

Comparison of Aerosol Optical Properties from *In Situ* Surface Measurements and Model Simulations

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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 are directly traceable to physical standards, which is an asset in accomplishing the overall goal of bettering the overall accuracy of aerosols processes and predicative capability of global climate models. The INSITU project looks at how well models reproduce aerosol optical property climatologies on a variety of time scales, aerosol persistence, and the systematic relationships between aerosol optical properties, and aerosol trends.

Here we present comparisons from ~60 surface sites with model output from 12 global climate models. Our analysis shows substantial model biases in absorption and scattering coefficients compared to surface measurements, though the sign and magnitude of the bias varies with location. Our results also indicate that model-simulated values for single scattering albedo (SSA) and scattering Angstrom exponent tend to be lower (i.e., aerosol is darker and larger) than the *in situ* measurements. Spatial patterns in the biases highlight model weaknesses, e.g., the inability of models to properly simulate aerosol characteristics at sites with complex topography as well as predicting more absorbing aerosol over Asia than is observed. 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* SSA to decrease with decreasing aerosol extinction coefficient.

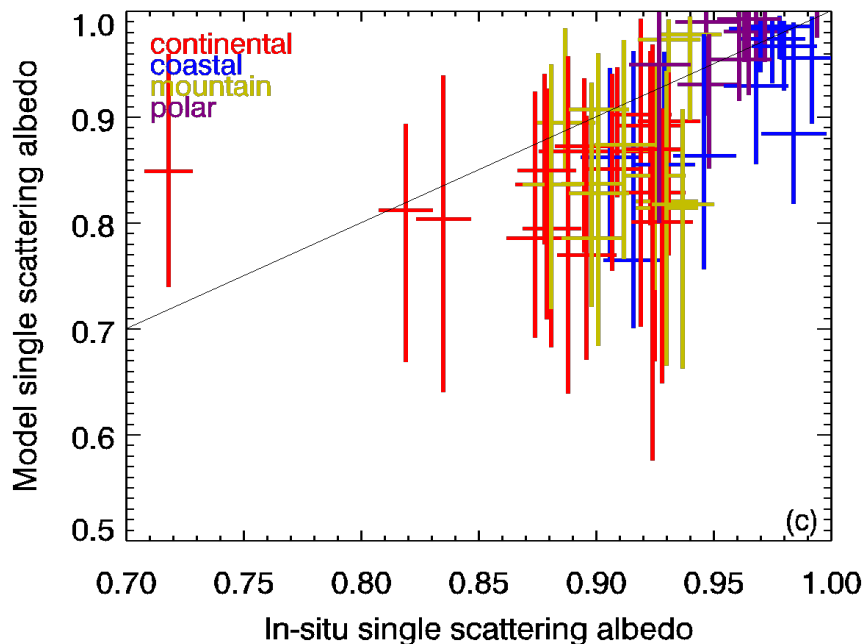


Figure 1. Comparison of observed and simulated aerosol SSA. Vertical bar shows range of model medians from 12 models, horizontal bar is measurement uncertainty. Bars cross at model and measurement median.