AeroCom update

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Recent papers from AeroCom
Examples of validation via AeroCom
Ongoing AeroCom experiments
AerChemMIP
Next workshop in Frascati
**2014 PAPERS FROM AEROCOM**


CORRESPONDENCE:
Upward adjustment needed for aerosol radiative forcing uncertainty

- Sulphate
- BC
- OA
- SOA
- Nitrate
- BB
- Sum

Myhre et al. (2013); ref. 7
Schulz et al. (2006); ref. 8
Bellouin et al. (2013); ref. 12
Loeb and Su (2010); ref. 6
Myhre (2009); ref. 1
Bellouin et al. (2008); ref. 4
Chung et al. (2005); ref. 5

DARF (W m⁻²), 5-95% range

17/6/2015 ICAP workshop Barcelona
Sulphate burden to forcing
AeroCom I => Aerocom II
Schulz ACP 2007 => Myhre ACP 2013

CHEP = Chemical Production
MEC = Mass extinction coefficient
NRF = Forcing efficiency per AOD
RF = Direct Forcing
EXAMPLES OF VALIDATION VIA AEROCOM
http://aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl
New features of AeroCom webinterface

http://aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl
New features of AeroCom webinterface II

DE–Melpitz (51.53N; 12.93E; 86m)

EMEP_svn2982_150430ST_Trend 2008
Obs: EBAS 2008

MAAP aerosol absorption coefficient factor: 1.16000

ABSC50DRY_AER [Mm⁻¹]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Rev.: 20140513

source: AEROCOM

EUM: EUSAAR, GAW–WDCA
PI: Sonntag Andre
Leibniz Institute for Tropospheric Research
No assimilation

Bias -34%
R 0.71

MODIS assimilated

Bias +19%
R 0.90

ATSR assimilated

Bias -19%
R 0.86

ATSR+MODIS assimilated

Bias +17%
R 0.91
IFS-ECMWF model validation

MACC NRT 2011–2015 against Aeronet NRT level 1.5 data AOD@550

Bias [%]

-60 -40 -20 0 10

Aeronet 1.5

Aeronet 2.0

- Suite
- o-suite 72–96h
- cntrl
- cntrl 72–96h
MACC NRT evaluation w Aerocom tools adding more observables

AOD

Surface Extinction

Evora (38.57N ; 7.9°)

ES–ElArenosillo (37.10N ; 6.73W ; 41m)

source: AEROCOM
Other ongoing validation work
Comparison to Earlinet lidar climatology
Upper tropospheric aerosol background?

Cabauw, The Netherlands (51.97N; 4.93E; 0m)

- Obs: EARLINET clim.
- GOCART-v4.A2.CTRL 2006
- date: clim. MAM
- # of profiles: 25

Seasonal distribution of EC3553D_AER [Mm⁻¹]

Source: AEROCOM

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Sampling error?
Bootstrapping model data for # profiles

Cabauw, The Netherla (51.97N ; 4.93E ; 0m)

Obs: EARLINET clim.
GOCART-v4.A2.CTRL 2006
date: clim. MAM
# of profiles: 25

CabauwTheNetherlands - 2006 - spring

Mean
Stdev
Stdev from bootstrap
# of days

EC3553D_AER [Mm⁻¹]
source: AER

Height [km]

Ext@355 (1/km)

MPHAM_V2_KZ.A2.CTRL
AeroCom Scientific Committee

Task: Reflect on and Recommend an AeroCom work plan
Produce a written recommendation at each AeroCom workshop on how to go on, Track and review progress in AeroCom working groups

Members – Appointed each year anew at AeroCom workshop

Proposed members
Working group leaders, Model representatives, Co-Chairs
Nitrate Bian / BB Petrenko / Dust Balkanski / Microphysics Mann
Aerosol Cloud Interactions Ghan, Liu
Direct radiative forcing Myhre, Samset
GCMs Takemura CTMs Chin
COSP simulator Stier / Satellite data Kahn, Holzer-Popp
Aircraft simulator Schwarz, Stier, Chen
Surface data Ogren, Schulz / Co-chairs Schulz, Kinne, Chin
AeroCom phase III experiments
https://wiki.met.no/aerocom/phase3-experiments

