

## ***Interactive comment on “Analysis of transpacific transport of black carbon during HIPPO-3: implications for black carbon aging” by Z. Shen et al.***

### **Anonymous Referee #4**

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The authors present an interesting investigation into how BC aerosols are transported over long distances in the GEOS-CHEM model, to end up in the region covered by the HIPPO-3 campaign. Further, they test the effects of reduced BC lifetime on the modeled BC vertical profiles, and compare to observations.

The manuscript is concise and well presented, and should proceed to publication in ACP. However I have a few requests for clarifications of the methods, as it is not at present obvious how, in particular, the idealized transport model used to study BC lifetime was employed.

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#### Major comments:

I find the idealized transport model presented in sec. 2.4, and used for analysis of the impact of different e-folding times in sec. 5.2, to be too briefly described. As I understand it, the authors have performed full CTM simulations with different e-folding times, and extract the transported BC volume into the relevant geographical region for each. Then, the idealized transport model is used to extract information on the prevalence of precipitation events that remove BC en-route. The authors conclude that there is a prevalence of precipitation events shortly after emission, and hence that ageing rates near source regions is crucial for correct modelling. To make this statement, I believe the authors first need to validate the output of the idealized model against existing weather data, e.g. the precipitation in the meteorological fields used to drive GEOS-CHEM. The model, they state, is equivalent to assuming that all BC is hydrophobic at emission time, and that all removal happens through precipitation. Can these assumptions be put in to the full GEOS-CHEM for a set of test runs as validation of the idealized model? Adding such documentation and tests, and an expansion on the presentation of the CTM runs done with altered e-folding time, would generally lift the discussion of a topic that is presently seeing a lot of interest.

Separately, I find the source attribution plots in Figures 3 and 4 very relevant for ongoing discussions on the climate impact of BC. I encourage the authors to perform similar studies for the full range of HIPPO results, if possible. (I do realize it's beyond the scope of the present paper, but perhaps as a follow-up.)

#### Minor comments:

P508,l25: I suggest adding the recent paper by Schwarz et al. 2013, GRL, to the list here, as it presents the data later used in the present paper.

P521,l27: “Our idealized BC transport model has satisfied fitting precision in both missions.” This statement needs to be better explained, and quantified.

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I also support the comments from the other reviewer regarding the need for a better description of biomass burning emissions used, and that showing the relevant regions and HIPPO flight tracks would improve the clarity of the manuscript.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 505, 2014.