WHY

The visible aerosol optical depth is the most fundamental property to characterize atmospheric aerosol, thus the primary property in aerosol remote sensing. Many different global multi-year data are offered from different sensors – at less accuracy and coverage over land. Discrepancies to aerosol simulations of global model can identify regions and season with problems (problems in remote sensing and / or problems in modeling). ***Agreement in aerosol optical depth comparisons are NOT sufficient to validate aerosol component models !***

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AEROSOL OPTICAL DEPTH

GLOBAL FIELDS FROM MEASUREMENTS AND SIMULATIONS

Satellite	Measurements	Authors
MO MODIS	(2001)	*Chu / Kaufmann*
MI MISR	(2001)	*Kahn / Martonchick*
AV AVHRR	(1983-2001)	*Mishchenko / Geo.*
TO TOMS	(1979-2001)	*Torres / Herman*
PO POLDER	(1986-1987)	*Goulomb / Tanre*
MM MODIS *(primary)* / MISR *(secondary)*		
MT MODIS *(primary)* / TOMS *(secondary)*		

Ground	Measurements	Authors
Aer AERONET	(1998-2001)	*Holben / Eck*

Models	Resolution	Simulation	Authors
LO LOA	3.75/2.5deg	yr 2000	*Reddy / Boucher*
LS LSCE	3.75/2.5deg	yr 2000	*Hauglustine /Schulz*
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	1.9/1.9deg	yr 1996	*Myhrne /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*
IM IMPACT	5.0/5.0deg	1yr avg	*Herzog / Penner*
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*

Preferred methods to demonstrate aerosol forcing skill in global modeling are comparisons to measured aerosol optical depth (aot). Here, available global (aot-) data-sets from ground and space are compared. Comparisons to model-simulations are provided for data-sets, considered 'superior': MODIS/MISR (superior cloud screen and land-retrieval) and AERONET(complete definition of all aerosol properties). Model-deviations on a yearly and seasonal basis are provided. Given accuracy limitations in remote sensing from space or representation limits of ground statistics, however, only larger deviations are meaningful.

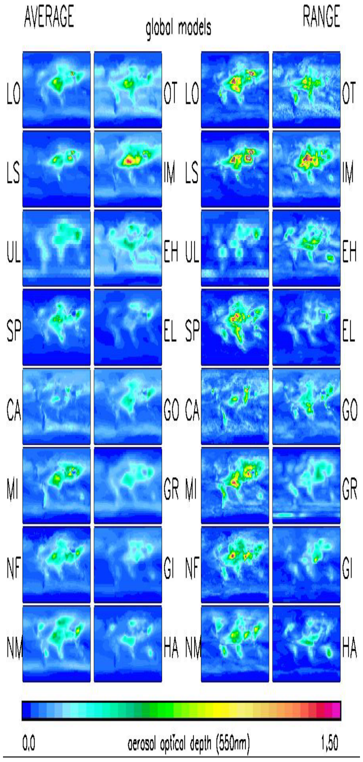
RESULTS

- **large differences in simulated aerosol optical depths among models**
- **more recent models have compensated for underestimates to satellites**
- **distribution is often unsatisfactory (sources stronger, remotely weaker)**
  - ***many models tend to overestimate (N.Africa) dust and urban sources***
  - ***models struggle with biomass seasons – especially in South America***
  - ***models are usually too weak in remote regions***

