Aerosol_cci Phase 2

Aerosol_cci achievements
What data sets are being produced
How will they be used

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& the Aerosol_cci team

Overview

Climate research data package						
algorithm	**version**	**sensor(s)**	**responsible provider**	**Main aerosol parameters**	**Resolution coverage**	**period(s)**
ADV / ASV	2.30	ATSR-2 AATSR	FMI	AOD, ANG	10km, 1° global	1995-2003 2002-2012
ORAC	3.02	ATSR-2 AATSR	UOxford / RAL	AOD, aerosol type	10km, 1° global	1995-2003 2002-2012
SU	4.2	AATSR	USwansea	AOD, ANG	10km, 1° global	1995-2003 2002-2012
AERGOM	2.14	GOMOS	BIRA	stratospheric extinction profiles + AOD+ ANG	10x2,5° global	2002-2012
Round robin data package						
algorithm	**version**	**sensor(s)**	**responsible provider**	**Main aerosol parameters**	**Resolution coverage**	**period(s)**
IMARS	3.3	IASI	DLR	Dust AOD	12km, 1° global	2013
MAPIR	1.1	IASI	BIRA	Dust AOD	12km, 1° "Greater Sahara"	2013
ULB	1	IASI	ULB	Dust AOD	12km, 1° global	2013
LMD	1.1	IASI	LMD	Dust AOD	12, 1° 60S – 60N	2013
Reference data package						
algorithm	**version**	**sensor(s)**	**responsible provider**	**Main aerosol parameters**	**Resolution coverage**	**period(s)**
GRASP		POLDER	LOA	AOD, SSA	6km, 1° Africa + 4 selected regions of 1200x1200 km^2 over land	2008

Fully reprocessed: L2, L3
Validation vs independent data sets (AERONET). Validation analysis in progress

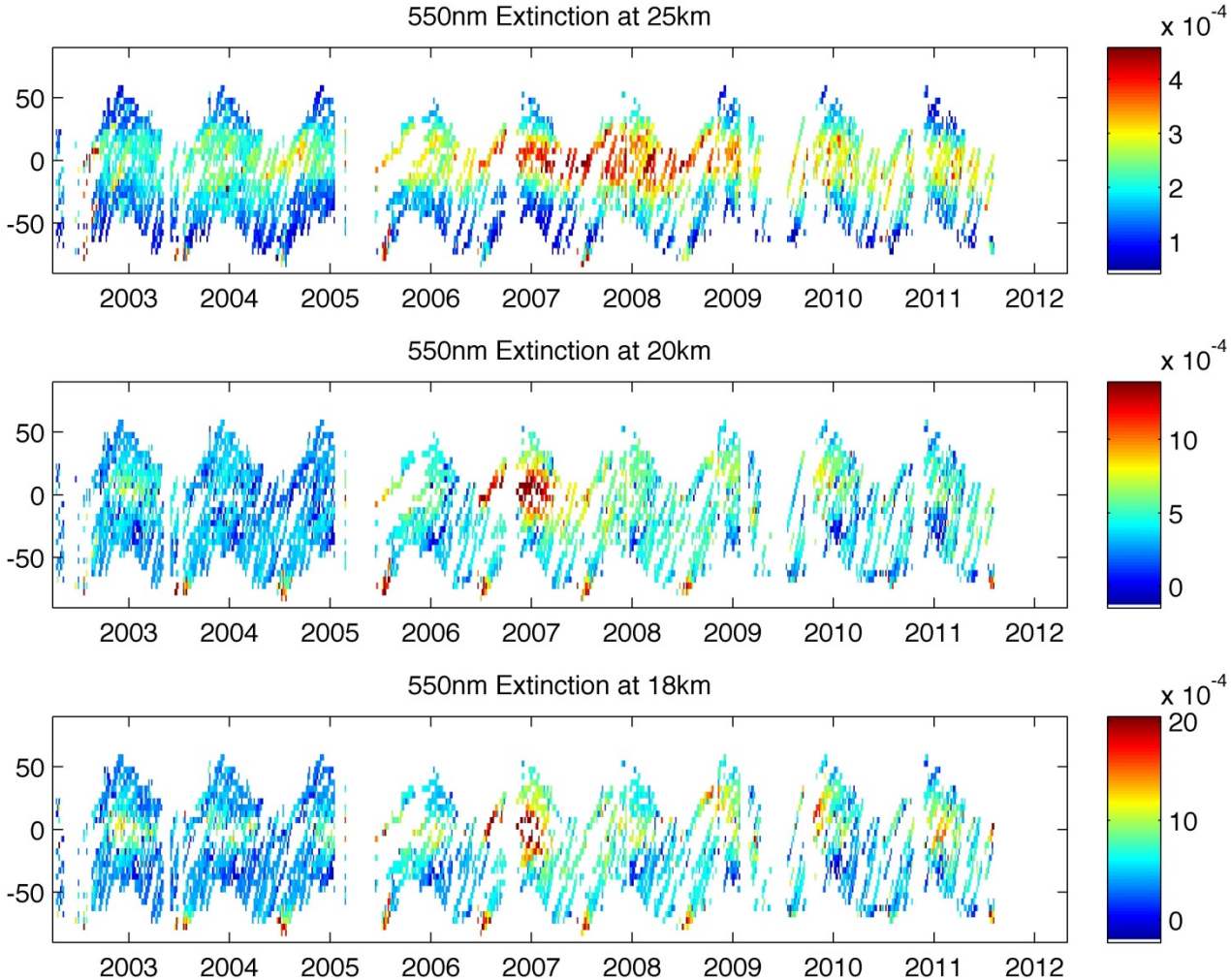
Stratospheric validation vs lidar, balloon data and CALIOP: in progress

DUST AOD retrieved in TIR
Evaluation underway:
Intercomparison data sets; ensemble

