**Interactive comment on** “Global indirect aerosol effects: a review” **by U. Lohmann and J. Feichter**

S. Ghan (Referee)

steve.ghan@pnl.gov

Received and published: 19 November 2004

This review of global aerosol indirect effects covers a lot of ground and hence could not go into the detail each aspect really deserves. Yet it provides an excellent synopsis of current understanding of global aerosol indirect effects. I particularly appreciate the effort to provide physical interpretations of the mechanisms involved with each aspect.

Although the review covers many aspects of indirect effects, there are a few that were not discussed and are worth some attention. 1. The dependence of indirect effects on the background aerosol concentration. 2. The competition between natural and anthropogenic aerosol as CCN: seasalt as an example (Ghan, S. J., G. Guzman, and H. Abdul-Razzak, 1998: Competition between sea-salt and sulfate particles as cloud condensation nuclei. J. Atmos. Sci., 55, 3340-3347; C. D. O'Dowd, J. A. Lowe, M. H.
Smith and A. D. Kaye, 1999: The relative importance of non-sea-salt sulphate and sea-salt aerosol to the marine cloud condensation nuclei population: An improved multi-component aerosol-cloud droplet parametrization. QJRMS, 125, p. 1295-314). 3. The importance of predicting aerosol number as well as mass in modal representations of the aerosol size distribution, so that processes that influence aerosol mass only do not affect aerosol number, and processes that influence aerosol number only do not affect aerosol mass for each mode. Ghan et al (2001) demonstrated the importance. 4. Feedbacks of clouds on aerosols. This can be the subject of another review article, but the Baker - Charlson bistability hypothesis (clean/precipitating vs dirty non-precipitating atmosphere) is worth mentioning. M. B. Baker and R. J. Charlson, 1990: Bistability of CCN concentrations and thermodynamics in the cloud-topped boundary layer. Nature, 345, 142-145.

Specific Comments
