Geophysical Research Abstracts, Vol. 8, 00511, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00511
© European Geosciences Union 2006

The Sensitivity Assessments of Aerosol Indirect Forcing Using the NASA Global Modeling Initiative

N. Meskhidze, A. Nenes

(1) Georgia Institute of Technology, Georgia, USA

Aerosol-cloud-radiation interaction (the aerosol "indirect effect") remains a major uncertainty in assessments of anthropogenic climate change. Incomplete characterization of chemical complexity and heterogeneity of the aerosols that act as CCN and the wide range of length scales involved in cloud droplet formation process are major limitations in current GCM indirect effect assessments. Because of its computational burden, treatments of aerosol-cloud interactions in GCMs mainly rely on parameterizations. In this work we present anthropogenic indirect forcing calculations obtained from NASA Global Modeling Initiative (GMI) three-dimensional (3-D) model. Simulations were repeated using a variety of aerosol-cloud parameterizations, ranging from empirical relationships between cloud droplet number concentration and total aerosol mass [Boucher and Lohmann, 1995], up to current state-of-the art physically-based aerosol activation parameterization [Nenes and Seinfeld, 2003; Fountoukis and Nenes, 2005]. We have also evaluated the forcing sensitivity to different updraft velocity formulations, meteorological fields and trace gas emission datasets. Our modeling results suggest that variation in meteorological fields may account for more then 30% uncertainty in global annually averaged indirect forcing calculations. Different cloud droplet activation parameterizations can lead to significant difference in spatial distribution pattern of aerosol indirect forcing and can contribute up to 20 % uncertainty in global estimates.

Boucher, O., and U. Lohmann (1995), The sulfate-CCN-cloud albedo effect—A sensitivity study with 2 general-circulation models, *Tellus, Ser. B*, 47, 281– 300.

Fountoukis, C., and A. Nenes (2005), Continued development of a cloud droplet formation parameterization for global climate models, *J. Geophys. Res.*, 110, D11212, doi:10.1029/2004JD005591.

Nenes, A., and J. H. Seinfeld (2003), Parameterization of cloud droplet formation in global climate models, *J. Geophys. Res*.,108, 4415, doi:10.1029/2002JD002911.