- TIR ➡ VIS conversion
- VIS vs coarse mode fraction from:
  - AERONET
  - MISR

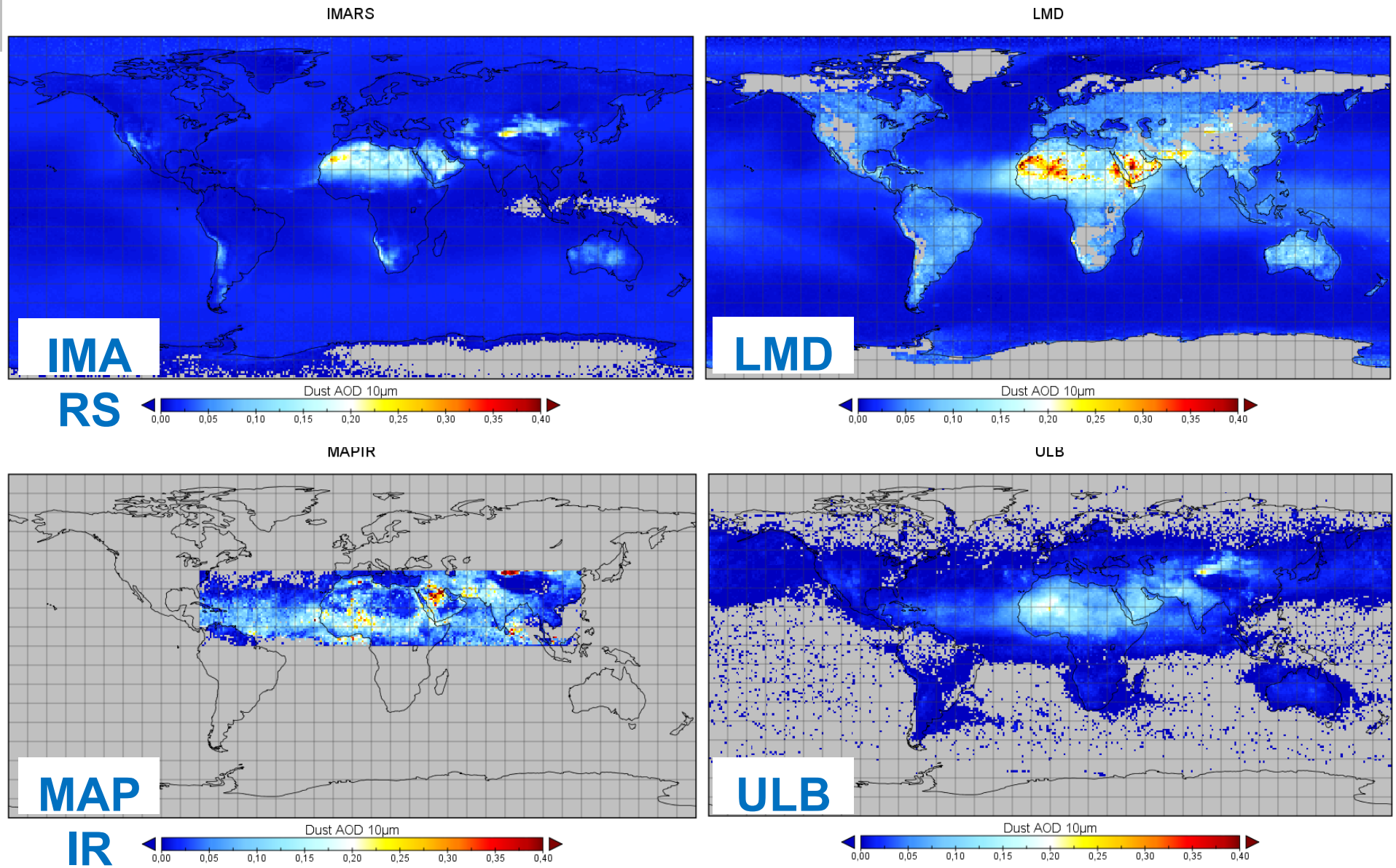
GOMOS / stratosphere

GOMOS version GOMOS_AERGOM.v.2.15: new time series with adapted grid (5°latitude x 60° longitude x 1 km altitude x 5 days)



The new GOMOS-dataset with 5 day temporal and 60deg longitudinal resolution has been compared with MIPAS SO2 in a similar resolution for consistency

IASI (4 algorithms): Annual Mean Dust AOD at 10µm for 2013

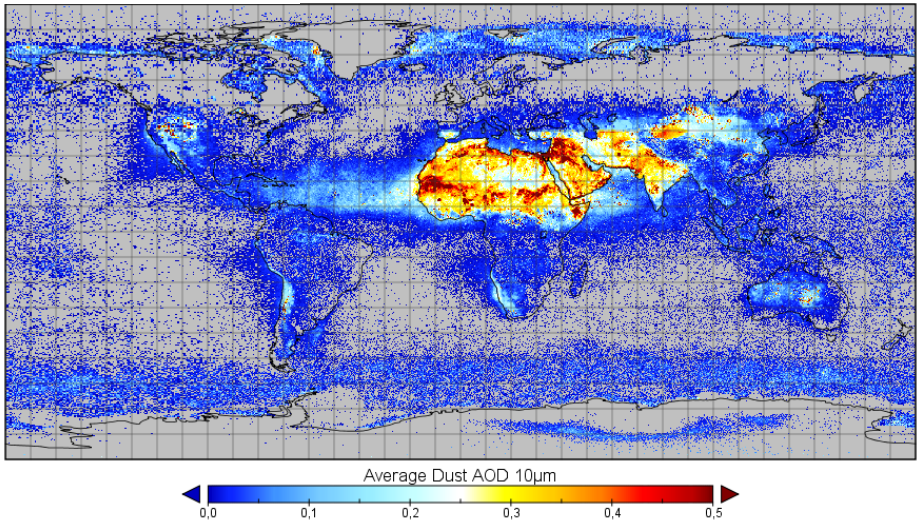


Inter-comparison: CCI Ensemble

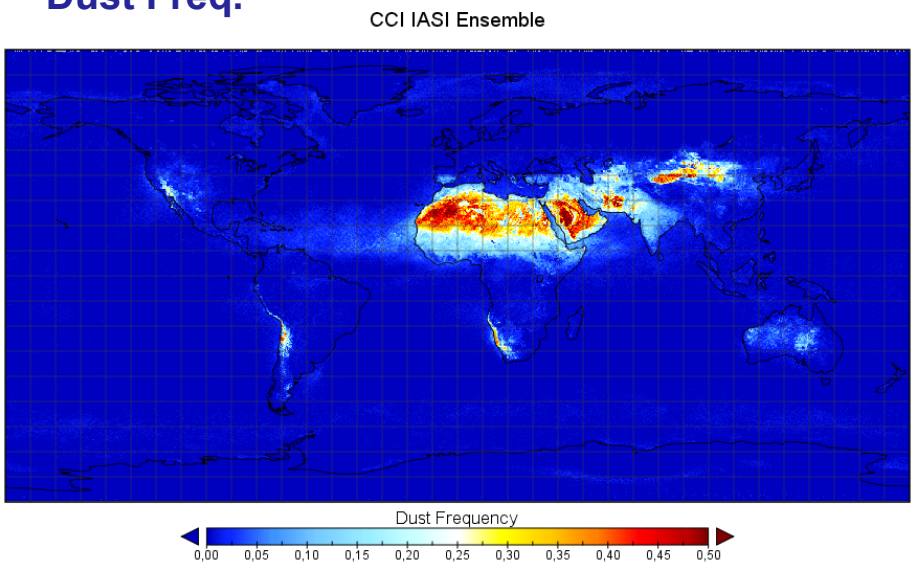
Ensemble Generation:

