

AeroCom status

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Oct 2006 Virginia Beach AeroCom workshop
Recommendations on AeroCom priorities



- ☺ Consolidate the obs data available
- ☺ Consolidate AeroCom modelled aerosol climatology
- ☺ Extend the observational database to design benchmark tests
- ☺ Allow for better use of AeroCom database (input/output)
- ☺ Establish Working groups to define goals, actions, diagnostics
- ⊘ Better documentation of parameterisations (optical, hygroscopicity, clouds)

Experiments

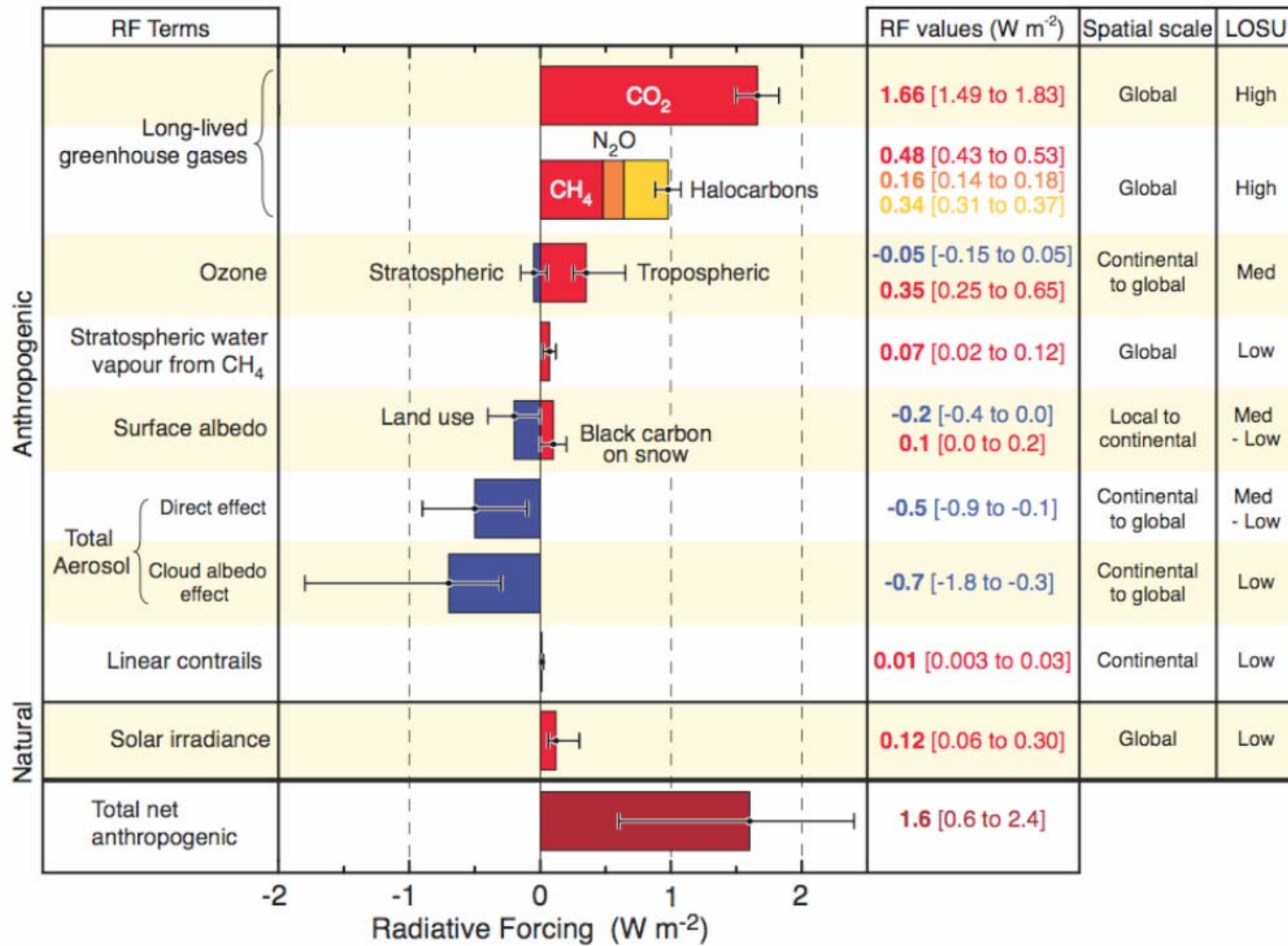
- ☺ HTAP interhemispheric transport
 - ☺ Calipso related simulation of period July-Sep 2006
 - ⊘ Redo of indirect experiments (follow-up Penner et al. ACP2006)
 - ⊘ Forcing calculation for preindustrial/present in IPCC models
 - ⊘ Reference set of coupled aerosol-climat simulations 1860-2050

Ensure link to other activities:

- ☺ GEWEX, CCSP, Column models, GEIA, HTAP, NARSTO, AC&C, EUCAAR
- ☺ Next meeting 22-26 Oct 2007, with CNES « A-train » meeting, Lille, F

Motivation

Radiative Forcing Components



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How to significantly improve the evaluation process of regional and global aerosol models?

