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Interactive comment on “Modeled black carbon radiative forcing and atmospheric lifetime in AeroCom Phase II constrained by aircraft observations” by B. H. Samset et al.

Anonymous Referee #1

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This is an excellent paper that uses data from multiple aircraft measurement studies to investigate the variability of black carbon (BC) concentration as predicted by 13 global models as part of the AEREOCOM 2 exercise. The comparison shows clearly that the models substantially under-represent the BC burden at altitude and in remote regions. The study also shows that the models are much closer to the measurements close to source regions, at least for the region of Chinese outflow. The authors show that the models with rapid removal of BC compare most favourably with the measured data and when an analysis of the radiative forcing contribution from the model BC is performed, the models that best capture the BC mass show a substantially lower RF

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than in previous combined model studies that have informed the IPCC process. This work has a substantial impact on our understanding of BC and its effects and I strongly recommend publication.

The paper is clearly written and the results and methods are well laid out and described.

The following few points may be helpful. Page 20089 line 14: The models are comparing with data collected between 2008 and 2012, however the emissions used in the model are from a decade before (2000). Given that some regions used in the study are subject to rapidly changing emissions, what impact may this have on the results?

Page 20093 line 25 to page 20094 line 5: Whilst I agree with the points made, it is also worth pointing out that the A-FORCE measurements do not extend to the elevated altitudes measured in HIPPO and to a lesser extent in the other studies. It should be pointed out that there is a significant model to model variability at altitude in this and other regions but the measurement data is not available to confirm whether upper tropospheric BC values are similar in this region to the remote Pacific and continental north America.

Page 20099 lines 11-15: This statement is not true close to polluted regions and is contradicted later in the paragraph. I suggest rephrasing.

I am not sure how it can be improved, but figure 2 is very hard to read clearly and easily.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 20083, 2014.

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