

Aerosol properties vary strongly with time and location – e.g. aerosol optical depth
 Aerosol introduces one of the largest uncertainty in predictions of the Earth's climate. One reason is an inaccurate representation of the variability of aerosol properties on temporal and spatial scales. Here, global fields for the most important aerosol property are compared: the mid-visible optical depth (a measure for the attenuation of sun-light). Monthly averages of a model composite are compared to a satellite composite and yearly averages further demonstrate differences among models and data.

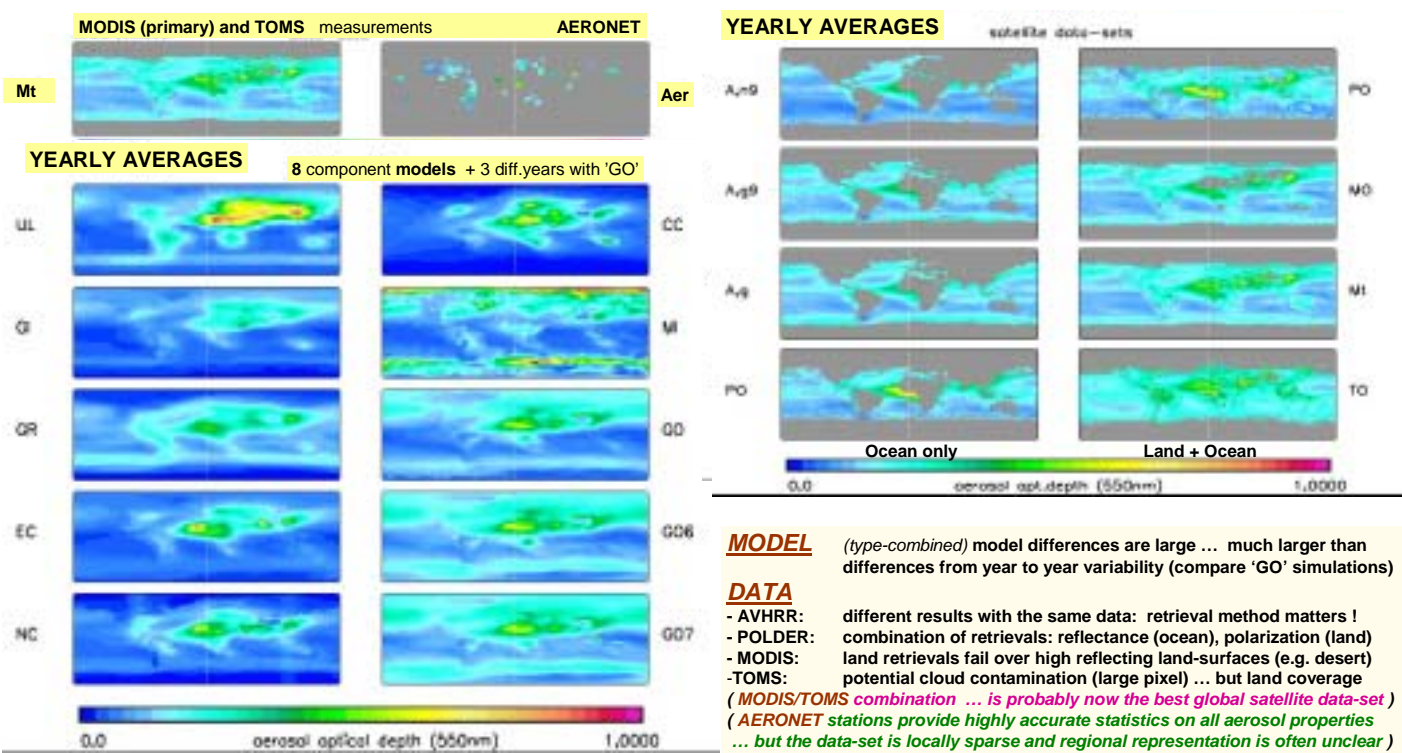
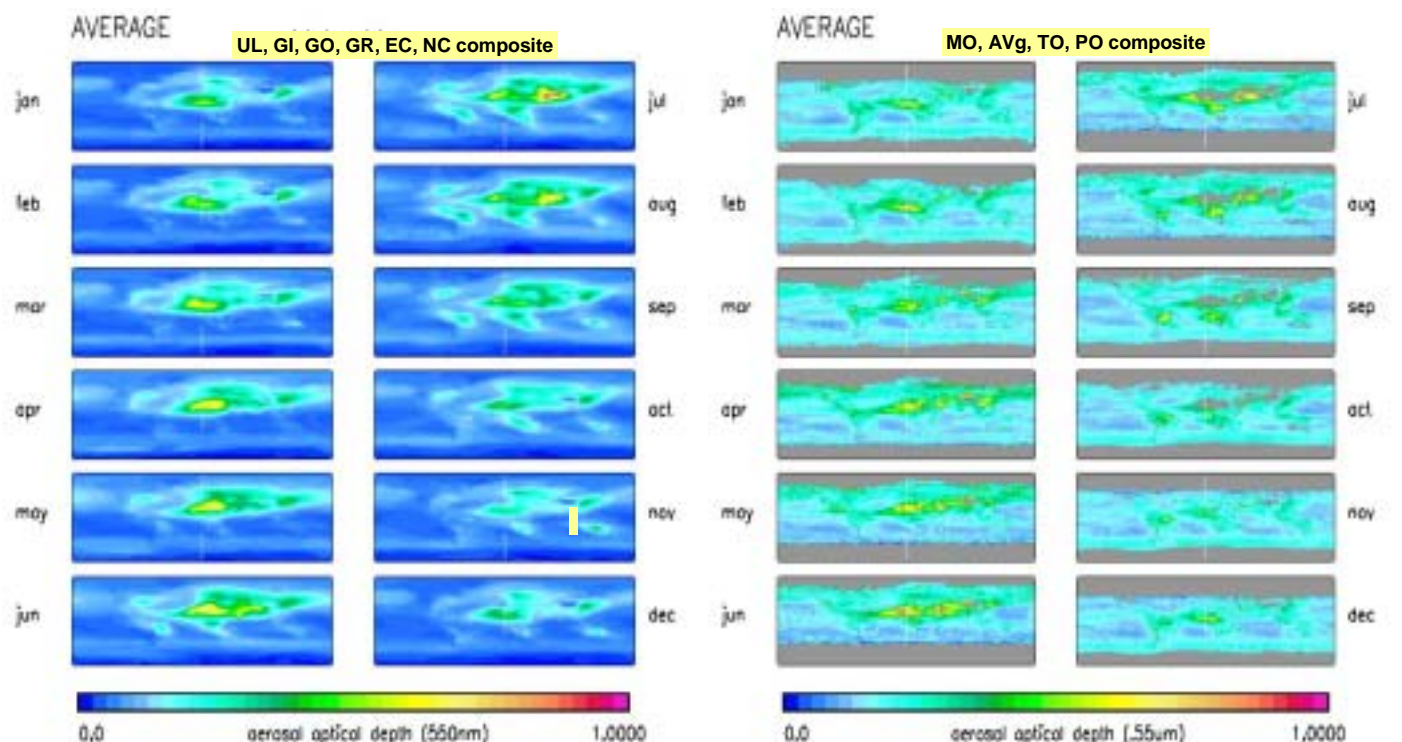


