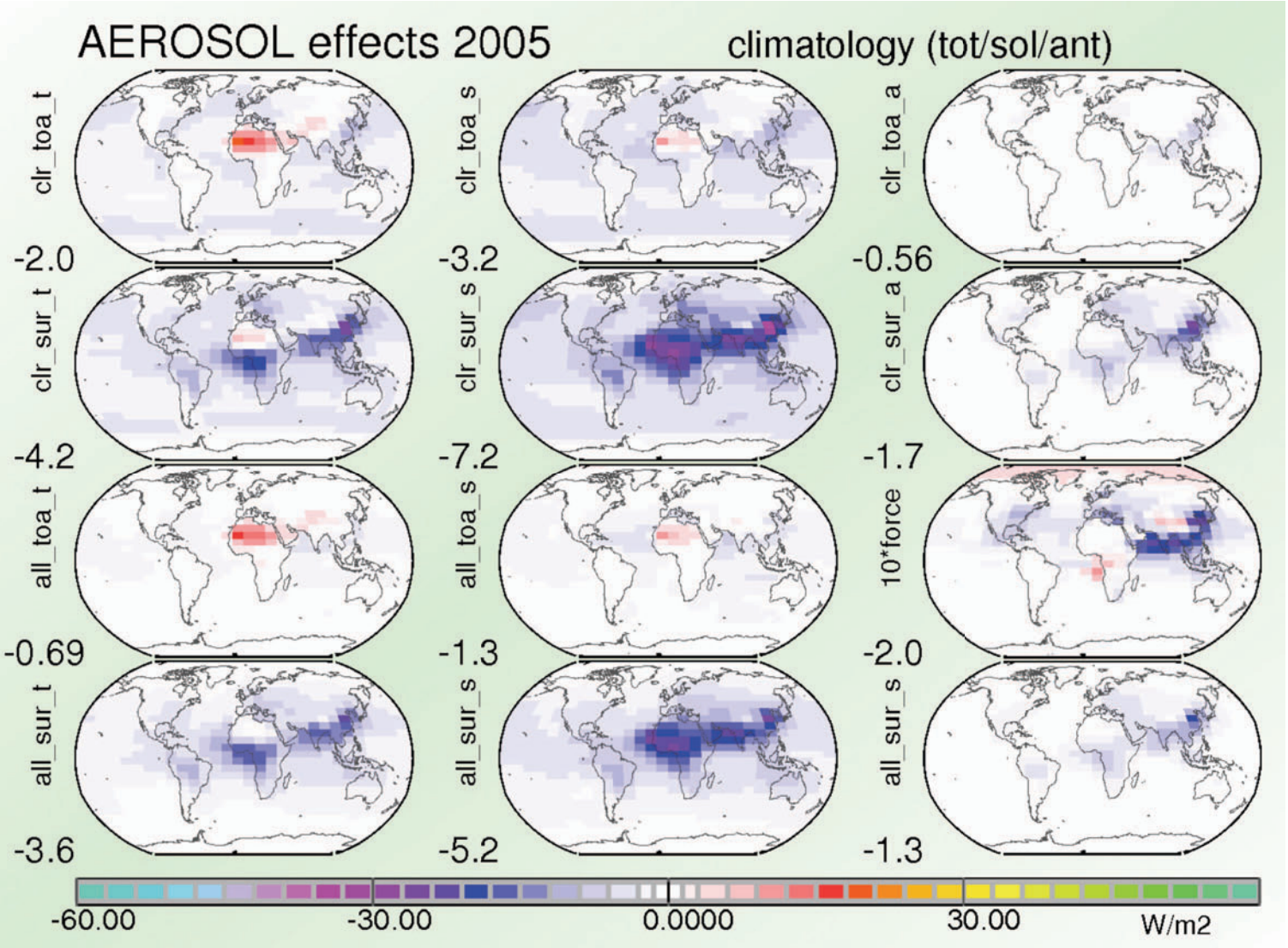