CHALLENGES

communicate between modeling and data groups

establish meaningful process oriented benchmark tests

representative

scale independent

accurate

quantitative

make benchmark tests accessible, repeatable and doable

solve technical problems

speed

format

interactivity

supported by.....EU-EUCAARI and EU GEOMON

Functionality of any benchmark test tool:

- centered around a single aerosol property
- useful for model development progress monitoring
- read CMOR formatted or AeroCom similar model output
- read routines for standard data
- read 'error' insensitive (data gaps, variable names, axis ...)
- multiple filters (sea, land, regions, station-subsets, thresholds)
- weight to area and according to design
- interpolate model fields
- reference imbedded (AeroCom median, Data-climatology)
- multiple plots and statistics and scores
- published
- available

Pilot benchmark test **No 1**

Aerosol size distribution

- **in-situ**

- aerosol speciated size distribution from impactors
- physical particle sizers: DMA, optical counters, aerodynamic particle sizers

- **remote sensing**

- satellite fine mode fraction (MODIS,POLDER)
- size distribution of AERONET sky-data
- Angstroem parameter spectral dependence

Pilot benchmark test **No 2**

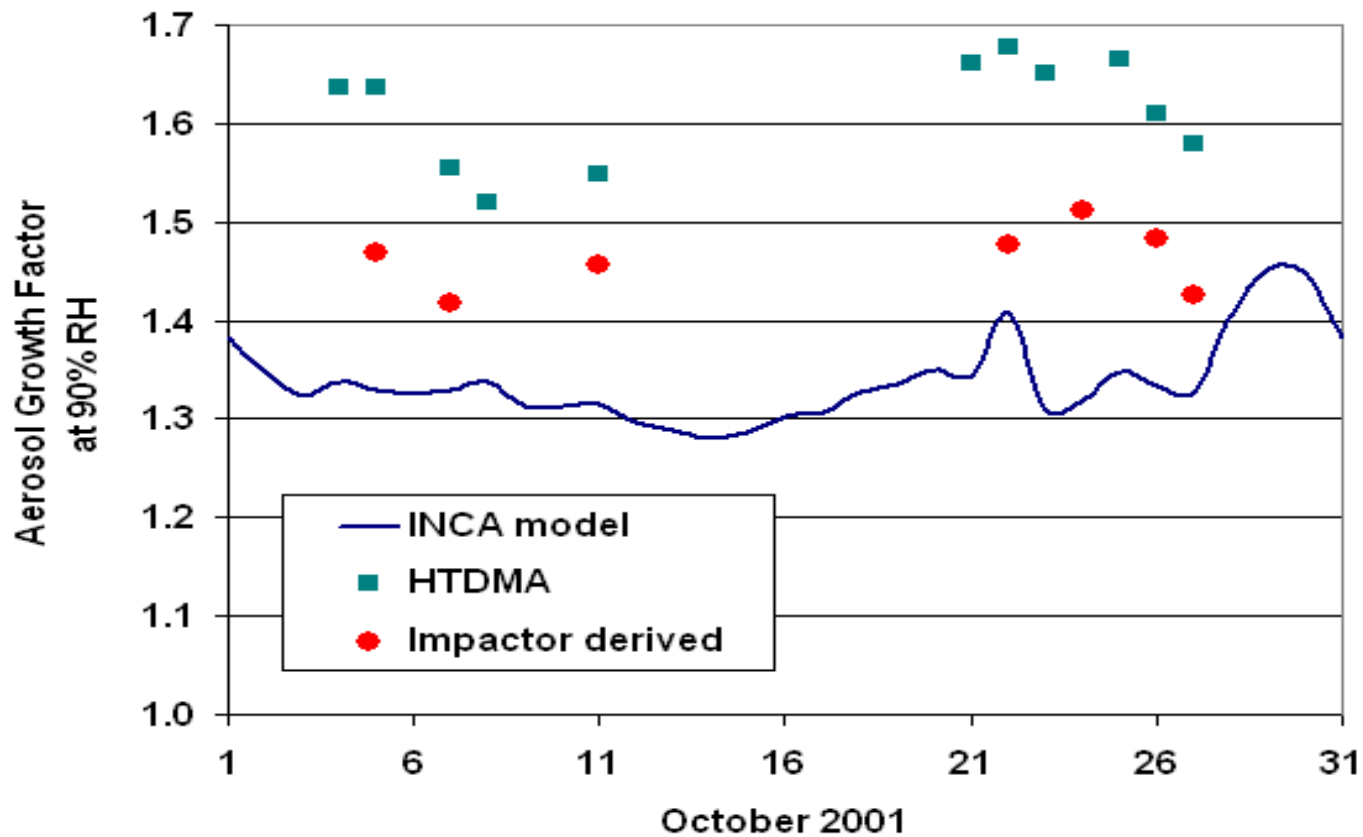
Clear sky and all sky forcing

- **campaign data / surface**
 - forcing from campaigns (e.g. TARFOX 1998)
 - BSRN data
- **remote sensing data**
 - MODIS/CERES clear-sky forcing over ocean
 - AERONET based all- and clear-sky forcing
 - AERONET sky inversion data 1996-2006
- **supplementary data**
 - MODIS surface albedo
 - ISCCP cloud data
 - CALIPSO/CloudSat altitudes

Pilot benchmark test No 3

Hygroscopic growth of the aerosol

