

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

Satellite	Measurements
MO MODIS	(2001)
MI MISR	(2001)
AV AVHRR	(1983-2001)
TO TOMS	(1979-2001)
PO POLDER	(1986-1987)
MM MODIS (primary) / MISR (secondary)	
MT MODIS (primary) / TOMS (secondary)	

Authors

Chu / Kaufmann
Kahn / Martonchick
Mishchenko / Geo.
Torres / Herman
Goulomb / Tanre

Ground

Aer	Measurements
AERONET	(1998-2001)

Authors

Holben / Eck

Models

Model	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	10/2.5deg	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
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.

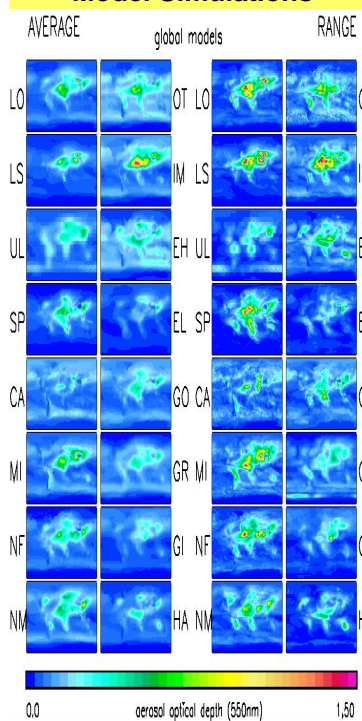
RESULTS

- 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

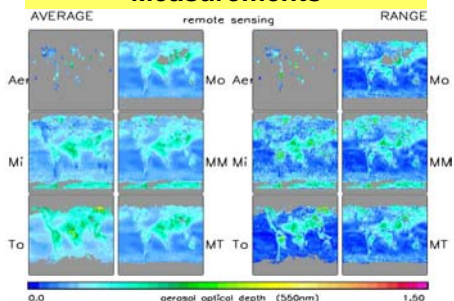
RESULTS

AEROSOL OPTICAL DEPTH

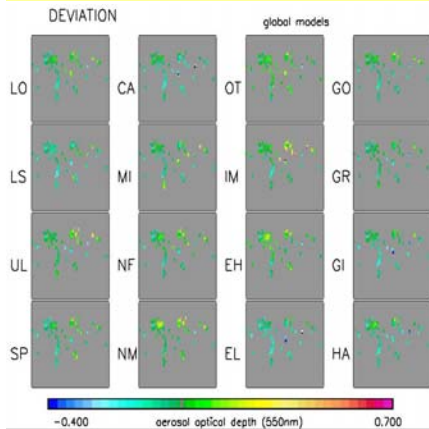
Model Simulations



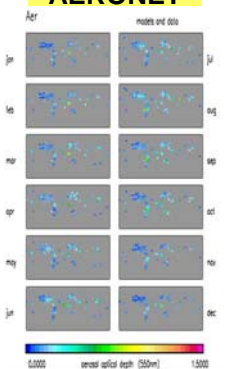
Measurements



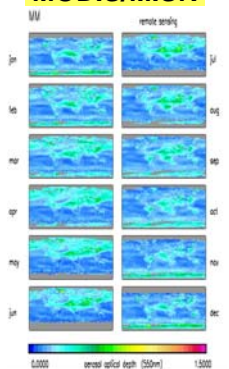
MODEL DEVIATIONS with respect to AERONET (1998-2001)



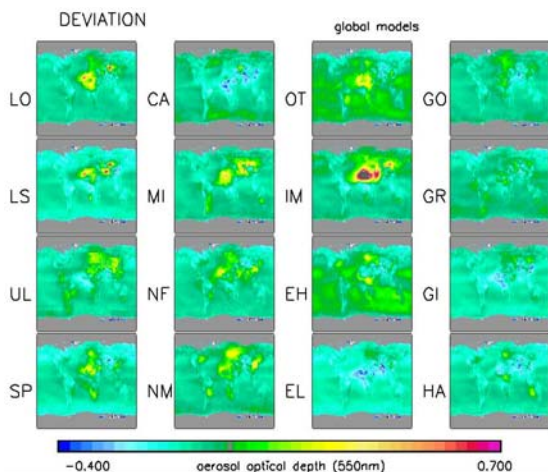
AERONET



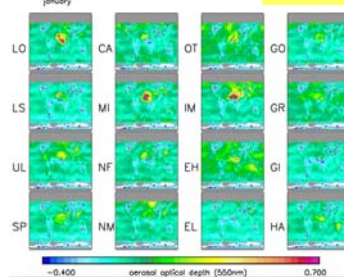
MODIS/MISR



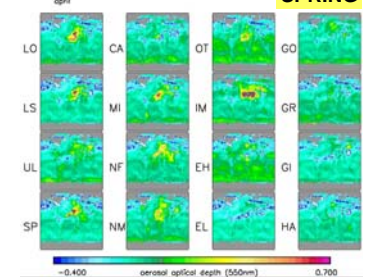
MODEL DEVIATIONS with respect to MODIS/MISR (2001) yearly (↓) by season (↔)



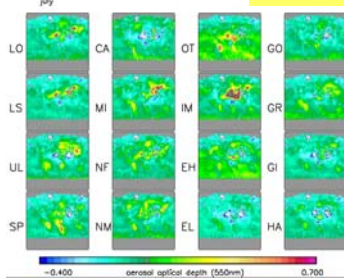
WINTER



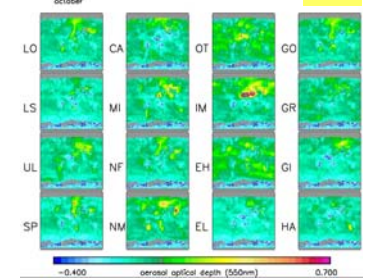
SPRING



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 can provide constraints to 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!**