- Average over all available dust observations in each FOV.
- Number of represented algorithms varies with FOV.
- Every valid dust observation of all algorithms is accouted for.
- Created from Level 2 files, thus on sensor projection.
- By using all available IASI information a reference dataset for 10µm AOD is created, which is not available from external sources.
- Evaluation then shows how variable the results of the four algorithms are at 10µm.

AOD at 10µm

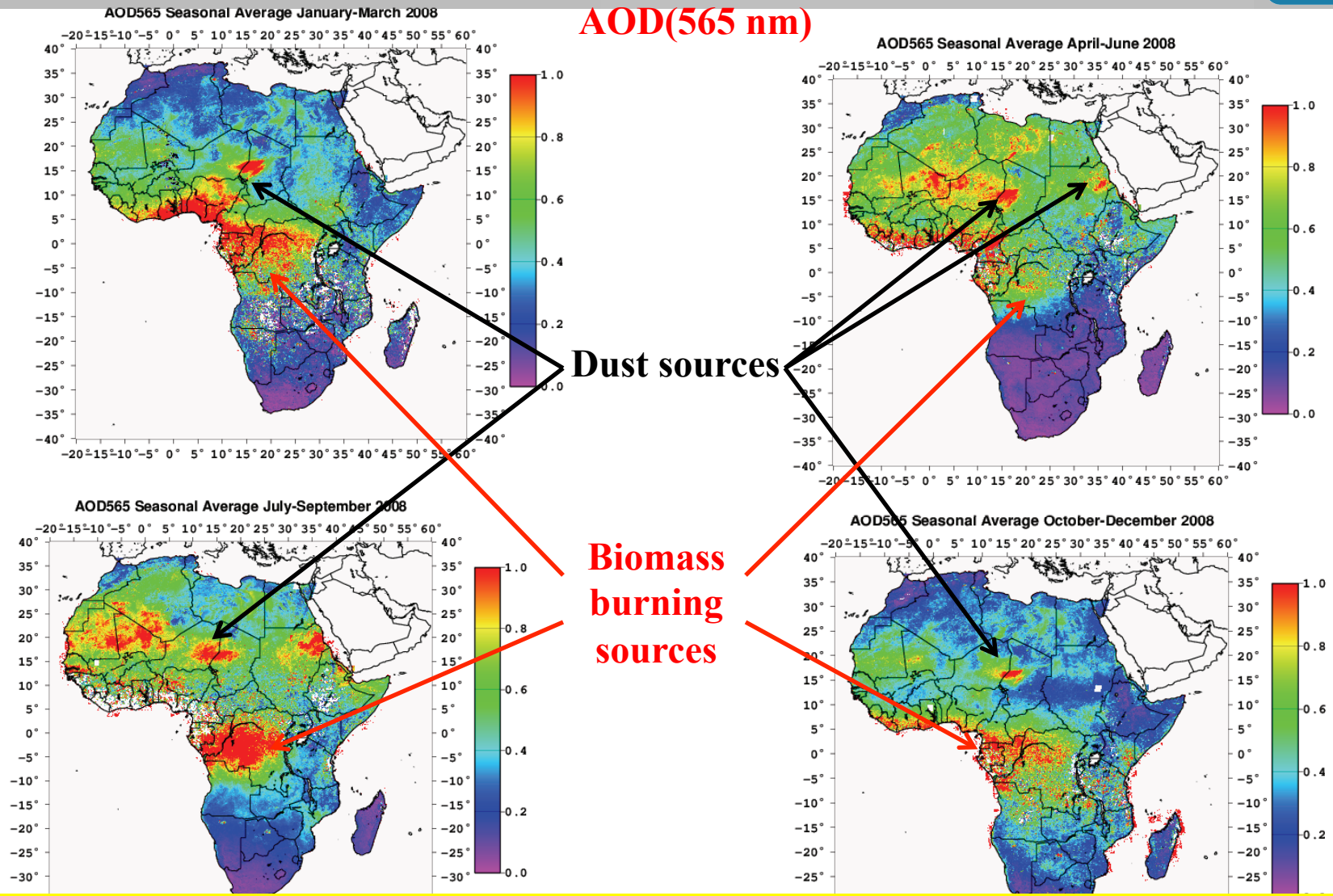


Dust Freq.



