An intercomparison and evaluation of CCN and size distribution among AeroCom global aerosol models of a range of complexity.

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Most first generation aerosol schemes in climate models are single-moment mass-based schemes, with a prescribed size distribution used to provide cloud condensation nuclei (CCN) concentrations for aerosol indirect effects. Many climate models are now adding aerosol schemes which include aerosol microphysics to simulate size distribution and CCN explicitly, resolving new particle formation and growth via coagulation, condensation and cloud processing.A major activity in the current 2nd phase of AeroCom is the intercomparison of this new generation of global aerosol microphysics models and evaluation against a wide range of global datasets

The recent set of AEROCOM phase II experiments included specific "all-aerosol-tracer" diagnostics to allow the particle size distribution and CCN concentrations to be intercompared consistently across aerosol schemes of varying complexity (mass-based, two-moment-modal, two-moment-sectional).

In this presentation, we show results from an intercomparison of CCN and particle size distributions among the 12 global aerosol microphysics models who submitted the all-aerosol-tracer data. We derive multi-model mean for several key aerosol properties generating benchmark datasets that give the overall best estimate according to the processes included in the models. A measure of uncertainty is also generated based on the central diversity among the central two-thirds of the models.

We compare size-resolved aerosol concentrations from the multi-model mean against a wide range of benchmark global datasets in both marine and continental regions evaluating simulated size distribution, Aitken and accumulation mode size and number concentrations both at the surface and in the vertical profile. We also compare the multi-model mean against total particle concentrations from Global Atmospheric Watch sites and a compilation of CCN concentration measurements covering a wide range of environments.

We examine how well the multi-model mean compares to these benchmark observational datasets and isolate where the models are unable to explain what is observed within a measured of uncertainty represented by the central model diversity.