Melpitz - IFT / Leipzig measurements
of hygroscopic growth factor & composition



NEW Standard AeroCom diagnostics

across experiments – initiatives - models

purpose

- provide ONE standard set of diagnostics for different aerosol model intercomparisons or evaluations
- observational data driven (benchmark requirements)
- budget / process oriented (non-data diagnostics)

process

1. suggestion: AeroCom HQ
2. Wiki page discussion

format

- follow HTAP experience
- netCDF - CMOR and CF-convention for chemistry

NEW Standard AeroCom diagnostics
across experiments / initiatives / models

examples

- process understanding of sulphur cycle HTAP+

3D monthly SO₂,SO₄ wet deposition

3D monthly Chemical production

Oxydant field documentation

-Caliop aerosol / CloudSat cloud profiles

3D daily extinction, lidar ratio, mm-radar

simulator implementation in models

statistics with 1x5deg gridded data

use the AeroCom Dataserver at LSCE !!

Linux server with nco, emacs, idl (+?)

Provides direct access to

AeroCom model output (disk ~ 2-5 TB)

AeroCom assembled observations and emissions

Requested from potential users

IT Registration form for LSCE send to M.Schulz

1 paragraph description of intended use



Content AeroCom Climatology

- **FORMAT:**
 - 1x1 degree
 - Monthly 3D and 2D Fields
 - netCDF files
 - CF Standard Names
- **VARIABLES**
 - all aerosol-components:
 - Deposition
 - Aerosol Emissions
 - Surface concentration
 - Column burden
 - Extinction
 - Aerosol Water Content
- **STATISTICS:**
 - Mean, Median, Range,
 - StdDev, 5-95 Percentiles
- **VARIABLES**
 - anthropogenic Components:
 - Direct Radiative effect
(Top, Atmosphere and Surface)
 - Anthropogenic AOD and Mass
 - Asymmetry Parameter
 - Single scattering albedo

