AeroCom achievements and goals of this workshop

Michael Schulz

Outline
- Science
- Organisation
- Web Interface
- Goals
AeroCom – science
Joint AeroCom papers achieved in 2014

- Organic aerosols .... Kostas Tsigaridis
  ACP accepted

- Black Carbon on snow ---- Chaoyi Jiao
  ACP 14 (5), 2399-2417.

- Size distribution ::: Graham Mann et al
  ACP 14 (9), 4679-4713.

- Dust over the Atlantic ==== Dongchul Kim et al
  JGR 119 (10), 6259-6277.

In preparation:
Kristiansen, see poster and presentation
Koffi, draft distributed
Sulphate life cycle AeroCom I and II
Schulz et al. ACP 2007 ; Myhre et al. ACP 2013
CORRESPONDENCE:
Upward adjustment to radiative forcing uncertainties
Evaluating the vertical distribution of the aerosol
Koffi et al. in preparation, 2014

GLOBAL ANNUAL

$Z_\alpha (0-6 \text{ km})$

GISS–ModelE: 1.22
GOCART: 1.84
SPRINTARS: 0.96
LSCE: 1.51
GMI–MERRA–v3: 1.53
ECHAM–HAM: 1.32
PNNL: 1.31
GISS–MATRIX: 1.03
Oslo_CTM2: 1.45
HodGEM: 1.24
CAM4_Oslo: 1.68
Earlinet climatology constructed w AeroCom tools example EMEP model validation

Evora, Portugal (38.57N ; 7.91W ; 290m)

Obs: EARLINET
EMEPglob.v2801
date: clim. MAM
# of measurements: 47

Evora, Portugal (38.57N ; 7.91W ; 290m)

Obs: EARLINET
EMEPglob.v2801
date: clim. SON
# of measurements: 52
Is our trend understanding consistent?
EMEP model versus EBAS/NILU database 2000-2011

EMEP Trend run
Emission varying, meteo 2011

Observations

Aerosol optical depth
-30%
-20%

PM10
-5%
0%

PM25
-10%
-10%

SO4
-20%
-20%

Total Nitrate
-10%
0%
Trend analysis: Using the full Aeronet network versus long-term operating Aeronet sites

OD550_AER AODTREND station list 2008

No of stations: 22

ALLYEAR – monthly

OD550_AER WORLD station list 2008

No of stations: 213

ALLYEAR – monthly

Selected sites

All sites
Trends @ Aeronet Sites globally
Aeronet versus MACC model reanalysis

Using ALL AERONET NETWORK

Using 22 LONG operating AERONET SITES

Increased bias

Better agreement
Elemental Carbon (thermo-optical analysis)
Trend analysis attempt with EMEP model

*Observations > Model*10 have been removed
AeroCom – organising science
New manual for data submission
https://wiki.met.no/aerocom/data_submission

130 users have account on aerocom-users.met.no

Disk area growing to host HTAP and AeroCom phase III (now ca 30 TB available)

WCS server is working in principal
http://wcs-test.met.no/static/index.html
Needs to be filled with content, thredds server planned

Web interface has now high-quality images, more metadata from netcdf global attributes, faster reaction, subsets introduced
AeroCom phase III experiments =>
https://wiki.met.no/aerocom/phase3-experiments

Nitrate comparison
Contact: Huisheng Bian (GSFC/NASA, JCET/UMBC), Huisheng.Bian@nasa.gov
Experiment Description File
NH3 Emissions from Geia file
File name convention Nitrate Filename Protocol File
Essential nitrate variables file aerocom_bbexperiment_proposed_v2.docx

Biomass Burning emissions experiments
Contact: Mariya Petrenko (NASA GSFC, USA; ORAU, USA), mariya.m.petrenko@nasa.gov
Experiment Description (updated June 18 2014) File
Model output file naming convention (September 11, 2014) File
Variable names for model output (highlighted in blue/cyan; Septmebr 11, 2014) File

HTAP 2 experiments
Contact: Mian Chin (NASA) mian.chin@nasa.gov; Michael Schulz (MetNo) michael.schulz@met.no
AeroCom specific experiment description for HTAP2 File
HTAP2 experiment description HTAP website

Aerosol Lifetime experiments, Fukushima tracers
Model output Specifications

+ Indirect effect experiment
CF-Checker and Range test tool is online
aerocom-test.met.no

File and CF-Version

Select File(s) to Upload Browse Select CF-version to validate cf-1.5

Test Results

<table>
<thead>
<tr>
<th>File Name</th>
<th>File size</th>
<th>Upload Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ta_HTAP2-monthly_RAQMS_r1i1p1_201001-201001.nc</td>
<td>5523 kByte</td>
<td>failure</td>
</tr>
</tbody>
</table>