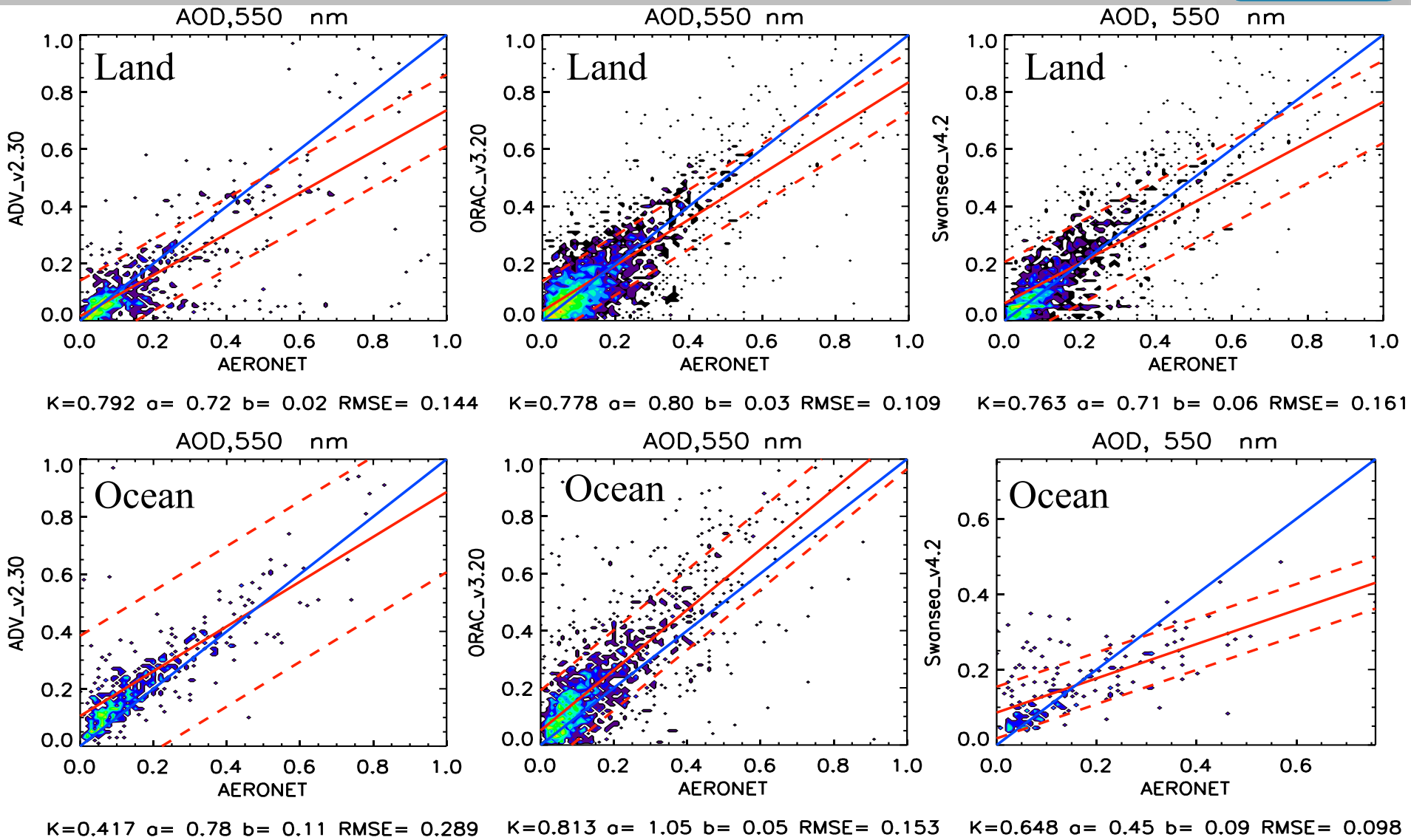
PARASOL: reference dataset

Retrieved seasonal variability of AOD



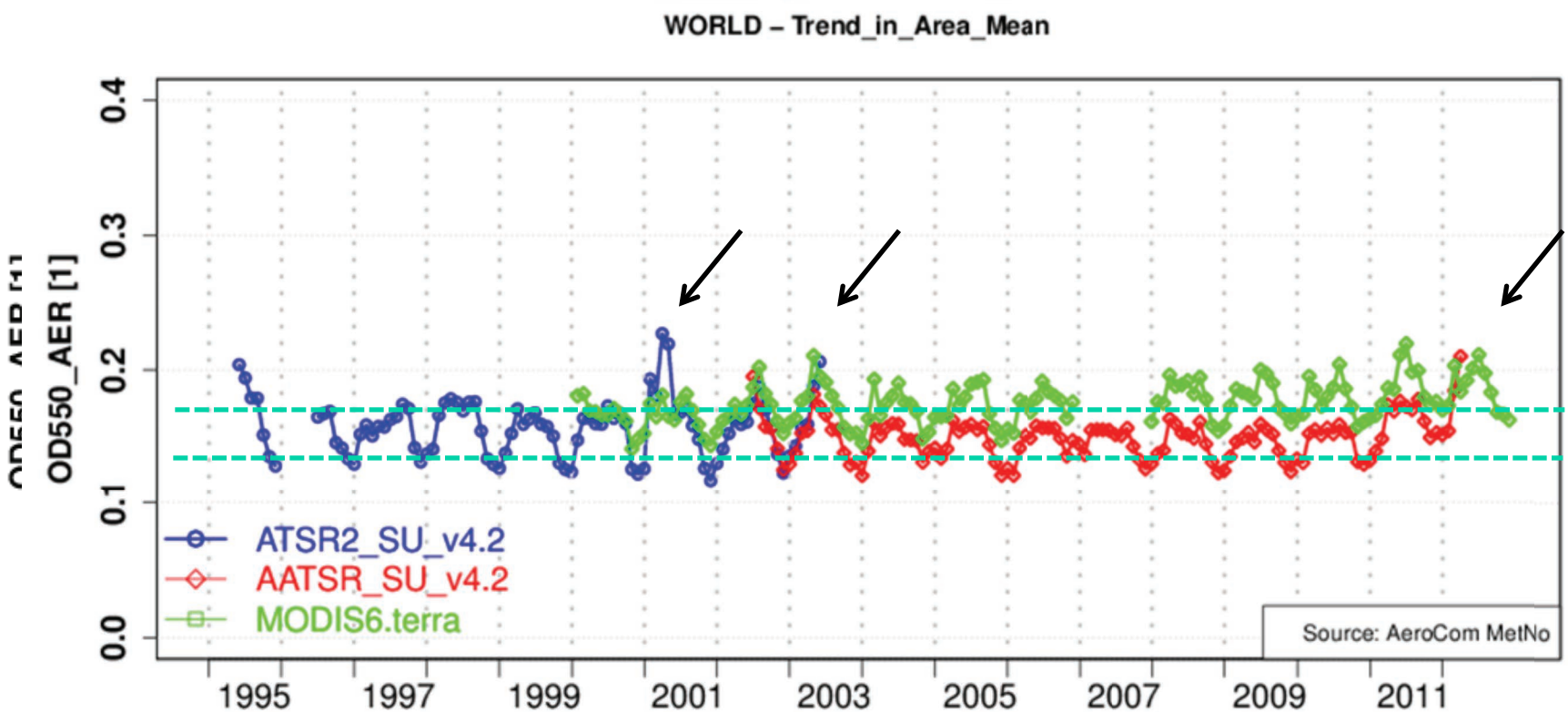
PARASOL: Aerosol types identification with GRASP: AOD, SSA, AE

