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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Exploring the vertical profile of atmospheric organic aerosol: comparing 17 aircraft field campaigns with a global model" *by* C. L. Heald et al.

Anonymous Referee #2

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The paper provides clear motivation and good background information for compiling 17 datasets globally. However, in order to carry out the full objective, specifically, (from page 25374 line 25) "...to consistently investigate OA loading into a global model", the most up-to-date global model must be considered. If the paper does not consider the most recent developments in the GEOS-Chem Model, including Pye and Seinfeld 2010, then the study is incomplete. The main recommendation is to include the potential additional source of organic aerosol from semi volatile and intermediate volatility compounds, as discussed in Pye and Seinfeld 2010.

Additional Comments:

Comment 1: Page 25380 Line 28: 2 degrees by 2.5 degrees horizontal resolution seems too coarse to compare to aircraft data. Please discuss and justify. A recommendation is to run a nested simulation, for example North America at 0.5 degrees latitude by 0.667 degrees longitude, and compare this model result to all available campaign data from that domain to see the impact of higher model resolution.

Comment 2: Page 25383 line 2: Why is the median the "best" test of model performance? Explain more clearly why.

Comment 3: Page 25383 Line 21: "The ratio of POA to SOA in polluted regions for the model is larger than 1, which contrasts with ratios much smaller than 1 in observations in aged polluted air... This suggests that SOA in the polluted regions in the model may be underestimated" – Can this be due to POA being treated as non-volatile. It is recommended to run a case like Pye and Seinfeld 2010 to see the impact of SV-POA.

Comment 4: Page 25386 Line: 28: "note here that the observations have been averaged to the model spatial resolution". Please clarify exactly how averaging was carried out.

Comment 5: Please explain the vertical structure of the model better.

Comment 6: Page 25393 Line 9: Please clarify why 5% fragmentation was used.

References:

Pye, H. O. T. and Seinfeld, J. H.: A global perspective on aerosol from low-volatility organic compounds, Atmos. Chem. Phys., 10, 4377-4401, doi:10.5194/acp-10-4377-2010, 2010.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 25371, 2011.