Simulations of Aerosol Microphysics in the NASA GEOS-5 Model
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Aerosol-cloud-chemistry interactions have potentially large but uncertain impacts on Earth's climate. One path to addressing these uncertainties is to construct models that incorporate various components of the Earth system and to test these models against data. To that end, we have previously incorporated the Goddard Chemistry, Aerosol, Radiation, and Transport (GOCART) module online in the NASA Goddard Earth Observing System model (GEOS-5). GEOS-5 provides a platform for Earth system modeling, incorporating atmospheric and ocean general circulation models, a land surface model, a data assimilation system, and treatments of atmospheric chemistry and hydrologic cycle. Including GOCART online in this framework has provided a path for interactive aerosol-climate studies; however, GOCART only tracks the mass of aerosols as external mixtures and does not include the detailed treatments of aerosol size distribution and composition (internal mixtures) needed for aerosol-cloud-chemistry-climate studies. To address that need we have incorporated the Community Aerosol and Radiation Model for Atmospheres (CARMA) online in GEOS-5. CARMA is a sectional aerosol-cloud microphysical model, capable of treating both aerosol size and composition explicitly be resolving the aerosol distribution into a variable number of size and composition groupings. Here we present first simulations of dust, sea salt, and smoke aerosols in GEOS-5 as treated by CARMA. These simulations are compared to available aerosol satellite, ground, and aircraft data and as well compared to the simulated distributions in our current GOCART based system.