ATSR-2& AATSR – 17 years
L2 Validation: ATSR-2 1995-2003



Similarly AATSR full time series (1995-2003) L2 data has been validated

ATSR time series

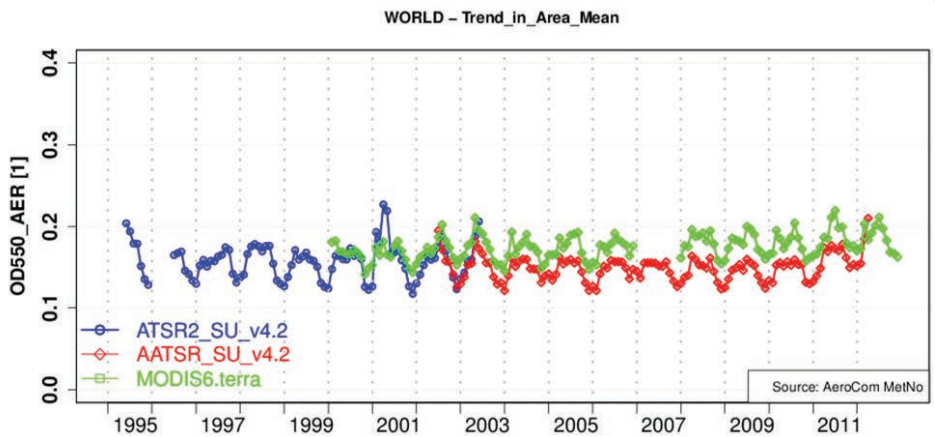


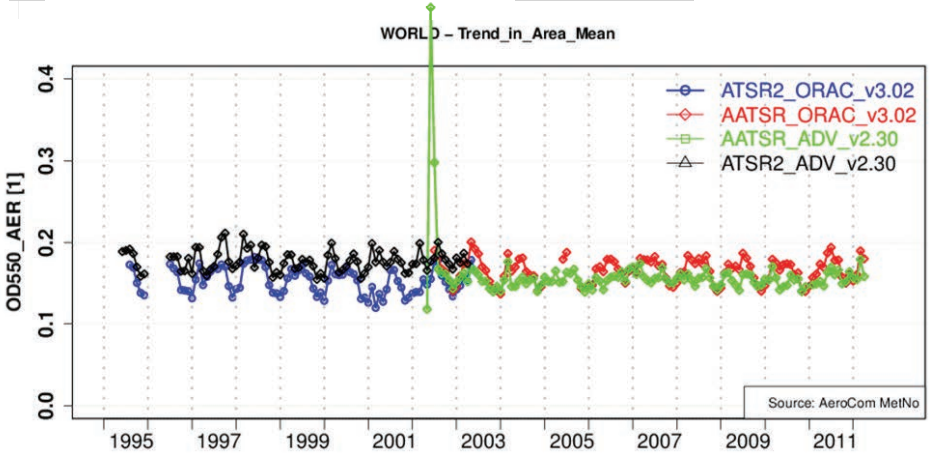
Peaks due to missing or incomplete data

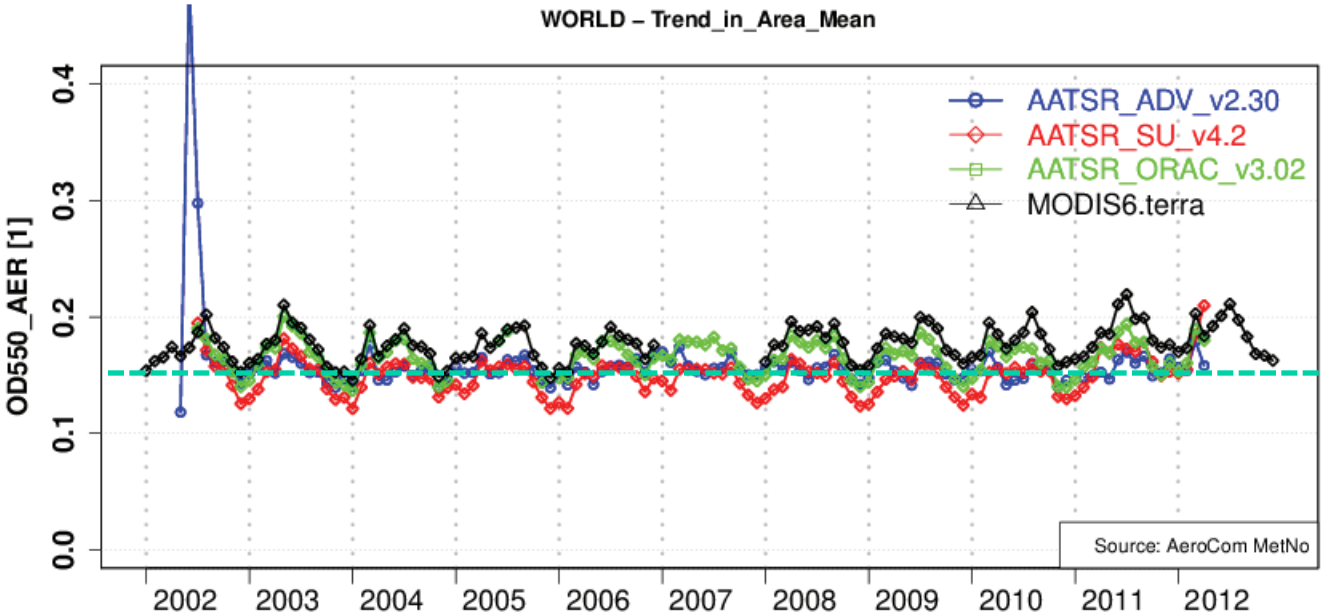
ATSR-2 fewer data points than AATSR; larger seasonal variation; AATSR increase from2010?

Comparison with MODIS: higher AOD, no peaks, increase at end?

