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Atmospheric Chemistry and Physics Discussions

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

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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

Page 7567, lines 10-11. If direct effects are treated then the difference is equal to the direct effect(Ghan et al., 2001). Page 7583, lines 9-10. Replace “spectral” with “modal”, because the former is sometimes used in treatments with many rather than few size modes. Should also cite Easter, R. C., S. J. Ghan, Y. Zhang, R. D. Saylor, E. G. Chapman, N. S. Laulainen, H. Abdul-Razzak, L. R. Leung, X Bian and R. A. Zaveri, 2004: MIRAGE: Model description and evaluation of aerosols and trace gases, J. Geophys. Res., 109, doi: 10.1029/2004JD004571. Zhang, Y., R.C. Easter, S. J. Ghan, and H. Abdul-Razzak, 2002: Impact of aerosol size representation on modeling aerosol-cloud interactions, J. Geophys. Res., 107, 4558, 10.1029/2001JD001549. Page 7584, line 20. also cite Easter et al. 2004 Page 7584, line 25. cite Abdul-Razzak and Ghan (2000) instead of (2002) for modal. Page 7586, first paragraph. Some discussion of the limitations of bulk treatments and the potential of size-resolved microphysics is appropriate here.

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