WHY

What is the current skill for aerosol in global models and for aerosol retrievals of satellites?
Simulations of the aerosol climatic impact in global models have many degrees of freedom. An intermediate product, here the attenuation of sunlight by aerosol (*the aerosol optical depth*) is compared to demonstrate skill. For a complete yearly cycle, monthly aerosol optical depth averages of 6 models (all models distinguish among five different aerosol types) are compared to 5 satellite retrievals and to 1 ground -based aerosol data-set.

Monthly averages of aerosol properties
global fields for aerosol optical depth [model vs. measurements]

Stefan Kinne and Authors
MPI for Meteorology, Hamburg

Simulations

| Models	Resolution	Simulation	Authors
♦ EC - ECHAM4 (GCM)	3.8/3.8deg	50yr avg	*Feichter/ Lohmann / Schulz*
♦ GR - Grantour (GCM)	5.0/5.0deg	1yr avg	*Herzog / Penner*
♦ NC - NCAR (GC/TM)	1.9/1.8deg	(95-00)	*Collins / Rasch*
♦ GO - GOCART (CTM)	2.0/2.5deg	(90, 96, 97)	*Chin / Ginoux*
♦ CC - CCSR (CTM)	2.8/2.8deg	(90)	*Takemura / Nakajima*
♦ GI - GISS (GCM)	4.0/5.0deg	3yr avg	*Koch / Tegen*

[separate processing of *sulfate, organic carbon, black carbon, dust, sea-salt*]

Data Sets

Satellites/Ground	Method	Data-Period	Region	Authors
♦ Mo- MODIS (.55µm)	VIS/n-IR refl.	(2000,2001)	global	*Chu / Kaufman*
♦ A,n - AVHRR (.63µm)	VIS reflect.	(1985-1988)	ocean	*Stowe (PATMOS)*
♦ A,g - AVHRR (.55µm)	VIS/n-IR refl.	(1985-1988)	ocean	*Mishchenko / Geo.*
♦ To - TOMS (.55 µm)	UV-reflect.	(1979-2001)	global	*Torres*
♦ Po - POLDER (.87µm)	pol n-IR refl.	(1986-1987)	global	*Goulomb/Tanre*
♦ Aer - Aeronet (.55µm)	attenuation	(1998-2001)	no(sites)	*Holben/Tanre*

[data other than at .55µm were normalized with Angstrom parameters of the CCSR-model]

Month by Month

aerosol optical depth (.55µm)   0.0 — 0.8000
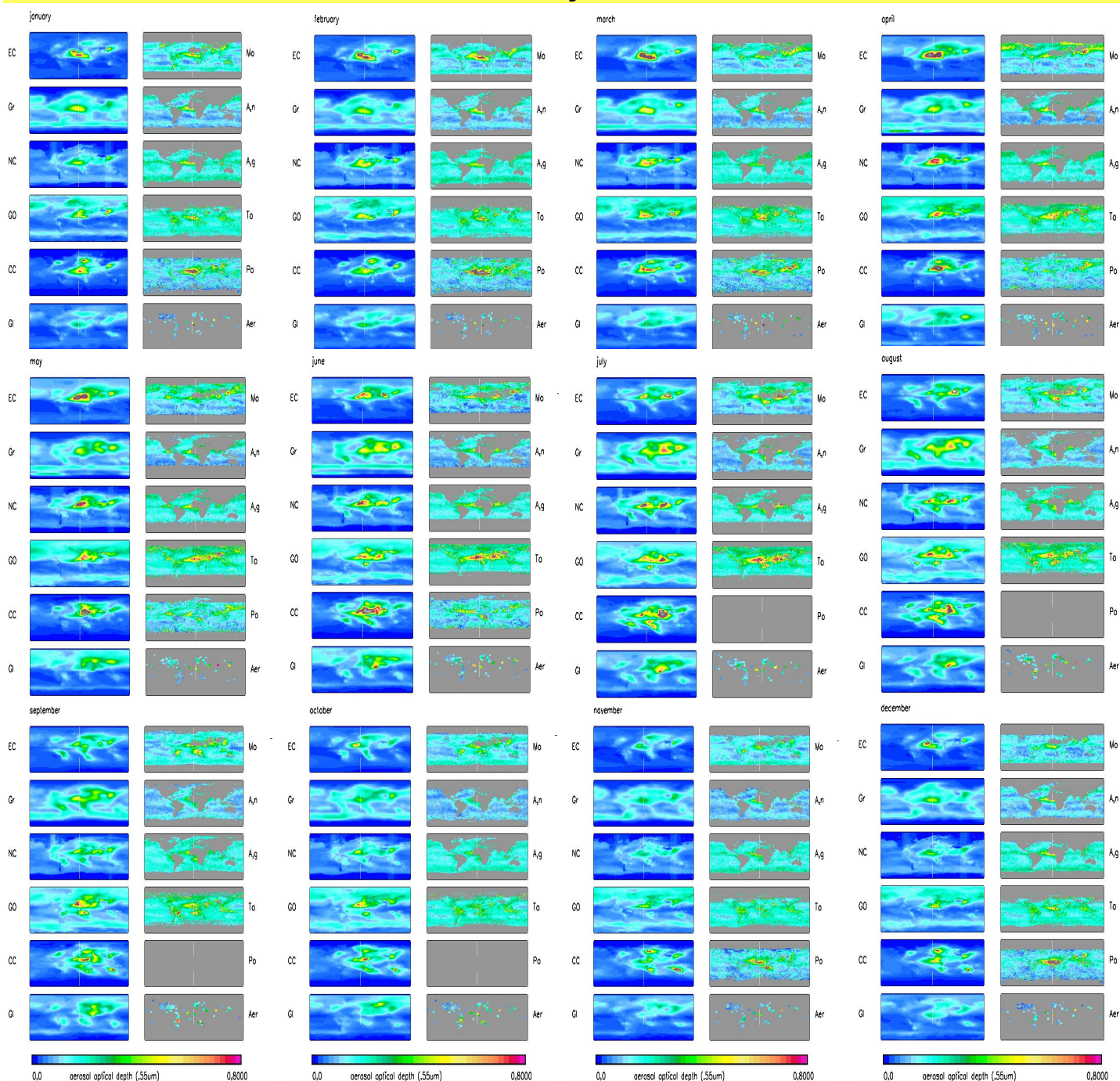
more Qs than As

Satellites - how accurate are retrievals? (a priori assumptions!)
- cloud contamination: a problem in remote regions?
- how to remove surface 'noise' over land?

Ground - can satellite scaling deliver 'regional representation'?

Models - how comparable / meaningful are aot model comparisons? (type contributions?, sources?, transport?, meteorology?)

what next

Satellites - intercompare satellite data / ground data

Ground - combine quality data sets (tighter net)

Models - guarantee similar input (emission, year)
- examine models on a component basis
- compare intermediate results (e.g. mass)
- apply filter for comparisons to data