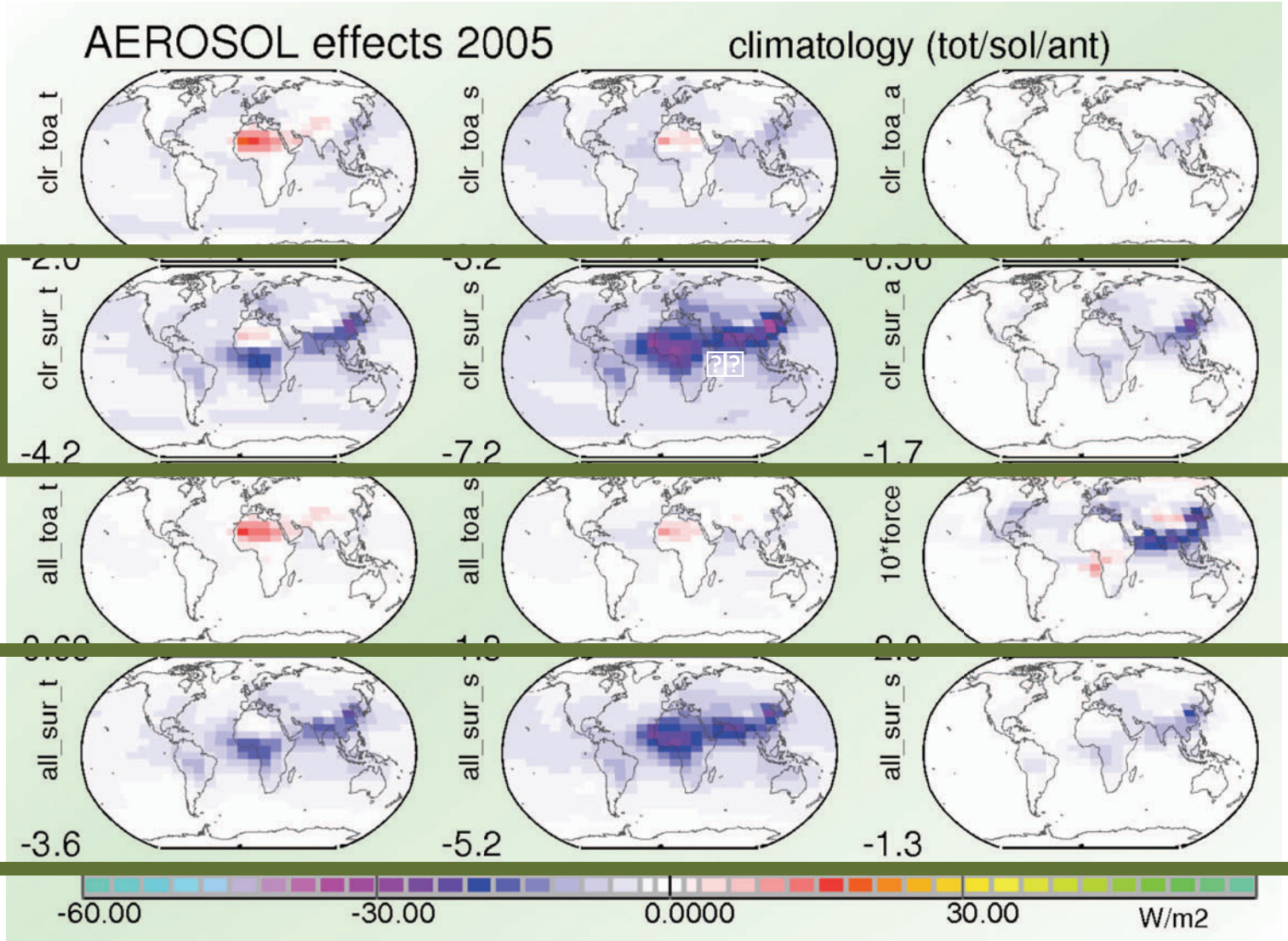