Global patterns of aerosol optical depth

A comparison of model simulations and satellite retrievals

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Simulations				Satellite Data-Sets				
Models	Resolution	Simulation	Authors	Satellites	Method	Data-Period	Region	Authors
♦ UL - ULAQ (GCM)	10/22.5deg	3yr avg	Pitari	♦ MO - MODIS (.55µm)	VIS/n-IR refl.	(2001)	global	Chu / Kaufman
♦ GI - GISS (GCM)	4.0/5.0deg	3yr avg	Koch / Tegen	♦ A,n9 - AVHRR (.63µm)	VIS reflect.	(1985-1988)	ocean	Stowe (PATMOS)
♦ GO - GOCART (CTM)	2.0/2.5deg	(90)	Chin / Ginoux	♦ A,g9 - AVHRR (.55µm)	VIS/n-IR refl.	(1985-1988)	ocean	Mishchenko / Geo..
♦ GR - Grantour (GCM)	5.0/5.0deg	1yr avg	Herzog / Penner	♦ A,g - AVHRR (.55µm)	VIS/n-IR refl.	(1984-2001)	ocean	Mishchenko / Geo
♦ EC - ECHAM4 (GCM)	3.8/3.8deg	50yr avg	Feichter / Schulz	♦ TO - TOMS (.55 µm)	UV-reflect.	(1979-2001)	global	Torres
♦ NC - NCAR (GC/TM)	1.9/1.8deg	(95-01)	Collins / Rasch	♦ PO - POLDER (.87µm)	n-IR refl./pol.	(1996-1997)	global	Goulomb/ Tanre
♦ CC - CCSR (CTM)	2.8/2.8deg	(90)	Takemura / Nakajima	[data, if not for .55µm, ... Angstrom parameter]				
♦ MI - MIRAGE (GC/TM)	2.8/2.8deg	(6/94-5/95)	Ghan / Easter	special combination:				
[sulfate, organic carbon, black carbon, dust, sea-salt processing]				♦ Mt - MODIS (.55µm) primary choice, TOMS (.55 µm) if MODIS data are not available				



MODEL (type-combined) model differences are large ... much larger than differences from year to year variability (compare 'GO' simulations)

DATA

- AVHRR: different results with the same data: retrieval method matters !
- POLDER: combination of retrievals: reflectance (ocean), polarization (land)
- MODIS: land retrievals fail over high reflecting land-surfaces (e.g. desert)
- TOMS: potential cloud contamination (large pixel) ... but land coverage

(MODIS/TOMS combination ... is probably now the best global satellite data-set)
 (AERONET stations provide highly accurate statistics on all aerosol properties ... but the data-set is locally sparse and regional representation is often unclear)