WHY **Aerosol optical depth (aot) comparisons to data from ground and space are preferred ways to demonstrate the skill of aerosol modules in global modeling. Comparisons among aerosol module detail demonstrate strong differences at sub-components, which may goes unnoticed when looking at integrated properties. Specifically we have to wonder: *Are 'good' aot totals skillful, just luck (off-setting errors) or a matter of tuning?* Investigations of detailed aerosol output of control experiments as proposed in AEROCOM will tell.**

Stefan Kinne and Authors
MPI for Meteorology, Hamburg, Germany

Simulated aerosol components

global fields of yearly averages and monthly range

Models	Resolution	Simulation	Authors
LO LOA	3.75/2.5deg	yr 2000	*Reddy / Boucher*
LS LSCE	3.75/2.5deg	yr 2000	*Schulz / Balkanski*
UL ULAQ	10/22.5deg	yr 2000	*Pitari / Montenaro*
SP SPRINTARS	1.3/1.3deg	yr 2000	*Takemura*
CA CANADA	2.8/2.8deg	1yr avg	*Gong*
MI MIRAGE	2.5/2.0deg	yr 2000	*Ghan / Easter*
NF NCAR-Match	1.9/1.9deg	yr 2000	*Fillmore / Collins*
NM NCAR-Mozart	2.8/2.8deg	1yr avg	*Tie / Brasseur*
OT OSLO	2.8/2.8deg	yr 1996	*Myhre /Isaksen*
IM IMPACT	2.5/2.0deg	3yr avg	*Liu/ Penner*
EH ECHAM5	2.8/2.8deg	3yr avg	*Stier / Feichter*
EL ECHAM4	3.8/3.8deg	3yr avg	*Lohmann /Feichter*
GO GOCART	2.0/2.5deg	yr 2000	*Chin / Ginoux*
GR GRANTOUR	5.0/5.0deg	1yr avg	*Herzog / Penner*
GI GISS	4.0/5.0deg	3yr avg	*Koch / Tegen*
HA HADAM4	2.5/3.8deg	5yr avg	*Roberts / Jones*