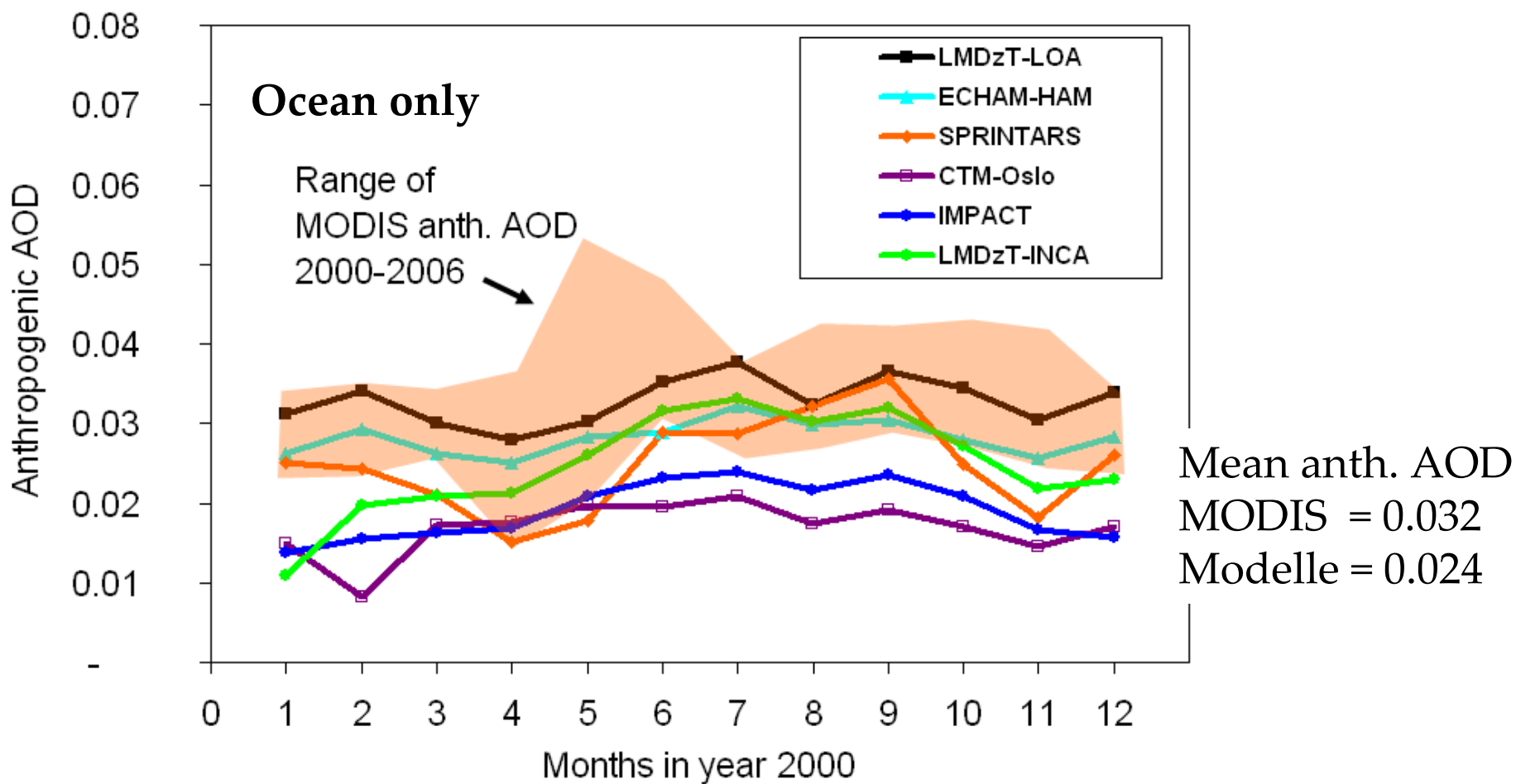
AeroCom Data Base Exploration (2)



Evaluation Anthropogenic Optical Depth

Modell-Diversity (AeroCom 2000-1750)