dir rad. impacts



at surface direct effect most important



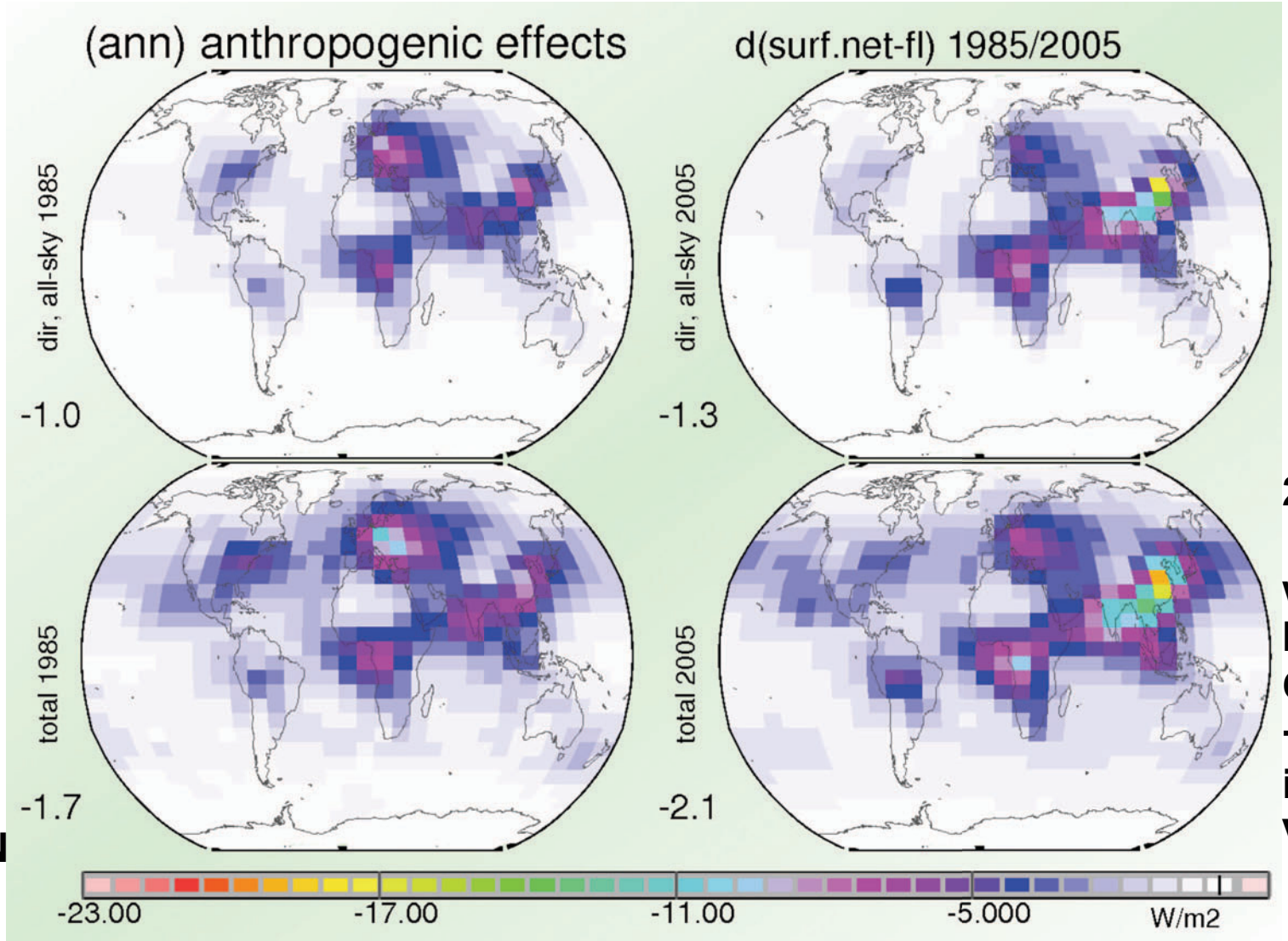
clr-sky 2005

all-sky 2005

changing impact on surf net fluxes

1985 clr-sky

1985 with ISCCP Clouds + indirect Via CCN



2005 clr-sky

2005 with ISCCP Clouds + indirect Via CCN

final slide

- update for MACv2 is available

ftp ftp-projects.zmaw.de/aerocom/climatology/MACv2_2017

  - next monthly pdf in place of single value
  - considering changes in fine-absorption
  - for specific spectral data needs: contact me

- forcing (and rad.effects)
  - indirect (via clouds) eff.s most import at TOA
  - direct effects most imp. in atm and at surface
  - over the last decades the aerosol induced reductions to on surface net-fluxes increased