In-situ Measurement Comparison

Contact: Betsy Andrews (NOAA/ESRL/GMD), Betsy.Andrews@noaa.gov

Experiment Description

List of stations with in-situ measurements to be used in comparison project

Modeller commitments (updated as commitments are made):

Follow project progress here:

Nitrate comparison

Contact: Huisheng Bian (CSFC/NASA, JCAT/UMBC), Huisheng.Bian@nasa.gov

Experiment Description

NH3 Emissions from Geia

File name convention

Essential nitrate variables

Biomass Burning emissions experiments

Contact: Mariya Petrenko (NASA GSFC, USA; ORAU, USA), mariya.m.petrenko@nasa.gov

Experiment Description (updated November 26, 2014)

Model output file naming convention (September 11, 2014)

Variable names for model output (highlighted in blue/cyan; October 16, 2014)

HTAP 2 experiments

Contact: Mian Chin (NASA) mian.chin@nasa.gov; Michael Schulz (MetNo) michael.schulz@met.no

AeroCom specific experiment description for HTAP2

HTAP2 experiment description

Aerosol Lifetime experiments, Fukushima tracers

Model output

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Meteorologisk institutt
**Motivation**
Comparable output data set of the latest model version simulations
Would allow additional interpretation for special experiments.
Document model progress, provide feedback on model development

**Procedure** (if the model changed from lately)
AeroCom models should produce each year one Control simulation year 2008,
with standard diagnostics, Strict format requirements

**Model Submission** before July 31 to AeroCom server at MetNo

**Standard plots** available during August; MetNo AeroCom webinterface
Validated against standard datasets,

**Feedback** from modellers to MetNo until Mid September

**Summary** and overview presentation at AeroCom workshop Sep/Oct
Check format: http://aerocom-test.met.no/upload
AerChemMIP Proposal to CMIP6
Joint initiative from CCMI and AeroCom

Co-chairs:
Bill Collins (UK)
Jean-François Lamarque (USA)
Michael Schulz (Norway)
Overview

AerChemMIP will quantify **forcings**, **feedbacks** and global-to-regional climate **response** \((\Delta T, \Delta P)\) from changes to:

- NTCF emissions (aerosols, O\(_3\) precursors)
- Reactive GHGs concentrations (N\(_2\)O, CH\(_4\), ODSs)

It will provide essential new data to answer CMPI6 Q1 “How does the Earth system respond to forcing?”. AerChemMIP will provide data on past and future changes in the chemical composition of the atmosphere and estimate the associated forcings.

It will provide significant contributions to WCRP theme “Biogeochemical forcings and feedbacks” (Chemistry-climate feedbacks, uncertainty associated with natural emissions,…)

Motivation 1: Quantification of the transient Effective Radiative Forcing of Near-Term Climate Forcers

Quantification of Effective Radiative Forcing of NTCFs for historical runs with interactive aerosol (+chemistry)
- Needed for D&A
- Improves on AR5 and Forster 2013
- Includes tropospheric $O_3$

Quantification of biogeochemical feedbacks
- E.g., chemistry-climate feedback under a 4x$CO_2$ with (AerChemMIP) vs without (RFMIP) interactive aerosols and chemistry changes the climate sensitivity

Nowack et al., *Nature*, 2015
Motivation 2: Quantifying the climate impacts of Near-Term Climate Forcers

Importance of NTCFs in climate prediction scenarios

- AR5: near term $\Delta T$ spread was due to Near-Term Climate Forcers

- ECLIPSE (FP7): Mitigation of CH4, BC compared to business as usual

- AerChemMIP will quantify the climate effects of NTCF mitigation based on a variant to ScenarioMIP Tier 1 SSP3-7

Stohl et al. 2015

AR5 fig 11.23a

ICAP workshop Barcelona

17/6/2015
14th AeroCom workshop 2015
AerChemMIP/CCMI/AeroCom/AeroSat joint meeting

5.10. – 9.10.
Frascati, Italy

Monday   Tuesday   Wednesday   Thursday   Friday
AeroCom    AeroCom    AerChemMIP    AeroCom……AEROSAT
            CCMI            CCMI

Host ESA, Simon Pinnock (AeroCom, AerChemMIP, Aerosat)
Host CNR, Federico Fierli (CCMI)
Thanks for your attention !