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REPRESENTING AEROSOL DYNAMICS AND PROPERTIES IN ATMOSPHERIC CHEMICAL TRANSPORT MODELS BY THE METHOD OF MOMENTS

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Abstract

Atmospheric aerosols scatter and absorb radiation affecting climate and visibility, nucleate cloud droplets contributing to composition of cloudwater and to acid deposition, and affect human health through inhalation. Important aerosol properties and processes depend on the size distribution. A given property can be evaluated as the integral of the appropriate kernel function over the size distribution. Explicit representation of the evolution of aerosol size distributions is virtually prohibitive in atmospheric chemical reaction and transport models because of the large numbers of variables which must be modeled, namely the number of particles within a given size range for a large number of size ranges. An alternative approach is to represent the aerosol dynamics by the low-order moments of the size distribution, which contain the key information about the aerosol. Moments evolve according to rate laws similar to those for chemical reactions, allowing moment evolution to be readily incorporated into chemical transport models. Here we present results obtained with moment methods and comparisons with conventional models. Typically a six-moment representation is accurate within a few percent.

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