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]

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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*

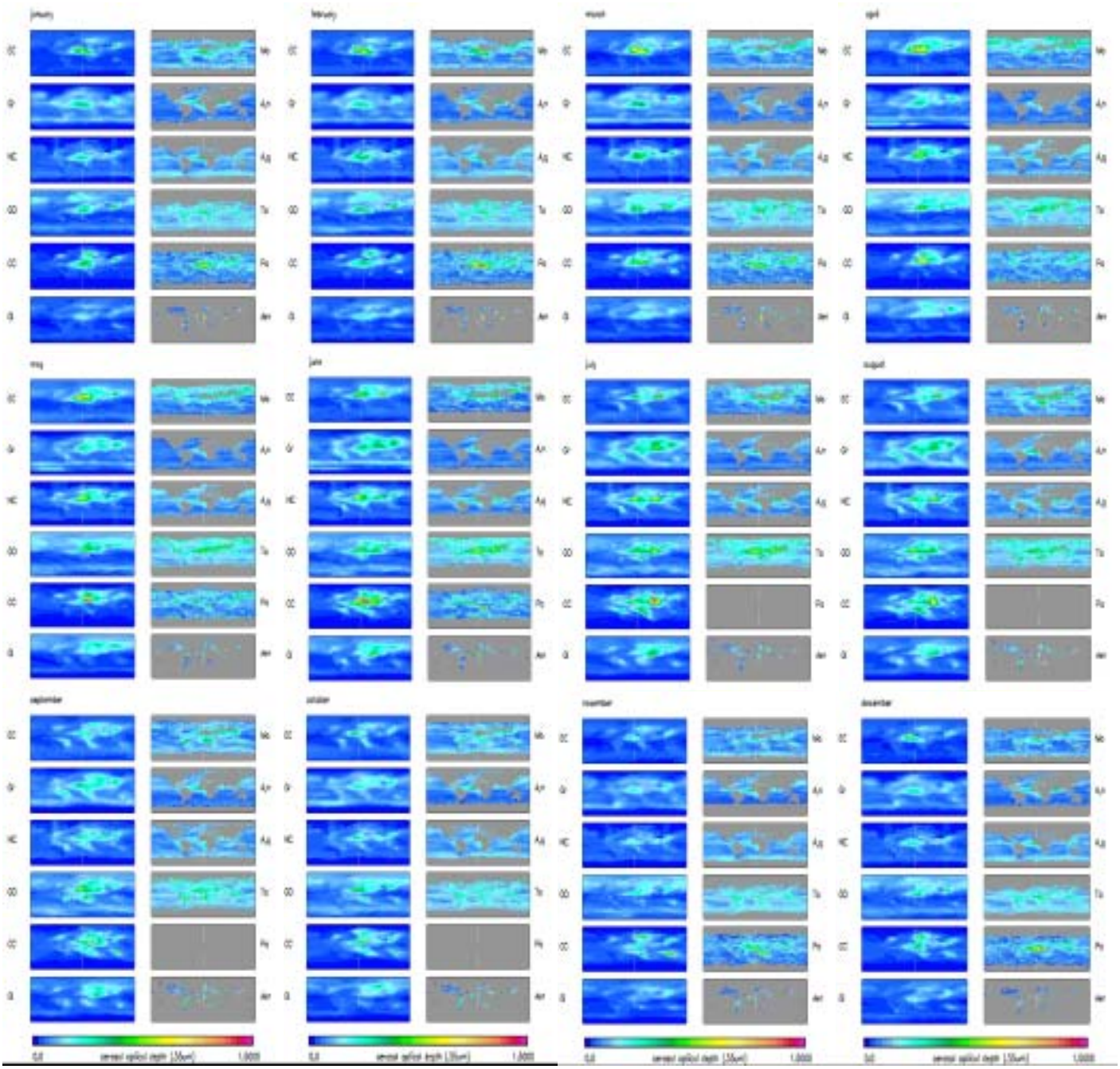
[separate processing of *sulfate, organic carbon, black carbon, dust, sea-salt*]

Data Sets

Satellites/Ground	Method	Data-Period	Region	Authors
♦ Mo- MODIS (.55µm)	VIS/n-IR refl.	(2001)	global	*Chu / Kaufman*
♦ A,n - AVHRR (.63µm)	VIS reflect.	(1985-1988)	ocean	*Stowe (PATMOS)*
♦ A,g - AVHRR (.55µm)	VIS/n-IR refl.	(1984-2001)	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



more Qs than As !

Satellites - *how accurate are retrievals?* (a priori assumptions?)
- *how to avoid sub-pixel cloud contamination?*
- *how to remove surface 'noise' over land?* (snow, seasons)

Ground - *regional representative?* (can satellite scaling deliver?)

Models - *are optical depths a meaningful model evaluation tool?* (correct 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 sampling for comparisons to data*