ATSR time series MODIS as reference



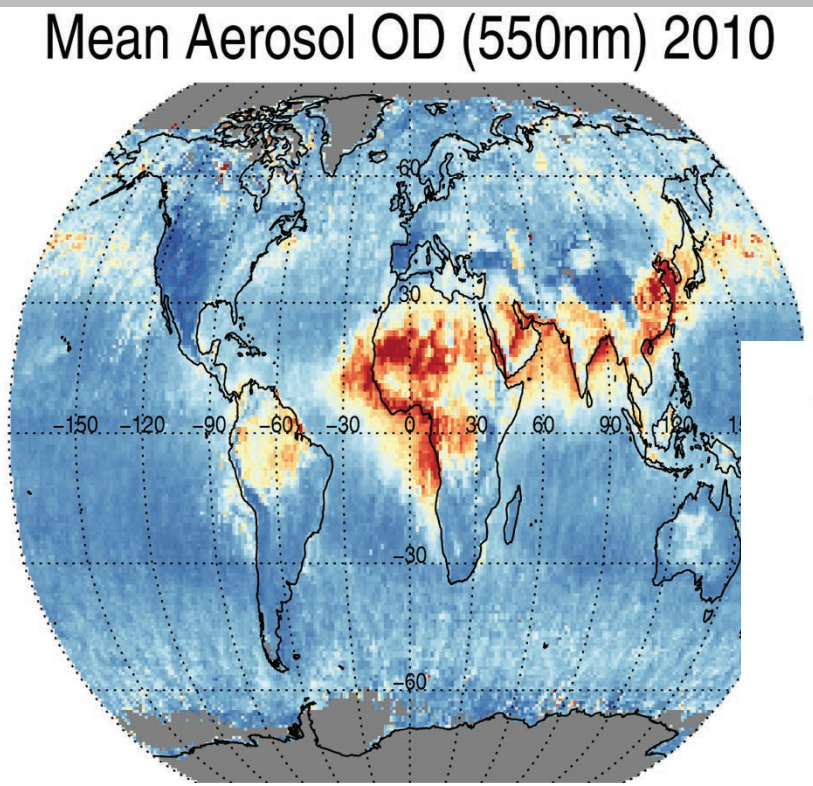


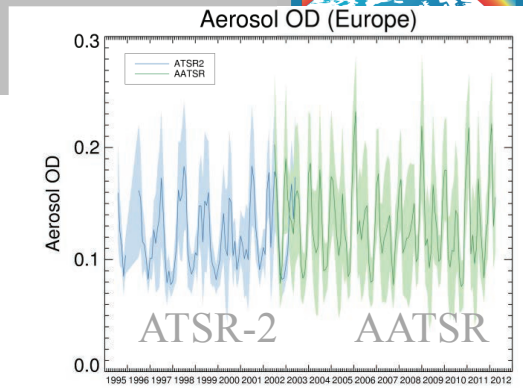


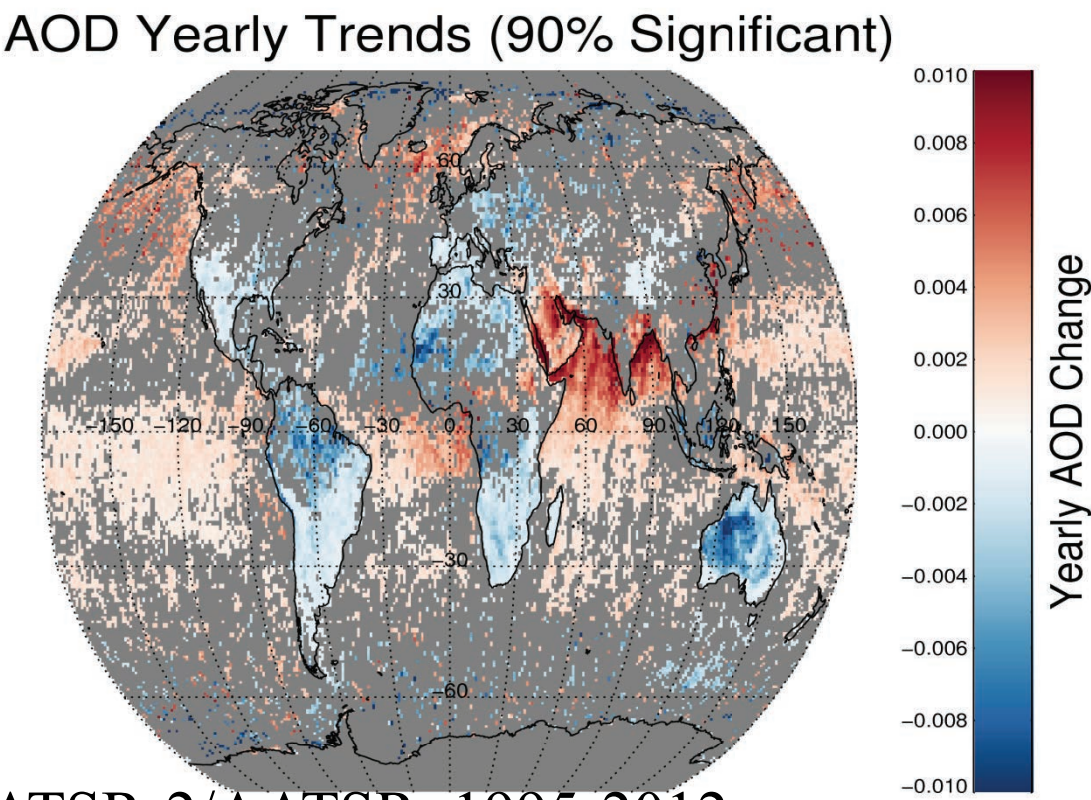
AATSR: ADV and SU similar with SU clearly lower in winter, ORAC closer to MODIS. Regionally larger differences.

ATSR-2: ORAC and SU very similar, differences with ADV under study

ORAC: Full (A)ATSR Processing





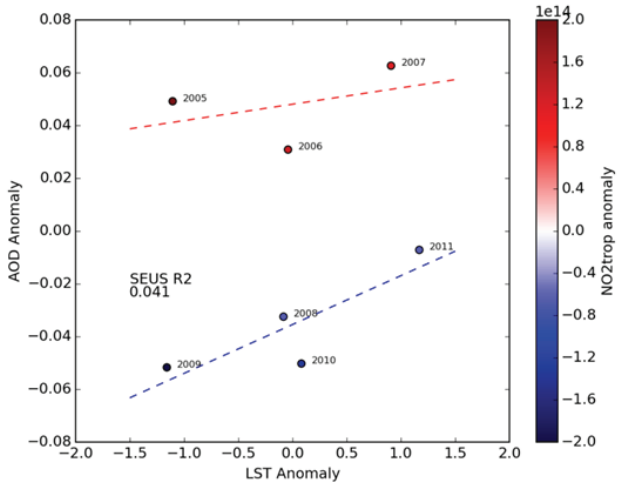


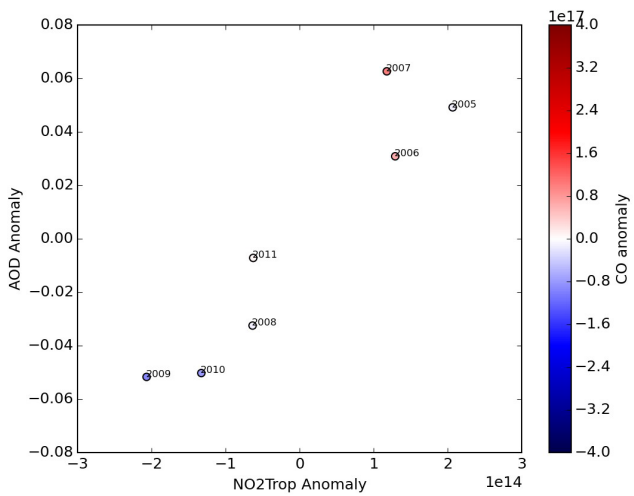
17 year global aerosol from ATSR-2/AATSR: 1995-2012

