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Interactive comment on "Aircraft Observations of Aerosol in the Manaus Urban Plume and Surrounding Tropical Forest during GoAmazon 2014/15" *by* John E. Shilling et al.

Anonymous Referee #1

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Referee comments on "Aircraft Observations of Aerosol in the Manaus Urban Plume and Surrounding Tropical Forest during GoAmazon 2014/15" by Shilling et al., 2018. MS No.: acp-2018-193.

The authors have done large number of research flights over the Amazon basin. The measurements are done with state-of-the-art instrumentation (HR-AMS, PTR-MS etc). However, currently the data analysis and representation is unfortunately lacking. The authors are giving a very narrow overview of the general situation and are focusing to only one flight in more detail. I believe this dataset is important and worth publishing but that first the data presentation needs to be significantly improved.

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Discussion paper

Major comments: 1) The title of article is very broad. I recommend clarifying the article title to be more inline with content. Also, check that the aim of this article (defined at the end of introduction) is inline with the title and results. 2) Improve the chapter 3.1, especially figure 2 and table 1. Clarify the figure 2 to be clear and easy to understand. Maybe remove unnecessary panels. Table 1: Please add general meteorological information (like conditions, T, RH, wind during flights), also probably would be more useful to show averages over the flight legs (1-5) or average values for different heights (500m, 1000m) separately, instead of whole flight average PM composition. Also, please include the PTR-MS results to this overview (fig2, table1). 3) Why unit mass data is used in fig 2? I strongly suggest replacing all the UMR data with HR data as authors have it and it is considered to be more accurate. Assumable all other data in figures and text is HR data? Also, PMF is assumable run on HR-data? I strongly suggest using only HR data as it is available and tools are developed for the data analysis. 4) Why PMF was run only to wet season data? Why not dry season? The authors speculate that during dry season biomass burning was a major source. PMF should certainly show this. PMF for dry season would give important information on differences in PM sources between seasons also. I recommend running PMF on data from both seasons. Improved chapter 3.1 and PMF run for both seasons would help to provide a better comparison between seasons. I recommend running PMF for both seasons to do proper source analysis. 5) The aim of flights was to study evolution of Manaus plume during aging. Is it not possible to find another flight for comparison for this "golden" one? It would be interesting to see if $\Delta org/\Delta CO$ would be as low and constant also in other flights. Also, would it be possible to identify any "golden" day from the dry season? The comparison in SOA aging between dry and wet season would be very interesting. Currently, as you show that the $\Delta org/\Delta CO$ is quite low and does not change, it is not sure if it was only one time occurrence or the normal situation. Also, please provide some statistics how often the manaus plume was observed during the flights for wet and dry season. 6) I assume that there are a large number of publications from this campaign already published. Please provide a short summary about those and how this differs from those

previously published. 7) Please check that all abbreviations (PTR-MS, HR-ToF-AMS, G-1 etc) are explained when first mentioned.

Detailed comments:

Page 1, Line 31. Please define "golden" Page 2, Line 24. Define Lagrangian Page 4, line 25. The aim of this study could be better defined. Especially the scientific aim. Page 5, line 15. Explain why 13 seconds time interval was chosen? AMS can be used with much better time resolution (Hz), especially when ptof is not used. Page 5, line 25. Define the software models used for the data analysis (igor version+ Squirrel and PIKA versions+ PMF software). Also, please add details about PMF analysis (number of factors tested, how nr of factors was decided, were factors constrained, ME2 etc.). The main parameters should be in the manuscript also, since not many people does not read the supplement. Page 5, line 25-26. Please explain why data was normalized to 23C and 1013hPA ? Page 5, line 28. Please provide the model and manufacturer for the PTR-MS and all other instruments. Page 6. Chapter 3.1. Please add a description of local conditions (temp, RH, wind etc) during the wet and dry periods. Also, provide info about the flight altitudes, times etc. It is hard to compare the results when it is not known if the difference is due to altitude or time of day or due to different source. Are the points in fig 2. top panel average values over the flights (including all altitudes?)? were all flights similar? Page 6, line 20-30/table 1. Are all these concentrations above the AMS detection limit? Especially the ammonium tends to have higher detection limits in aerosol mass spectrometers.. Page 7. Line 15-16. Is there any proof for this? High CO_2, CO, BC or levoglucosan values? Or tracers of levoglucosan (HR ions at m/z 63,70) at mass spectra? Page 8. The title of chapter 3.2 (Case Study, March 13, 2014 Flight) is not very descriptive. Consider changing it to something that describes content. Page 11. Line 30. How the age of plume was estimated to be 4-5 hours? Page 11. Please define "photochemical clock" Page 13. Chapter 3.3. I am confused. This is not based on the case study, but on all flights where manaus plume was observed? Page 13, row 11, 25. Please replace " SO_4 " to sulphate.

Figures

Fig 1. Are these T1-T3 ground stations used in this article? Fig 2. All the panels are showing same thing. Maybe consider how this figure could be condensed to a smaller figure? Also, the connecting lines between the average values are misleading. Maybe mark the median values with different colors. Also in top plot, some of the points (e.g. point between feb 27 and Mar 04) seems to maybe overlap? Fix these please. Fig 5. Legends from bottom panel are missing