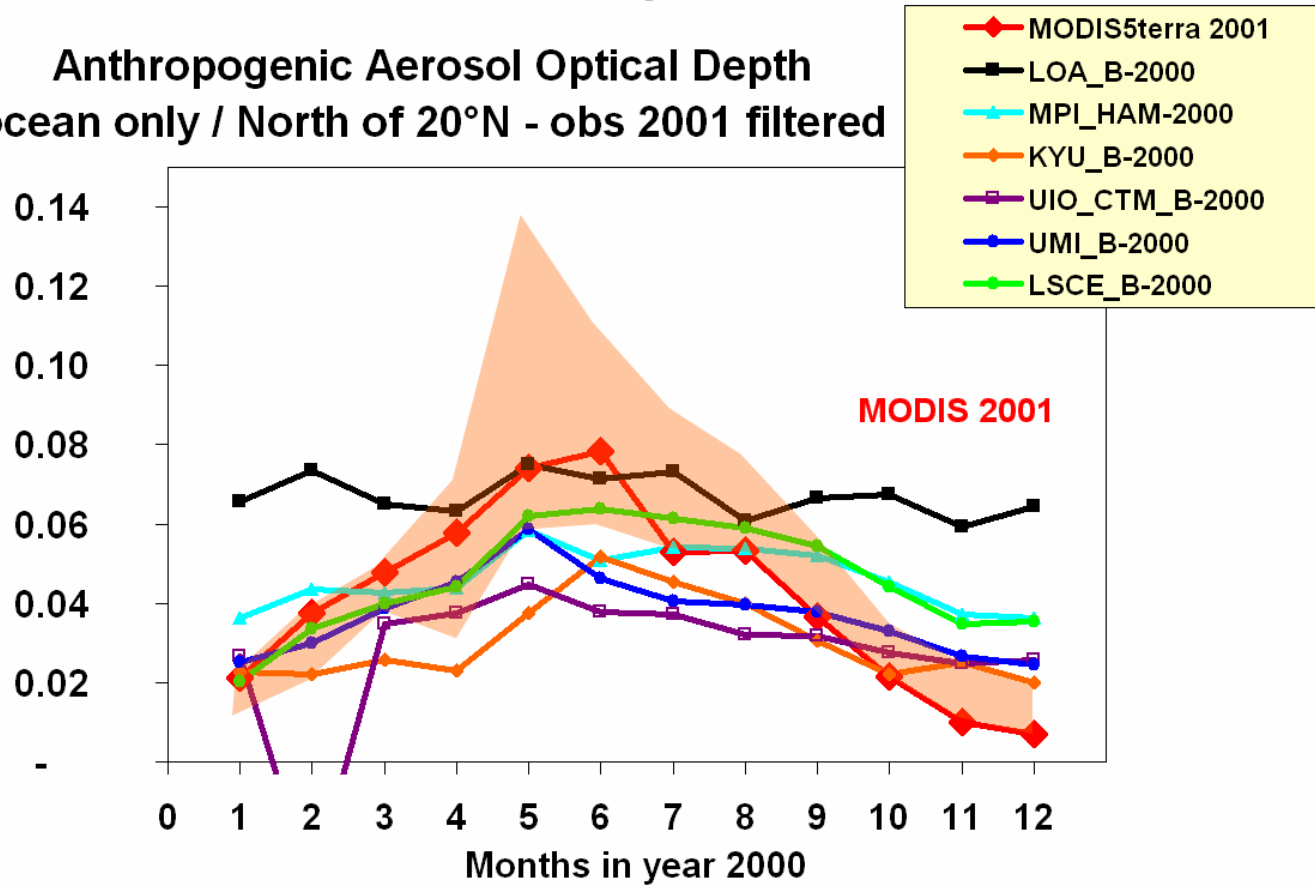
MODIS Interannual Variability



AeroCom Data Base Exploration (2b)