Use of Aerosol_cci data sets

Two Living Planet fellowships

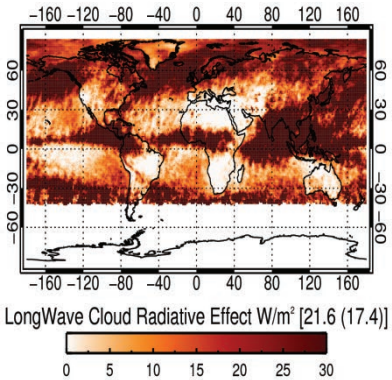
Tero Mielonen:

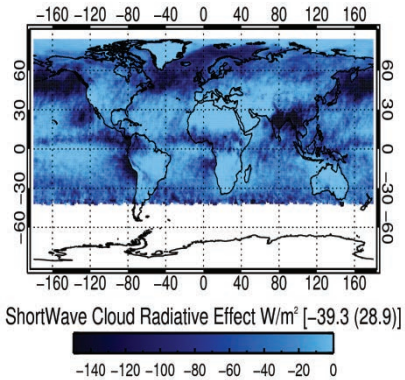




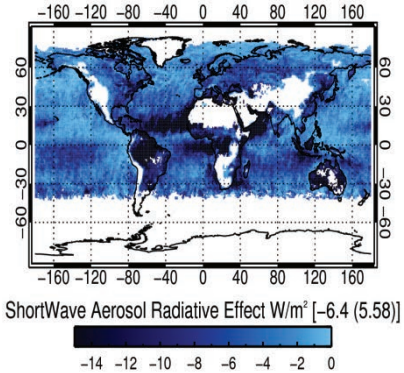
Adam Povey:

top of atmosphere cloud radiative effect



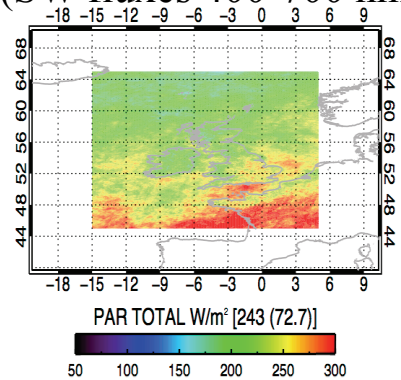


TOA aerosol direct radiative effect



Photosynthetic Active Radiation (PAR)

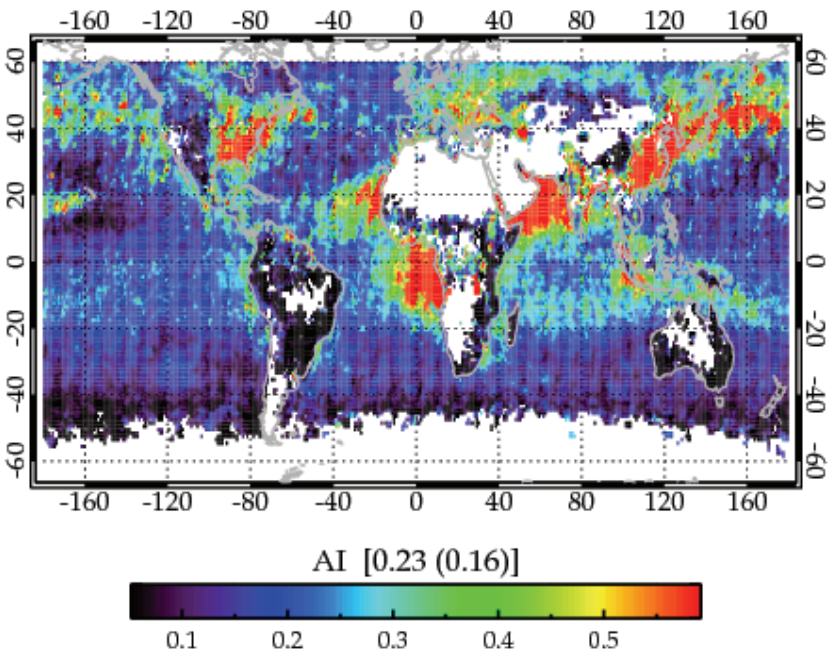
(SW fluxes 400-700 nm)