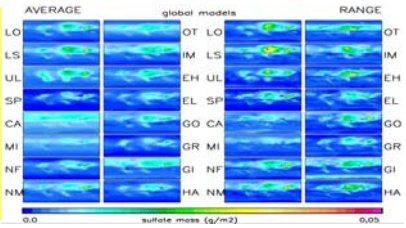
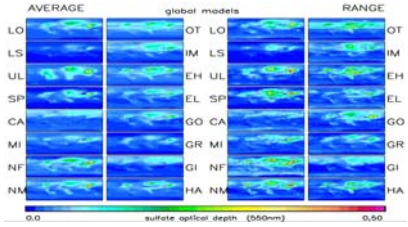
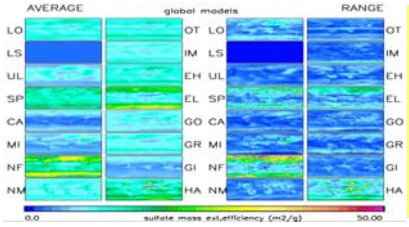
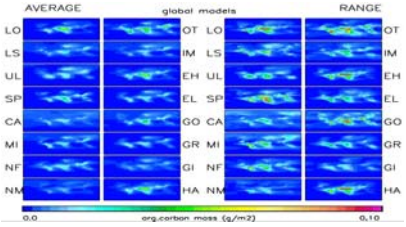
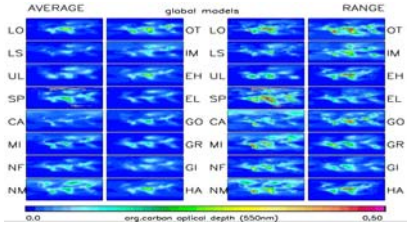
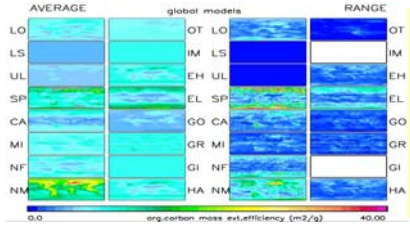
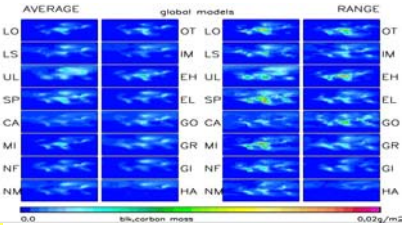
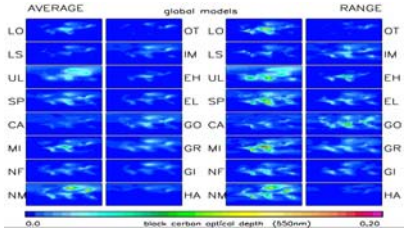
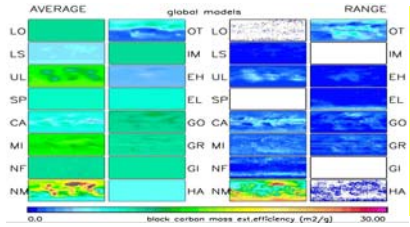
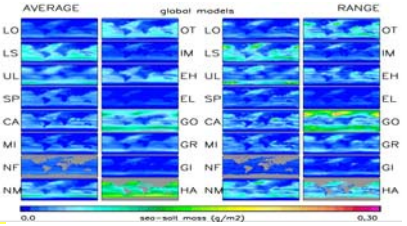
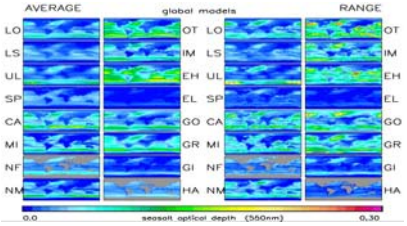
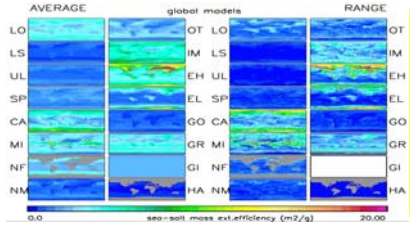
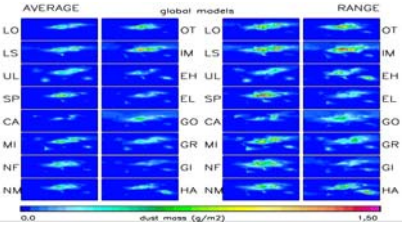
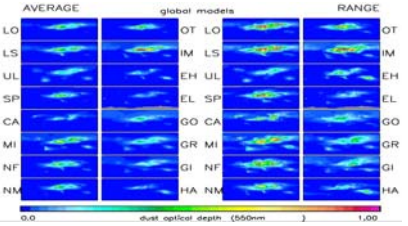
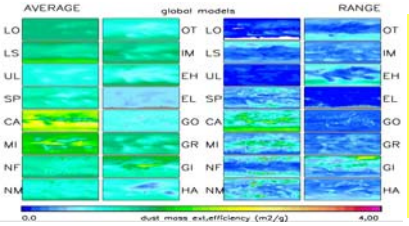
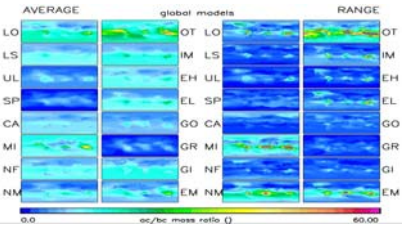
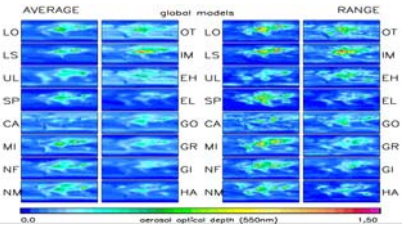
Human activity has increased atmospheric concentrations of greenhouse gases and aerosol. Our understanding of assocaited climatic impact is largely based on global modeling. And uncertainties with respect to aerosol have remained large. For an improved representation new aerosol modules in global modeling now distinguish between sulfate, organic carbon, black carbon, dust and sea-salt aerosol types. Here simulations of 16 models are presented. These are (in terms for forcing: intermediate products of) mass and aerosol optical depth and the conversion factor from mass into optical depth; the mass extinction efficiency – for each aerosol type.

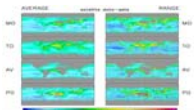
RESULTS

- **overall agreement for source location, but differences in strength**
- **large differences in simulated transport (and / or removal rates)**
- **large differences in conversion (of mass into optical depth) *due to***
  - ***size assumptions***
  - ***humidification assumptions***
  - ***ambient relative humidity used***

⇨ **extra comparisons needed to identify/ remove poor assumptions**

RESULTS

	AEROSOL MASS	AEROSOL OPTICAL DEPTH	AEROSOL MASS EXT. EFF.	
sulfate				sulfate
org. carbon				org. carbon
black carbon				black carbon
sea-salt				sea-salt
dust				dust
oc/bc ratio			total aot	satellite aot



Satellite-Data

MO MODIS	(2001)	*Chu / Kaufman (NASA)*
AV AVHRR	(1985-1988)	*Mishchenko / Geo. (NASA)*
TO TOMS	(1979-2001)	*Torres / Herman (NASA)*
PO POLDER	(1986-1987)	*Goulomb / Tanre (LOA)*

next **AEROCOM project**
⇨ **detailed evaluations**

- to understand reasons for differences in mass to optical depth conversions among models: ***identical year, identical water uptake***
- to identify major causes for differences in mass distribution, including transport: ***identical inventories (sources), identical meteorology***
- to understand observed seasonal and regional patterns of aerosol/chemistry: ***satellite data, field studies, long-term monitoring***