Review of

Secondary organic aerosol formation from ambient air in an oxidation flow reactor in central Amazonia

By Palm et al.

General comments

Palm et al. investigated the formation of secondary organic aerosol (SOA) from ambient air at two sites downwind of Manaus, Brazil. The experiments were conducted using Potential Aerosol Mass (PAM) oxidation flow reactor (OFR) and were observed by an array of particle and gas measurements. In addition, the study compared the SOA formed in the PAM reactor with predicted SOA from the measured ambient SOA precursors and their yields. The study found that the SOA enhancement could come from unmeasured semi-volatile and intermediate volatility gases. The sources of unmeasured SOA precursors were suggested to be biogenic, urban, and biomass burning emissions. I think the study contributed in exploring PAM OFR capacity to study atmospheric oxidation process in a field campaign. There are some parts that need clarifications and few typing errors. However, the manuscript overall reads well. I recommend accepting the manuscript for publication in the Atmospheric Chemistry and Physics journal after revisions.

Specific comments

1. Pg. 6 Ln. 11: It is suggested that variation of the estimated $OH_{exposure}$ could not be different more than a factor of 2 if the true OH reactivity (OHR) at T3 site was different from values at T0a site used as an assumption. Where is this factor of 2 coming from? Has sensitivity test been done? Please provide some information.
2. Pg. 7 Ln. 9: The reagent ion for PTR-TOF-MS was changed between IOP1 and IOP2 measurement periods. Were there specific reason(s) for changing the reagent ion? Also, would the measurement results be comparable between the two periods?
3. Pg. 15 Ln. 1: How was the wind direction between T2 site and Manaus? If the wind was not blowing to T2 from Manaus, the closer proximity of the site would not lead to increase in the urban emissions at T2. It may be good to add information of wind direction/trajectory in Section 2.1 (see technical comment #2).
4. Pg. 18 Lns. 12-14, Figure 8: The R^2 of measured vs. predicted SOA formation are low for all cases except the OH-OFR wet season. I am not convinced with the prediction approach. The typical chamber yield seems that it is not able to entirely capture SOA formation in the ambient of this study. This could be due to a more complex mixture of S/IVOCs in the atmosphere compared to in the chamber experiments. Thus, I would be more careful in interpreting the linear regressions results (i.e., slope), as the datasets (measured and predicted) do not show associations.
5. Pg. 20 Lns. 20-23: I think it is necessary to provide more information regarding PMF analysis using ME-2 algorithm (SoFi). In the earlier paragraphs (Pg. 20 Lns. 7-8), it is said that interpretation of factors from ambient OA is provided elsewhere. Hence, the details and

interpretation of factors from OFR OA should be provided here. The additional information such as:

   a. How the constrain was applied into the analysis (e.g., a-value or anchor) and how the solution was selected.
   b. Evaluation the unconstrained factors solution before constraining the factors solution. Previous studies recommended examining the unconstrained factors to determine constraint(s) required for improving the factors solution (Crippa et al., 2014; Fröhlich et al., 2015).

6. Pg. 21 Lns. 7-9, Figure 10: The plateau of LO-OOA looks more of a slight increase because it was followed by a significant decrease. The LO-OOA was gradually increasing from around 0.5 eq. day, reaching a peak at around 2 eq. day, and then continuously decreasing.
7. Pg. 21 Lns. 16-17: It is unclear what the SOA from PMF analysis results is. It is because PMF analysis yielded LO-OOA and MO-OOA which can be referred as the SOA factor. In case of the dry season, IEPOX-SOA is also an SOA factor.
8. Pg. 23 Ln. 3: The authors refer to Thalman et al. (2017) for details analysis of ambient OA hygroscopicity (K_{org}). Thalman et al. (2017) reported K_{org} for particles with diameter range between ~90 to ~180 nm and showed that K_{org} was independent of particle size. Is there any reason for selecting K_{org} of 160 nm mobility diameter particles?
9. Pg. 26 Lns. 11-14 and Pg. 27 Lns. 3-4: Here, the authors mention about multivariate relationship or multilinear regression (MLR). I think it would be good to provide the MLR model and coefficient values. Hence, it is clear how the SOA formation was predicted (Figure 12).

Technical comments

1. Pg. 4 Ln. 24: What does GoAmazon2014/15 stand for? Have the description of field campaign here rather than on Pg. 5 Ln. 5.
2. Pg. 5 Ln. 12: Add information that T2 site is downwind of Manaus. It is unclear here whether it is downwind or upwind.
3. Pg. 6 Ln. 24: What is reference(s) for the typical 24 average ambient O3 concentration? Or is it from measurement at the site? Please clarify.
4. Pg. 7 Ln. 12: What does SQT stand for?
5. Pg. 8 Ln. 12: Does it mean the ambient OA concentration is an average of measurements before and after OFR sampling? Please clarify.
6. Pg. 10 Ln. 10: What does MT stand for?
7. Pg. 10 Ln. 17: The compounds and their acronyms should be provided earlier in the text. See technical comments #4 and 6.
8. Pg. 14 Ln. 7: What does LT mean?
9. Pg. 17 Lns. 19-22: Which large chamber studies that OA mass concentrations are a factor of 2 comparable with the present study? Please add references. It may also be good to add the OA mass from previous chamber studies in Table S1 for comparison.
10. Pg. 18 Ln. 11: Remove double from C=C bonds.
11. Pg. 20 Lns. 9-13:

Add reference for IEPOX-SOA: Budisulistiorini et al. (2013)

Add reference for Fac91: Robinson et al. (2011), Budisulistiorini et al. (2015)

12. Pg. 22 Lns. 21-25: Add reference(s) for observation of SOA-forming gases at the site (or nearby locations) during daytime and nighttime.
13. Figures 3 and 4: The unit of x axis (time) is better in Local Time (LT) because in the text you use LT.
14. Figure 13: Are the labels (a) and (b) on figure caption switched? Please check.

References

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