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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric aerosols in the earth system: a review of interactions and feedbacks" *by* K. S. Carslaw et al.

Anonymous Referee #3

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This paper reviews the role of interactions and feedbacks associated with aerosols in the Earth system. It focuses on natural aerosols from terrestrial biogenic systems, marine aerosols, stratospheric and volcanic aerosols and on dust aerosols. These aerosols and its interactions are comprehensively and well characterized. Thus the manuscript is well suited for ACP.

The paper is not that reader friendly as all the figures are only quantitative and reveal no clear take-home messages. The paper thus reads more like a list of things we don't know yet about the effect of natural aerosols in the earth system. If that's the aim, then some aspects should be extended. One example is the nitrogen cycle as mentioned by referee 1. Another example is aerosol-cloud interactions and feedbacks. In fact, given the overall importance of clouds for aerosol processing, chemical reactions and

removal processes, very little attention is given to clouds. I thus recommend including more on the role of clouds before accepting the paper before publication. I provide some examples below.

Detailed comments:

p. 11088, line 22: Next to Haywood&Boucher, I suggest adding Lohmann and Feichter, ACP, 2005; Forster et al., IPCC, 2007; Denman et al., IPCC, 2007. I also suggest adding a sentence on possible aerosol effects on precipitation, see e.g. Levin&Cotton: "Aerosol Pollution Impact on Precipitation", Springer, 2009.

p. 11100, line 23: This local cloud radiative forcing should be put in a larger context. How does that compare to estimates of the direct forcing in e.g. IPCC?

Section 2.4.1: I suggest adding the Mercado et al., Nature, 2009 here.

Section 3.1.3.2: I am missing a discussion on d CCN/d cloud albedo, that in my view, belongs to the discussion of the CLAW hypothesis.

p. 11132, line 13: There are many references for dust aerosols acting as ice nuclei. I suggest adding e.g., DeMott et al., JGR, 2003; Phillips et al., JAS, 2008; Hoose et al., ERL, 2009.

p. 11132, line 14: Another reference for the relationship between dust and tropical cyclones would be Evan et al., GRL, 2006.

p. 11139, line 13: Here again I suggest putting the radiative forcing in context with the radiative forcing due to other aerosols.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 11087, 2009.