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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range transport of black carbon to the Pacific Ocean and its dependence on aging timescale" *by* J. Zhang et al.

Anonymous Referee #3

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The study Zhang et al., "Long range transport of black carbon to the Pacific Ocean and its dependence on aging timescale", used a chemical transport model (MOZART-4) to test the sensitivity of BC simulations to prescribed aging timescales. The authors tagged the emission sources to study source-receptor relationships. They also used observations to calibrate the aging timescale parameters, and discussed the difference between the default and the improved model. Overall I find this study interesting and scientifically important. The manuscript is well-prepared that it is straightforward to follow and concise. Therefore, I recommend the paper to be published on ACP. I only have a few minor comments for the authors to consider if they think they can further improve the paper:

1. Page 16950, line 22: The citation Emmons et al., 2010 should be placed right af-

ter MOZART-4, instead of after NCAR. 2. Page 16950, line 24: Please provide the citation for MATCH. 3. Page 16951, line 13: This model is run at rather coarse resolution. I wonder if the conclusion will change with higher model resolution. It might be interesting to cite a few papers and a few sentences to acknowledge changing model resolutions might affect aerosol-cloud interactions, and change the sensitivity test of aging timescale here. 4. Page 16951, line 16: I am confused. Is MACCity emissions used for IPCC-AR5 simulations? What about the Lamarque et al. (2010) emissions? 5. Page 16957, line 2: I think it might read better if you move the discussion from line 8 (mixing in Asia and North America is quick) to line 2, following "(less than half a day)". 6. Regarding Figure 4, I notice that even with the improved model in many cases the model still under-estimate the BC concentration by an order of magnitude, but there is no discussion on this feature. Please elaborate. 7. Page 16959, line 12: Since the term "Pacific Ocean" has been used many times previously in the text, the acronym "PO" is out of place and not needed. 8. Page 16961, line 15: Perhaps replace "dT/dtau" with "S=dT/dtau", and discuss S later in this paragraph. 9. Page 16962, line 1: Please elaborate why the theoretical value of the slope is 0.8.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 16945, 2015.