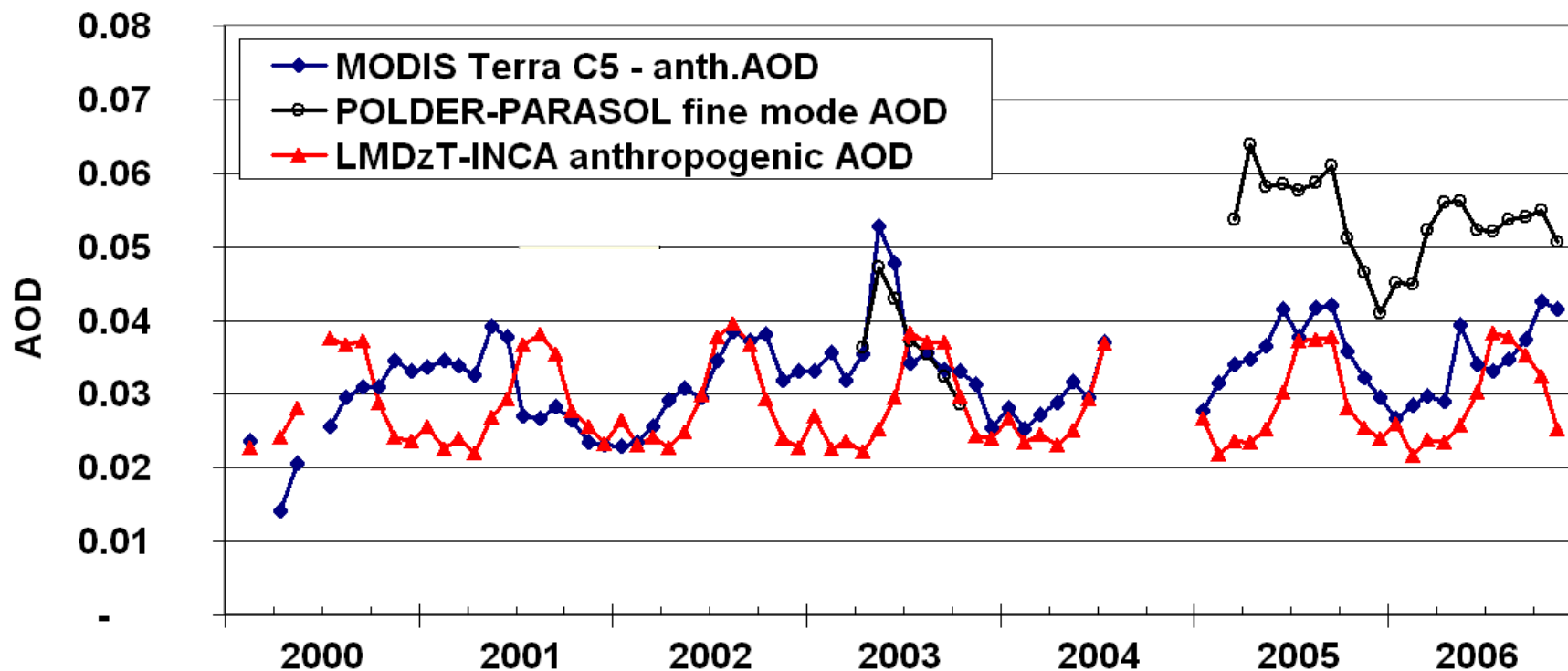


Anthropogenic Aerosol Optical Depth
ocean only / North of 20°N - obs 2001 filtered