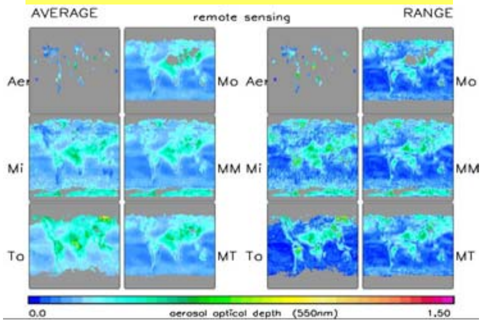
RESULTS

AEROSOL OPTICAL DEPTH

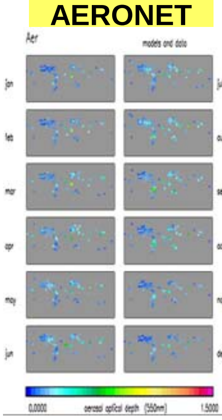
Model Simulations



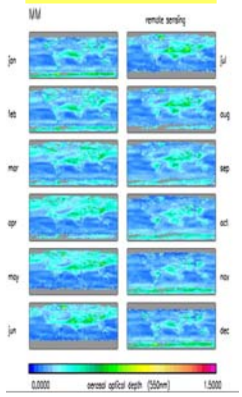
Measurements



AERONET

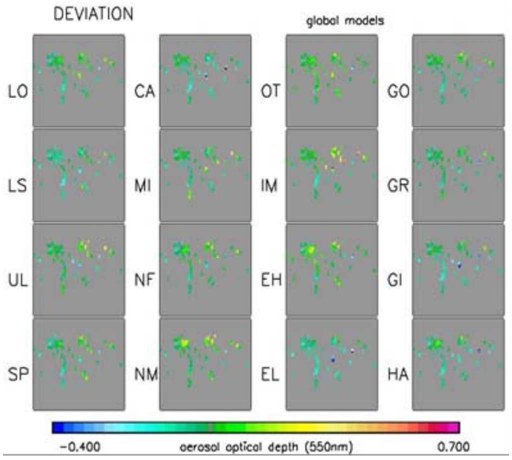


MODIS/MISR



MODEL DEVIATIONS

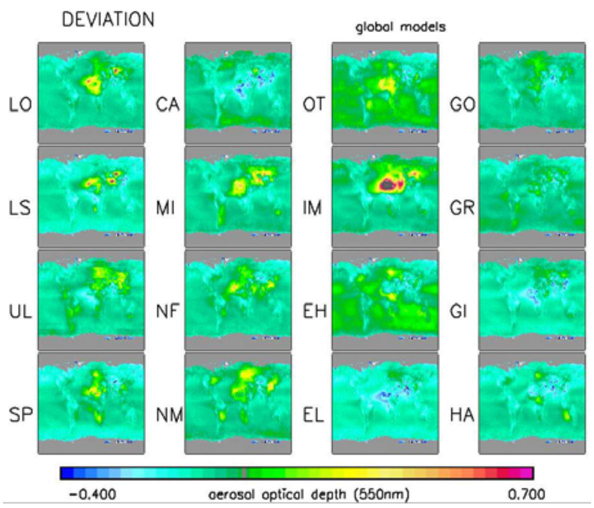
with respect to AERONET (1998-2001)



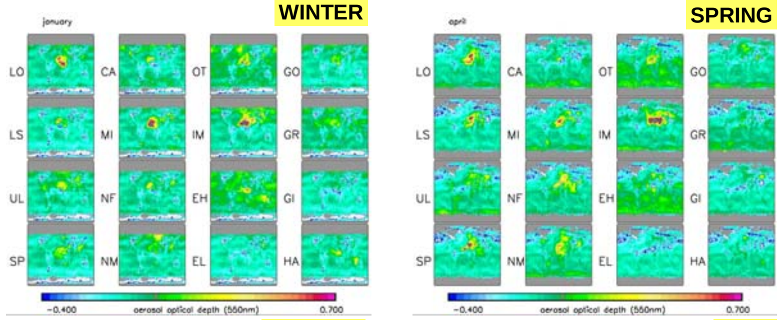
MODEL DEVIATIONS

with respect to MODIS/MISR (2001)

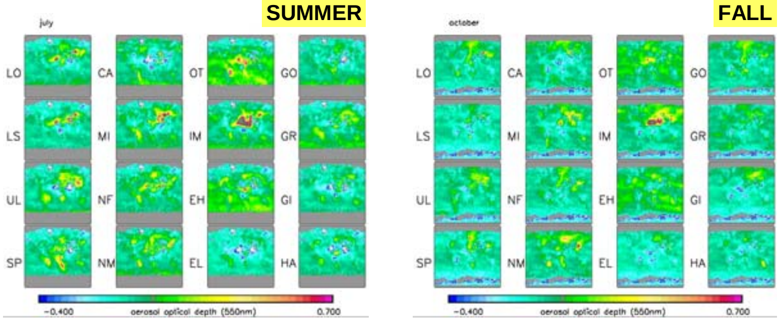
yearly (↓) ***by season (⇨)***



WINTER **SPRING**



SUMMER **FALL**



next **AEROCOM project activities**

- to establish the ***best*** global data-sets on aerosol properties (not just aot) for chosen years of model-simulations:: ***a community effort !***
- to identify data or sensors, which indirectly provide boundaries simulations of any particular aerosol component: ***express sensor needs !***
- to identify regions / seasons, where deviations among measurements and to and among models require more detail: ***express data needs !***