CF-Convention Test - Select CF-version cf-1.5 if CF convention version error appears

- global Conventions attribute should be set to “CF-1.5”, not “CF-1.6” (2.6.1)
- lev: standard_name ‘general_atmosphere_hybrid_sigma_pressure_coordinate’ does not exist in standard name table (3.3)
- lev_bnds: standard_name ‘general_atmosphere_hybrid_sigma_pressure_coordinate’ does not exist in standard name table (3.3)
- pint: standard_name ‘interface_pressure’ does not exist in standard name table (3.3)
- lev: standard_name ‘general_atmosphere_hybrid_sigma_pressure_coordinate’ does not allow formula_terms (4.3.2)
- lev_bnds: formula_terms attribute only allowed on coordinate variables (4.3.2)

- pint: variable dimension “lat” refers to horizontal dimension, it should have a cell_methods entry covering this dimension (7.3)
- pint: variable dimension “lon” refers to horizontal dimension, it should have a cell_methods entry covering this dimension (7.3)
- ps: variable dimension “lat” refers to horizontal dimension, it should have a cell_methods entry covering this dimension (7.3)
- ps: variable dimension “lon” refers to horizontal dimension, it should have a cell_methods entry covering this dimension (7.3)

- running CFchecker version 1.5.18 (INIT)
- checking compliance with convention CF-1.5 (INIT)
- using standard name table version: 26, last modified: 2013-11-08T06:09:34Z (INIT)
- using area type table version: 2, date: 10 July 2013 (INIT)
- variable “a” does not contain units attribute (3.1)
- variable “b” does not contain units attribute (3.1)
- variable “b_bnds” does not contain units attribute (3.1)
- variable “a_bnds” does not contain units attribute (3.1)

Variable Data Range Test for HTAP and AeroCom

- lon_bnds range is out of bounds. Data values should be in range of [-180.0,360.0]
- pint: undefined variable for range test:

md5: 34c8441e01846e4fa8434a5747d36b
New experiments should always have

- ONE CONTROL experiment for all new model versions participating in any experiment
- Allows check of improvement over time
- Basic diagnostics of emissions, loads, surface concentrations, optical properties give quick feedback on model quality

THE FILENAME

{project}_{model}_{modelversion}_{exp}_{var}_{collection}_{year}_{time frequency}.nc
AerChemMIP

A joint initiative of

- Co-chairs
  Michael Schulz (Norway) - Jean-François Lamarque (USA)

- Main contributors to discussions (so far)
  Bill Collins (UK), Veronika Eyring (D) Gunnar Myhre (Norway)
  Steve Smith (US) Olivier Boucher (France) Michaela Hegglin (UK)
  Drew Shindell (USA) Michael Prather (US) Piers Forster (UK)
  Fiona O’Connor (UK) Susanne Bauer/Kostas Tsigaridis (US) Toshi Takemura (JP) Paul Ginoux (US)
Climate Model Intercomparisons: Preparing for the Next Phase

Within this scientific framework, a more distributed organization for CMIP6 than in previous phases of CMIP is proposed. This would fall under the umbrella of the CMIP6 Next Gen.
Motivation for having AerChemMIP

- Address shortcomings of CMIP5 with respect to composition&forcing&response (mostly aerosols and ozone)
- Interactive chemistry and aerosol is state-of-the-art in many climate models… What are the effects on climate?

Need to organize
- Define combined metrics and diagnostics for composition/forcing/response evaluation
- Identify science questions of relevance to CMIP6 and define the associated simulations
- Provide single entity based on AeroCom and CCMI to interact with other CMIP6 contributors on emissions, interactions and forcing estimates.

More on Thursday afternoon

Slides send around today
Eclipse simulations of aerosol forcing 1990-2015 based on new emission data

- Simulations completed in 4 models
- Additional 4 models are currently running the simulations

Change in PM2.5

Direct aerosol effect
PDRMIP
Precipitation Driver Response Model Intercomparison Project

• PDRMIP will compare the precipitation response to various climate drivers, across models. Analyses planned include a better understanding of the drivers’ importance for inter-model differences in precipitation changes, energy budget analysis and extremes related to precipitation.

• PDRMIP is a new climate model intercomparison initiative, and was launched in Oslo in November 2013. Currently the PDRMIP simulations are run by seven climate modelling groups, and more modelling groups are encouraged to participate!

