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Prediction of cloud drop number in a 3-D global aerosol microphysics model

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Quantification of the aerosol indirect effect in climate models has been limited in part by the relatively simplistic way in which aerosols have had to be simulated. Most GCMs have simulated the mass of various particle types and then used relationships between aerosol mass and droplet number or prescribed size distributions to quantify changes in droplet number.

Here, we show results from a global model of aerosol microphysics (Spracklen *et al*, 2004) that resolves the aerosol size distribution and includes all the microphysical processes of particle formation, growth, coagulation, cloud processing, etc that shape the distribution. We then use a physically based parameterisation (Nenes and Seinfeld, 2003) to calculate cloud droplet number based on the bin-resolved aerosol and an assumed updraught velocity field.

In this presentation we will: 1) show global maps of predicted cloud droplet number and examine how robust these predictions are in the context of the often large uncertainties in the driving aerosol microphysical processes, 2) Compare the microphysical calculation of global droplet number with an empirical parameterisation commonly used in GCM simulations and 3) Examine the response of cloud droplet number to anthropogenic sulfate loading.