Requirements for model data to be used in REMOTE SENSING experiment

This document briefly describes the AEROCOM Remote Sensing experiment and the data we hope to obtain from modelling groups. This experiment aims to evaluate current global aerosol models (more precise: the AEROCOM CTRL2016 models) against remote sensing datasets.

The experiment only requests standard model output and should require no further model development, with the possible exception of dry AOT (see later).

The experiment hopes to establish current model diversity in the context of diversity and/or uncertainty in remote sensing datasets.

Several aspects of this experiment are improvements or extensions of previous work done in this field:

- The model data will be sampled (collocated) to the observations to reduce as much as possible spatio-temporal sampling issues (see http://www.atmos-chem-phys.net/16/1065/2016/ for an estimate of temporal sampling issues without collocation),
- This will allow in-depth evaluations (e.g. time-series, Taylor plots, EOF analysis) that will be shared with modelling groups,
- Remote sensing data from different sensors (e.g. MODIS Terra & Aqua, MISR, AATSR, PARASOL) and different retrieval algorithms (e.g. standard MODIS Dark Target, Deep Blue but also MAIAC etc.) will be compared *in the context of model evaluation* to understand the impact of retrieval errors,
- Not only AOT but also AE, AAOT and SSA will be compared against observations,
- Both satellite and ground-based remote-sensing data will be used.
- Novel satellite retrievals that estimate SSA are included (4 different retrievals by the groups of O. Dubovik, O. Hasekamp, J. Redemann and O. Torres)

The experiment will also allow for

- Model evaluation against novel dust AOT retrievals from IASI,
- Model evaluation against LIDAR data.

At the moment, 12 different remote sensing groups have specially prepared (aggregated and time-stamped) observations for this experiment. These datasets will also be used to track model development in the coming years.

Results will be published in peer-reviewed journals and all modellers that submitted data will be offered co-authorship. For questions, please contact Nick Schutgens (schutgens@physics.ox.ac.uk), University of Oxford, UK.

Timeframe for observations

Model data for three years (2006, 2008 and 2010) are sought. This will allow the most diverse set of observations (some remote sensing datasets are currently limited to only a few years) and includes the AEROCOM reference years 2008 & 2010. Our requirements for model data differ slightly per year in that more data is requested for 2010 than for the 2006 and 2008 (see Tables at the end).

Requested observations and auxiliary information

The following data is requested: ambient total AOT (Aerosol Optical Thickness), fAOT (fine mode AOT), AAOT (absorptive AOT) and dust AOT as well as dry total AOT (AOT at zero relative humidity). Additionally, profiles of ambient AOT and relative humidity as well as model level thicknesses are requested for one year (2010).

Ambient fine mode AOT, absorptive AOT, dust AOT and dry total AOT are requested at 550nm. Ambient total AOT is requested at three wavelengths: at 550nm, and as close to 440nm and 870nm as the current model setup allows. E.g in the case of ECHAM-HAM that would imply AOT at 460 and 825nm. Fine mode AOT should be total AOT for particles with ambient diameter less than or equal to 1 micrometer. See also the Tables at the end of this document. These data should be instantaneous model values (*not time-averaged*) provided at high output frequency (3 hourly). The time-stamps of the model output should be close to 00, 03, 06, 09, 12 hours UTC, … etc.

Models should be run in their standard setup, as defined for the AEROCOM CTRL2016 experiments. This will facilitate the interpretation of any evaluation results. All runs should be nudged to appropriate reanalysis meteorology. Obviously, the experimental setup should be consistent across the three years. Models should be suitably spun-up before output of data. No pre-industrial run is required.

File format and structure

Files should adhere to the normal AEROCOM rules: one NetCDF file per variable, CF-compliant.

Filenaming should be:

aerocom3_<ModelName>_<ExperimentName>_<VariableName>_<VerticalCoordinateType>_<Period>_<Frequency>.nc, e.g.

aerocom3_ECHAM5.5HAM2.0_ RemSens_od550aer_Surface_2008_3hourly.nc

Table 1 Model data requested for 2006, 3-hourly

Long name	Short name	Comments
Aerosol Optical Thickness	od440aer	Near 440nm
Aerosol Optical Thickness	od550aer	
Dry Aerosol Optical Thickness	od550dryaer	At zero relative humidity
Aerosol Optical Thickness	od870aer	Near 870nm
Absorptive AOT	abs550aer	
Fine mode AOT	od550lt1aer	
Dust AOT	od550dust	

Table 2 Model data requested for 2008, 3-hourly

Long name	Short name	Comments
Aerosol Optical Thickness	od440aer	Near 440nm
Aerosol Optical Thickness	od550aer	
Dry Aerosol Optical Thickness	od550dryaer	At zero relative humidity
Aerosol Optical Thickness	od870aer	Near 870nm
Absorptive AOT	abs550aer	
Fine mode AOT	od550lt1aer	
Dust AOT	od550dust	

Table 3 Model data requested for 2010, 3-hourly

Long name	Short name	Comments
Aerosol Optical Thickness	od440aer	Near 440nm
Aerosol Optical Thickness	od550aer	
Dry Aerosol Optical Thickness	od550dryaer	At zero relative humidity
Aerosol Optical Thickness	od870aer	Near 870nm
Absorptive AOT	abs550aer	
Fine mode AOT	od550lt1aer	
Dust AOT	od550dust	
Layer Aerosol Optical Thickness	od550aer3d	
Layer relative humidity	humidity3d	Relative humidity in layer
Layer thickness	deltaz3d	Unit: [m]

Please adjust the shortname of od440aer and od870aer according to the wavelengths used.

For a T63L31 model run this will amount to 24 files of ~23GB data in total.