• PDRMIP has applied to be a CMIP6-Endorsed MIP

Confirmed participating models:
• National Center for Atmospheric Research (NCAR) Community Earth System Model CESM1
• Hadley Center Climate Model HadGEM2 & HadGEM3
• Goddard Institute for Space Studies (GISS) ModelE
• SPRINTARS
• IPSL-CM5
• NorESM

Participants and collaborators of PDRMIP:
Dr. Gunnar Myhre, Dr. Bjørn H. Samset, Dr. Øivind Hodnebrog and Dr. Jana Sillmann (CICERO, Norway), Prof. Piers M. Forster (University of Leeds, UK), Dr. Drew T. Shindell (NASA GISS, USA), Dr. Toshihiko Takemura (Kyushu University, Japan), Dr. Jimy Dudhia (NCAR, USA), Dr. Olivier Boucher (CNRS, France), Dr. Francis Zwiers (PCIC, Canada), Dr. Slava Kharin (CCCma, Canada), Dr. Jean-François Lamarque (NCAR, USA), Dr. Dirk Olivié (Norway), Dr. Alf Kirkevåg (Norway), Dr. Michael Schulz (Norway), Dr. Apostolos Voulgarakis (UK)

Contact gunnar.myhre@cicero.oslo.no if you want to participate
AeroCom web interface

- -  news from MetNo

-- some new features
**AeroCom web interface**

- **AEROCOM phase II INTERFACE - MODEL versus DATA, Model maps & scores**

  **Graph Type:** Map of data (w area mean value)
  **Data Set / Model:** CAM4-Oslo-Vcmsg5.A2CTRL
  **Parameter:** LOAD_BC
  **Place-Year-Freq:** WORLD, an9999, Annual Average

  ![LOAD_BC 9999 mean 0.467](image created 27.03.2014 9:37)

  Source: AEROCOM
Menu abbreviations

Long explanatory text appears

- AEROCOM phase II INTERFACE - MODEL versus DATA, Model maps & scores

Project-> AEROCOM ▼ Subset/Paper-> AEROCOM Phase II CTRL ▼ Explicit-1-panel ▼ URL LINK to current

Graph Type: Gridded Map of Correlation against gridded aggregated mont ▼
Data Set / Model: CAM4-Oslo-Vcmip5.A2CTRL ▼
Parameter: ABS550_AER ▼
Place-Year-Freq: WORLD ▼ an9999 ▼ Annual Average ▼
Reference: AERONETsky ▼

Reference dataset and eventually year / Aeronet Level 2, workup by Stefan Kinne

image created 27.03.2014 18:7

Hide info hovering over image  Edit Subset "MyList"
Global netCDF attributes for each dataset “appear”
Which models/datasets should be looked at together? Subsets for different project phases & publications
Which datasets were used in which publication?
example: retrievals in cci-aerosol publication in AMT
Which other models can I compare to?
Synchronize shows comparable datasets available

<table>
<thead>
<tr>
<th>Project</th>
<th>Subset/Paper</th>
<th>Model</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEROCOM</td>
<td>AEROCOM Phase II CTRL</td>
<td>OD550_AER</td>
<td>STATMAP_BIAS</td>
</tr>
<tr>
<td>WORLD</td>
<td>an9999</td>
<td>Annual Average</td>
<td>AERONETSun</td>
</tr>
</tbody>
</table>

BCC_AGCM2.0.1_CAM.A2_CTRL
CAM4-Oslo-Vcmip5.A2_CTRL
CAM5.1-MAM3-PNNL.A2_CTRL
CAM5-MAM3-PNNL.A2_CTRL
CAM5-V3.A2_CTRL
CAM4-Oslo.A2_CTRL
GEOCHEM-v822.A2_CTRL
GISS-MATRIX.A2_CTRL
GISS-modelE.A2_CTRL
GMI-v3.A2_CTRL
GISt-A2_CTRL
GOCART-v4.A2_CTRL
GOCART-v4Ed.A2_CTRL
HadGem2-ES.A2_CTRL
HadGem2-ES.A2CTRL-DIRECT
LSCEv2c.A2_CTRL
MPI-HAM.12.A2_CTRL
MPI-HAM.12.A2CTRL-DIRECT
OsloCTM2.A2_CTRL
SPRINTARS-v384.A2_CTRL
SPRINTARS-v385.A2_CTRL
TM5-V3.A2_CTRL
Can we compare against a reference?
example MACC MAM 2014 to MACC MAM climatology

Reference Dimension
Difference/Correlation map vs different references?
Example ATSR vs AeroCom Median & Modis
Data evaluated against different observations? example MACC against Aeronet 2.0 and 1.5 NRT
AeroCom Web Interface

Feedback very welcome !!
Goals of the workshop
Goals and Questions for the workshop

- Progress in current AeroCom Experiments?
  - Nitrate, BB, Indirect, (HTAP), Lifetime
- AerChemMIP diagnostics and experiments?
- Next steps for meaningful model evaluation?
  - Satellite and surface observation synergy
  - Trend significance
  - Model error finding
  - Model improvement documentation
  - Forcing documentation in GCMs
- Database and Tools overview / review
  - What could be done better?
- AeroCom Scientific Committee?
thanks

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