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AEROSOL DYNAMICS AND SHORTWAVE RADIATIVE FORCING IN A SUB-HEMISPHERIC MODEL BY THE METHOD OF MOMENTS

D. L. Wright, Jr., R. L. McGraw, C. M. Benkovitz, and S. E. Schwartz
Environmental Chemistry Division
Department of Applied Science
Brookhaven National Laboratory
Upton, NY 11973-5000

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Abstract

The dynamics of tropospheric sulfate and sea salt aerosols have been incorporated into a high-resolution Eulerian chemical transformation and transport model driven by observational meteorological data (Benkovitz et al., J. Geophys. Res., 99, 725, 1994) via the Quadrature Method of Moments (R. McGraw, Aerosol Sci. and Tech., 27, 255, 1997). Aerosol processes include emission of primary sulfate aerosol and precursor gases, nucleation of new sulfate aerosol, condensational growth, coagulation, dry deposition, wet removal, uptake and release of water with varying relative humidity, and the enhancement of aerosol growth within clouds. Evolution of each aerosol is modeled by tracking the first six moments of the number size distribution (R. McGraw, this meeting). Moment-based methods are computationally efficient and free of numerical diffusion. Optical properties such as the scattering coefficient and Angstrom exponent, and radiative properties such as the forcing can be accurately and efficiently computed from the lower order moments by a technique using multiple isomomental distributions. Examples will be presented of modeled geographical distribution and temporal evolution of quantities such as aerosol number, mass, effective radius, and optical properties suitable for comparison with in-situ and remote sensing data at specific times and locations.