Geophysical Research Abstracts
Vol. 14, EGU2012-10665, 2012
EGU General Assembly 2012

Host Model Uncertainty in Aerosol Radiative Forcing Estimates – The AeroCom Prescribed Experiment

P. Stier (1), S. Kinne (2), N. Bellouin (3), G. Myhre (4), T. Takemura (5), H. Yu (6), C. Randles (6), and C.E. Chung (7)

(1) Department of Physics, University of Oxford, United Kingdom (philip.stier@physics.ox.ac.uk), (2) Max Planck Institute for Meteorology, Hamburg, Germany, (3) Hadley Centre, UK MetOffice, Exeter, UK, (4) Department of Geosciences, University of Oslo, Oslo, Norway, (5) Research Institute for Applied Mechanics, Kyushu University, Japan, (6) NASA Goddard Space Flight Center, Greenbelt, USA, (7) Gwangju Institute of Science and Technology, Gwangju, Korea

Anthropogenic and natural aerosol radiative effects are recognized to affect global and regional climate. However, even for the case of identical aerosol emissions, the simulated direct aerosol radiative forcings show significant diversity among the AeroCom models (Schulz et al., 2006).

Our analysis of aerosol absorption in the AeroCom models indicates a larger diversity in the translation from given aerosol radiative properties (absorption optical depth) to actual atmospheric absorption than in the translation of a given atmospheric burden of black carbon to the radiative properties (absorption optical depth). The large diversity is caused by differences in the simulated cloud fields, radiative transfer, the relative vertical distribution of aerosols and clouds, and the effective surface albedo. This indicates that differences in host model (GCM or CTM hosting the aerosol module) parameterizations contribute significantly to the simulated diversity of aerosol radiative forcing. The magnitude of these host model effects in global aerosol model and satellites retrieved aerosol radiative forcing estimates cannot be estimated from the diagnostics of the “standard” AeroCom forcing experiments.

To quantify the contribution of differences in the host models to the simulated aerosol radiative forcing and absorption we conduct the AeroCom Prescribed experiment, a simple aerosol model and satellite retrieval intercomparison with prescribed highly idealised aerosol fields. Quality checks, such as diagnostic output of the 3D aerosol fields as implemented in each model, ensure the comparability of the aerosol implementation in the participating models.

The simulated forcing variability among the models and retrievals is a direct measure of the contribution of host model assumptions to the uncertainty in the assessment of the aerosol radiative effects. We will present the results from the AeroCom prescribed experiment with focus on the attribution to the simulated variability to parametric and structural model uncertainties. This work will help to prioritise areas for future model improvements and ultimately lead to uncertainty reduction.