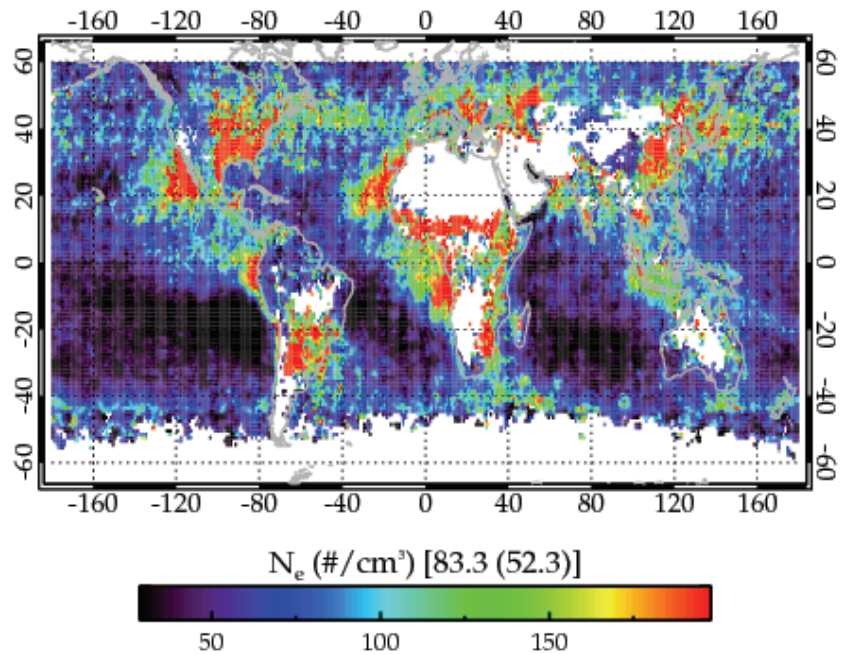
AATSR Joint Aerosol/Cloud

Global Distributions: 2008 JJA 1°x1°

Aerosol Index

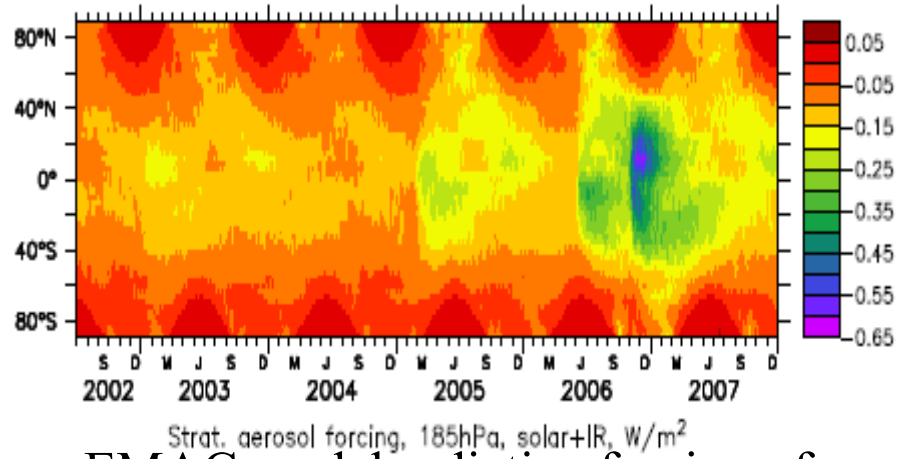


Cloud Droplet Number Concentration

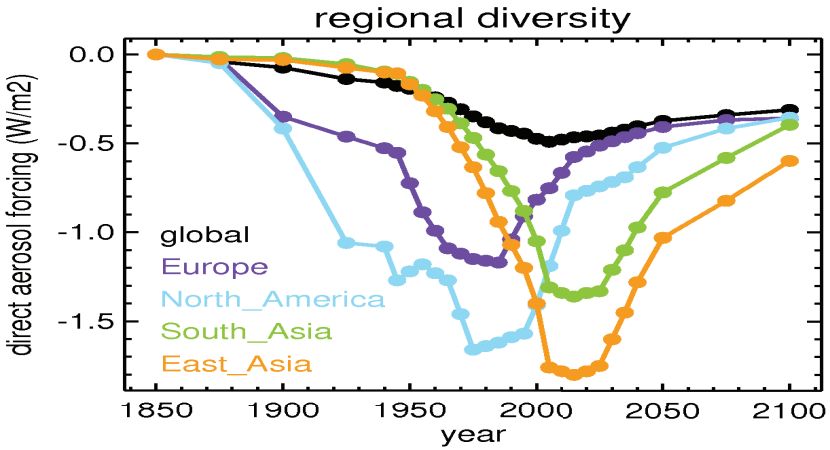


- Aerosol index is a proxy for cloud condensation nuclei
- Cloud droplet number concentration: $\mathbf{N_d = \gamma\, \tau^{0.5}\, R_e^{-2.5}}$ **(γ=1.37e^{-5} m$^{-0.5}$)**
- Cloud droplet number concentrations generally higher where AI is large
  - Eastern USA, China, South Africa

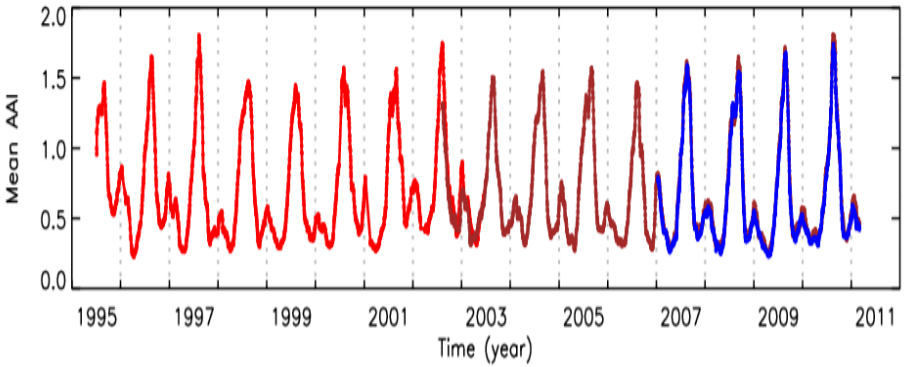
New in P2: case studies



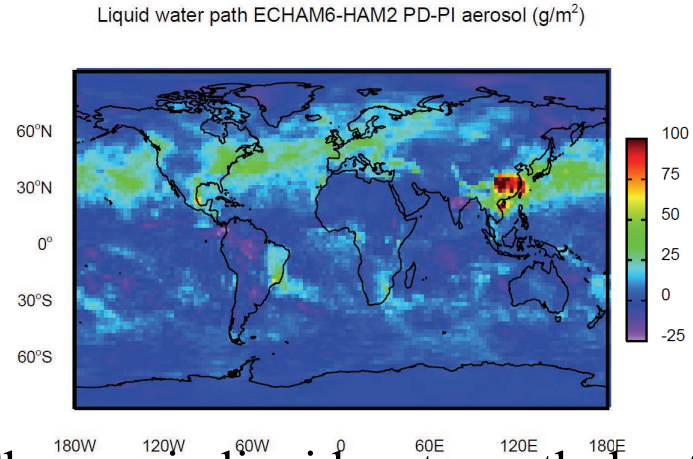
EMAC model radiative forcing of stratospheric aerosol (Brühl et al., 2012/3



simulated regional aerosol direct radiative forcing (Kinne et al., 2013)



AAI record for West-Africa (Tilstra et al., 2011). Red GOME-1, Brown SCIAMACHY blue GOME-2A



Changes in liquid water path due to anthropogenic aerosol (ECHAM6-HAM2; Lohmann, et al. 2010)

ESA / Frascati

8+9 October 2015

in association with

AEROCOM and CCMI

-> time for interaction with modelers