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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Climate response due to carbonaceous aerosols and aerosol-induced SST effects in NCAR community atmospheric model CAM3.5" *by* W.-C. Hsieh et al.

Anonymous Referee #1

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Review of "Climate response due to carbonaceous aerosols and aerosol-induced SST effects in NCAR community atmospheric model CAM3.5" by Hsieh et al.

General Comments

This paper investigates the climate response to carbonaceous aerosols using several different ocean boundary conditions. The major finding of the paper is that SST feedbacks are important. Overall, I think this paper is well-written, interesting and comprehensive. However, I feel as if the authors present too much information, which dilutes the truly interesting results. The paper is also hard to read, as the reader is bombarded with result after result, with minimal interpretation. For example, the paper discusses

clouds, precipitation, temperature, radiative fluxes, atmospheric circulation, SLP, vertical velocity, geopotential height, etc. A total of 15 figures are presented, some of which contain 9 panels (which are also too small to read, unless significantly magnified). Is this necessary?

My suggestion is to streamline the paper by focusing on the more important results. For example, one of the interesting aspects of this study is that 3x the default mass of carbonaceous aerosols are used. Yet, this is not mentioned in the abstract. Nor do the authors attempt to quantify the effects of amplified atmospheric heating/surface dimming. For example, one could overlay the zonal mean atmospheric absorption from the default carbonaceous aerosol mass in Fig. 2. This would allow the reader to clearly see the effects of your modification. Another interesting result that could be expanded upon is the finding that carbonaceous aerosols lead to a widening of the tropical belt. This is a new result, and supports the recent analysis by Allen et al. in Nature. Although this is quantified by looking at the MMC, it also appears to exist in the subtropical jet (Fig. 11). But this is not mentioned. Another interesting result is the opposite response between low and mid/high level clouds. Why is this? What does this imply for the semi-direct effect? See Koch et al., 2010 for an excellent review of the semi-direct effect (actually, this paper is briefly cited in the introduction). Another interesting result is the SST response. Fig. 3 shows a very interesting SST pattern.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7349, 2013.