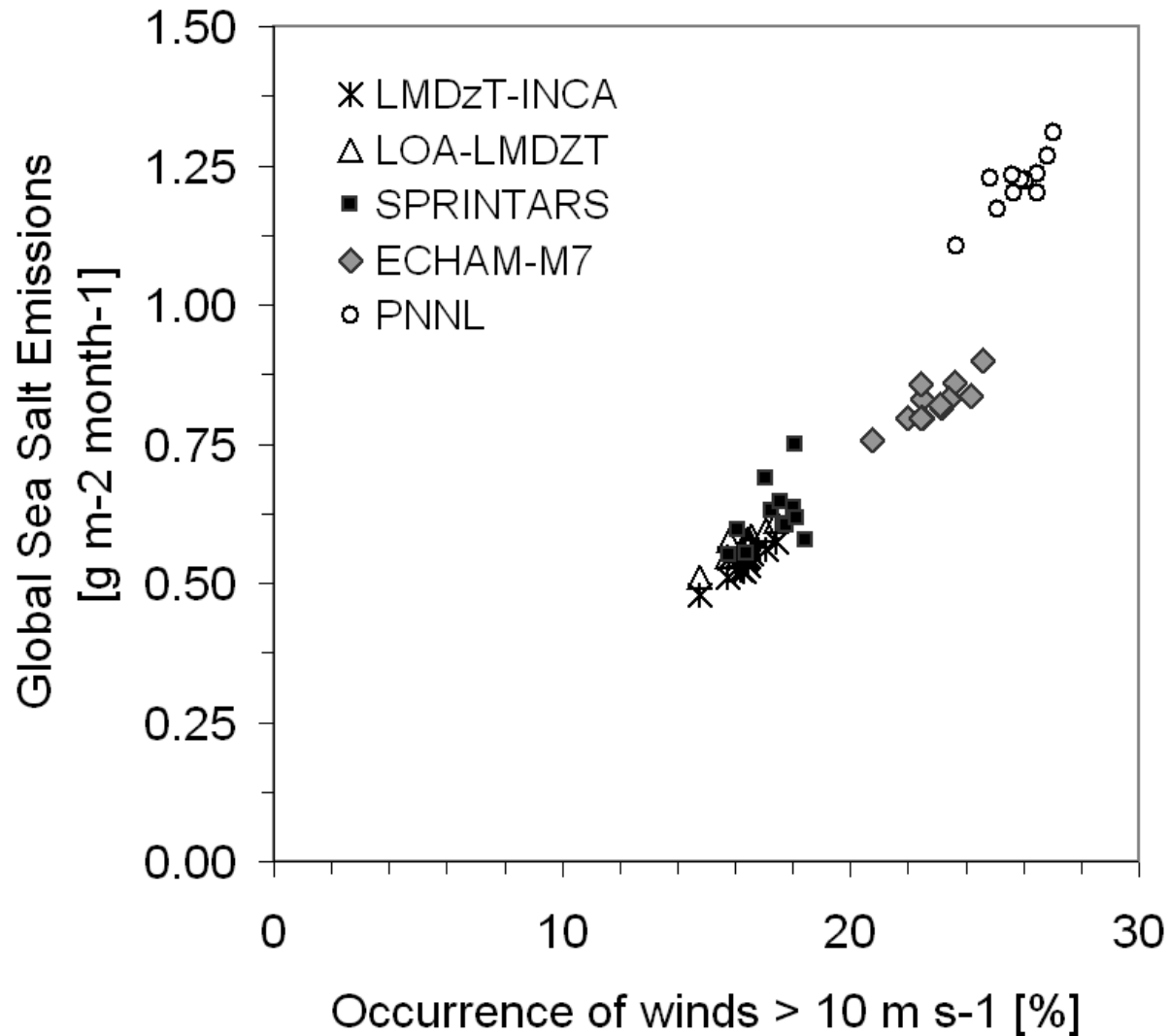


Evaluation Long Term trends fine mode AOD





Diagnostic 'high winds' for sea salt emission parameterisation



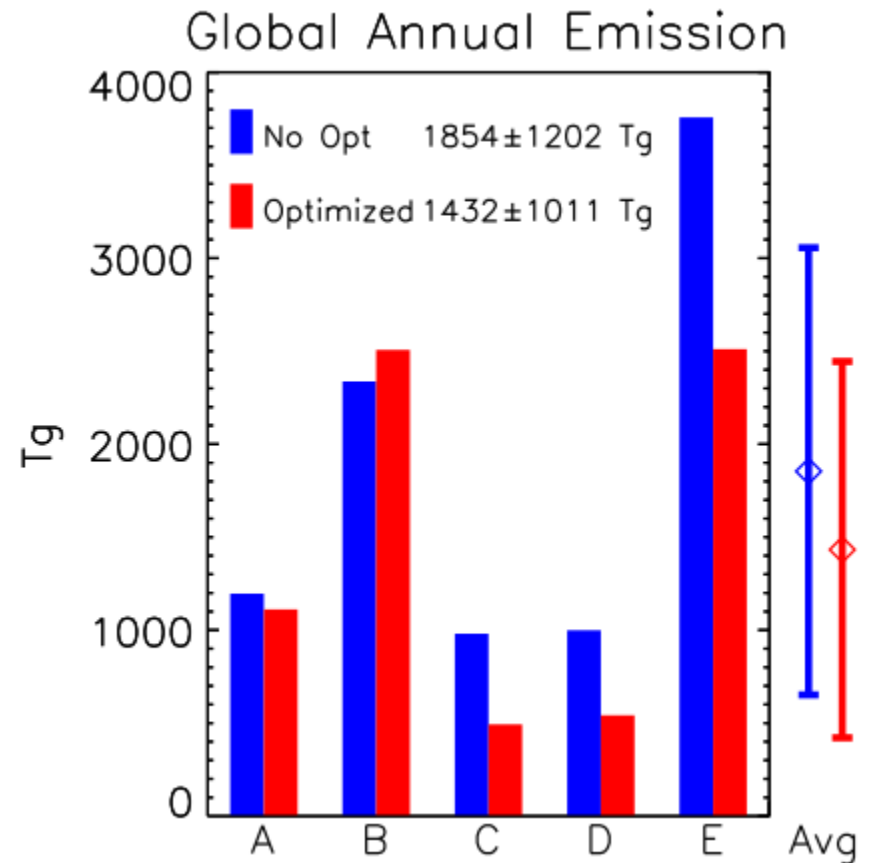
AeroCom Data Base Exploration (5)



Courtesy Ron Miller / GISS
Dust emission optimization based on
U Miami / MISR / Aeronet observations

Model	RMS (No Opt)	RMS (Optimized)
A	0.63	0.63
B	1.00	0.73
C	0.67	0.67
D	0.94	0.79
E	0.80	0.72

