

AeroCom INSITU Project: Comparing modeled and measured aerosol optical properties

Elisabeth Andrews (1), Lauren Schmeisser (1,2), Michael Schulz (3), Markus Fiebig (4), John Ogren (5),
Huisheng Bian (6), Mian Chin (6), Richard Easter (7), Steve Ghan (7), Harri Kokkola (8), Anton Laakso (8),
Gunnar Myhre (9), Cynthia Randles (6), Arlindo da Silva (6), Phillip Stier (10), Ragnhild Skeie (9), Toshihiko
Takemura (11), Twan van Noije (12), and Kai Zhang (7)

(1) CIRES, University of Colorado, Boulder, United States (betsy.andrews@noaa.gov), (2) University of Washington, Seattle, United States, (3) MetNo, Oslo, Norway, (4) NILU, Oslo, Norway, (5) NOAA/ESRL/GMD, Boulder, United States, (6) NASA/GSFC, Greenbelt, United States, (7) PNNL, Richland, United States, (8) Finnish Meterological Institue, Helsinki, Finland, (9) CICERO, Oslo, Norway, (10) University of Oxford, Oxford, United Kingdom, (11) Research Institute for Applied Mechanics, Kyushu University, Fukuoka, Japan, (12) KNMI, Utrecht, The Netherlands

AeroCom, an open international collaboration of scientists seeking to improve global aerosol models, recently initiated a project comparing model output to in-situ, surface-based measurements of aerosol optical properties. The model/measurement comparison project, called INSITU, aims to evaluate the performance of a suite of AeroCom aerosol models with site-specific observational data in order to inform iterative improvements to model aerosol modules. Surface in-situ data has the unique property of being traceable to physical standards, which is an asset in accomplishing the overall goal of bettering the accuracy of aerosols processes and the predicitve capability of global climate models. Here we compare dry, in-situ aerosol scattering and absorption data from ~ 75 surface, in-situ sites from various global aerosol networks (including NOAA, EUSAAR/ACTRIS and GAW) with a simulated optical properties from a suite of models participating in the AeroCom project.

We report how well models reproduce aerosol climatologies for a variety of time scales, aerosol characteristics and behaviors (e.g., aerosol persistence and the systematic relationships between aerosol optical properties), and aerosol trends. Though INSITU is a multi-year endeavor, preliminary phases of the analysis suggest substantial model biases in absorption and scattering coefficients compared to surface measurements, though the sign and magnitude of the bias varies with location. Spatial patterns in the biases highlight model weaknesses, e.g., the inability of models to properly simulate aerosol characteristics at sites with complex topography. Additionally, differences in modeled and measured systematic variability of aerosol optical properties suggest that some models are not accurately capturing specific aerosol behaviors, for example, the tendency of in-situ single scattering albedo to decrease with decreasing aerosol extinction coefficient. The endgoal of the INSITU project is to identify specific discrepancies with current aerosol models and suggest further model runs and perturbations that could further elucidate the discrepancies between measured and modeled aerosol optical properties.