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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aircraft-based observations of isoprene epoxydiol-derived secondary organic aerosol (IEPOX-SOA) in the tropical upper troposphere over the Amazon region" *by* Christiane Schulz et al.

Anonymous Referee #1

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This manuscript presents field results from airborne measurements made over the Amazon in 2014 as part of the ACRIDICON-CHUVA project. It illustrates the potential of using aerosol mass spectrometry instruments to identify ambient SOA formed from IEPOX. Airborne in-situ measurements of aerosol composition and physical properties were used to illustrate the presence of IEPOX-SOA at altitudes > 5 km. Several different approaches are used to quantify the presence of this IEPOX-SOA and subsequently for organic nitrate providing a robust analysis.These observations are original, showing the relationship between organic nitrates and IEPOX-SOA. This manuscript is very well

written, all figures and tables are clear and easily interpreted. This paper is of interest to the ACP audience and is suitable for publication. I have a small number of comments below that can be considered or discussed prior to publication.

Although details of the different flights are provided in other papers (Andreae et al.,) some flight details would be appreciated in the supplementary of this manuscript. This study includes measurements from 13 different flights, how did the meteorological conditions change during each of these flights. According to the overview paper by Andreae et al., 2018, there is some variability linked to air mass source and wind conditions. Can the vertical profiles be classified into different groups depending on meteorological sources?

In section 4.3, the authors state that the sources of the organic aerosol in the LT and the UT are not the same, providing air mass trajectories along the flight track would help support these conclusions.

The authors mention that there are 4 CPC instruments operating during these flights, with cut of diameters of 4 and 10 nm. Were two of the CPCs at 4nm and the other two at 10 nm. In the manuscript Andreae et al.,(2018) it was mentioned that the second set of CPC instruments were coupled with a DMA set up for particle size distribution measurements. Is this also the case for these flights. According to the accompanying papers, other aerosol physical parameters should be available from the UHSAS for larger diameters. These size distribution measurements may help to support the conclusions on the SOA particle growth (Page 15, Line 13).

Page 14, Line 6: It should be mentioned here that there is significant variability of the m/z 44 (or f44) among different AMS instruments and care should be taken when comparing results from different instruments (Frohlich et al., 2015, Pieber et al., 2016, Crenn et al., 2016).

The authors detail several different methods to provide a robust characterization of the presence of organic nitrate and IEPOX SOA during these flights. It could be stated why

PMF analysis was not used to try identify the presence of these aerosols. If IEPOX-SOA is contributing up to 40% of the organic mass, they should be easily extracted by a PMF analysis.

In addition, would adding inorganic ions (SO4 and NO3) into the PMF matrix help in extracting a organic nitrate factor that could then be compared with the other methods used to identify these species?

For the calculation of the organic nitrate concentrations. It is not clear the difference the first estimation and the third estimation. These both methods are based on the ratio of the NO+/NO2+ ions in the instrument and how it varies from calibration values. However, using the method outlined in Kiendler-Scharr et al., is a more robust and tested method than just using the ratios alone. Can the authors comment on the added values of the first estimation compared to the third?

Clarification on the contents of Figures:

Figure 2: presents data from all flgihts during the ACRIDICON-CHUVA campaign.

Figure 3: presents data from 13 flights of the ACRIDICON-CHUVA campaign.

Figure 4 to Figure 10: It is not stated which flights these measurements correspond.

Can the authors provide more information on which flights were represented in figures 3 to 10 and why they were chosen over all 20 flights?.

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