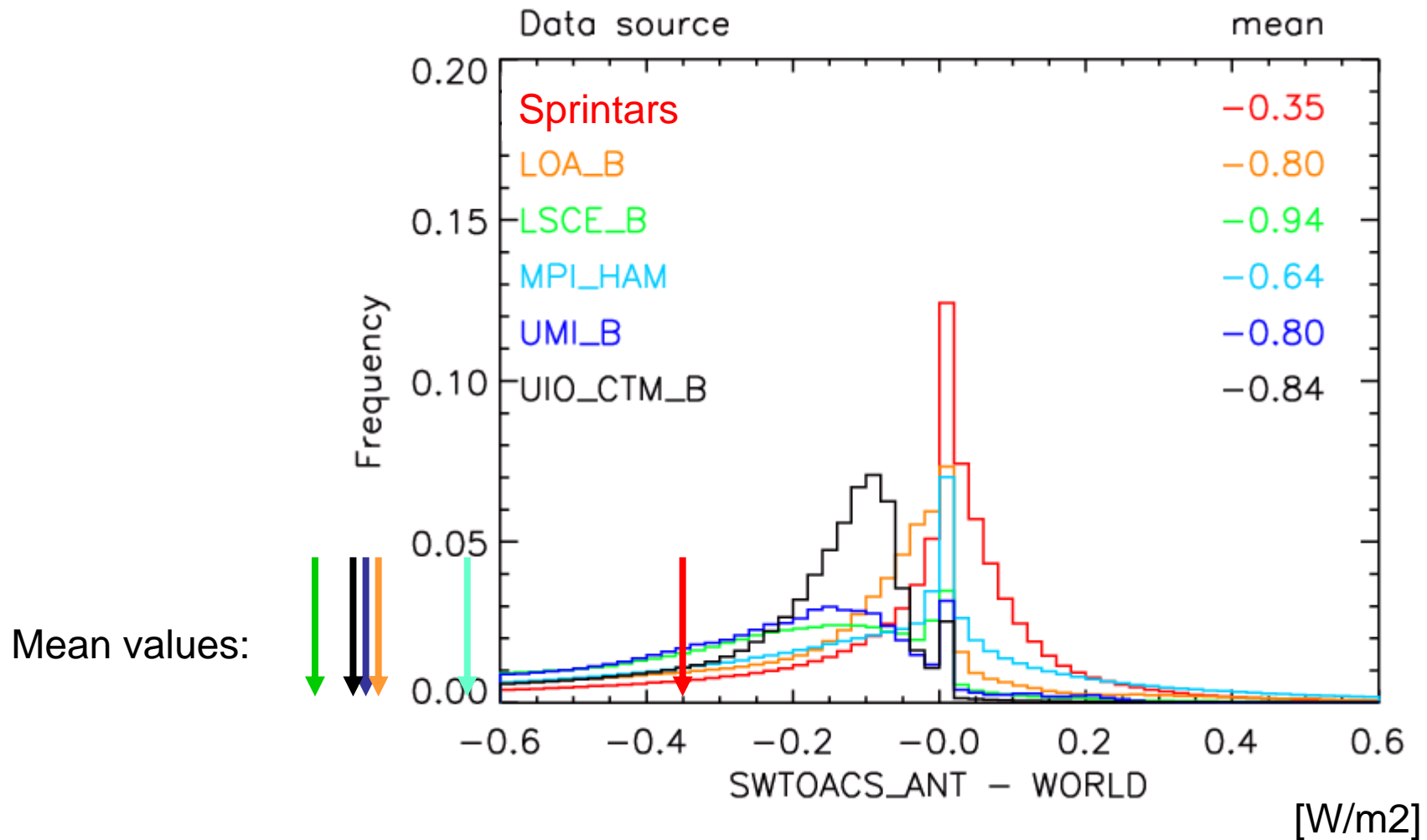
- Optimization increases the agreement of each model with the dust observations (by reducing the RMS error).
- But the range of emission among the AEROCOM models is not reduced.



AeroCom Data Base Exploration (6)

AeroCom

Area weighted frequency
of daily clear-sky direct radiative forcing by aerosols
From AeroCom models



AeroCom Data Base Exploration (6)



....In the planning

Link of AeroCom database to NASA/GIOVANNI

Planned is DODS or WCS machine-to-machine link

Analysis of model results will take advantage of A train depot

GIOVANNI tools will integrate selected model output

Data usage policy needed ???????

Future: Other links ?

Geomon database at NILU ?

HTAP server ?

DATAFED ?

ICARE ?

Eventual AeroCom experiments
to be stored on AeroCom server for joint analysis

SST driven, reanalysis meteorology

AeroCom A-train

2000

2006/7



2000

2007

AeroCom Recent Trends



1980

2007

AeroCom Hindcast



Aerosol interactive with climate system

1750

1950

2000

2050



1750

2100



Key elements of AeroCom future activities

Revisited Standard Aerocom Diagnostics

Benchmark test development

Joint studies around “working groups”

Joint Publications

Database usage (Model – data depository)

Link to other tools such as GIOVANNI

Preparation of AR5 – planning of experiments in 2009