

Cover letter for ACP manuscript acp-2014-146, revised version of 16 July 2014

Dear Prof. Maria Cristina Facchini:

Please find attached our revised manuscript and our response to the referee 1.

We have answered all three of referee comments and implemented all suggestions for improvement. All changes are marked by red letters.

We are confident that the revised manuscript meets the quality standards of ACP, and we are looking forward to your response.

Many thanks and best regards,

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Response to the comments of Anonymous Referee #1

In the revised manuscript, the authors made important improvements. In the revision, the authors clarified a number of concerns that both reviewers have raised. The chemical understanding of the proposed molecular corridors was especially improved. However, there are still several issues that they need to address before publication in ACP.

1. In the Introduction section, the authors mentioned that only 10-30% of SOA have been identified using common techniques. The reference is from ambient studies. How about the general mass closure for the lab studies used in this paper? If the identified percentage is low, the authors need to clarify that the data points used here are sufficient to represent the entire SOA behavior.

Response:

By the combination of two mass spectrometry an Aerosol Mass Spectrometer (AMS) and DART-MS, close to 100% identification and quantification of the particle phase for each of the three alkane systems was achieved (Schilling-Fahnestock et al., 2014). We will clarify this point in the revised manuscript.

2. In the revised manuscript, the authors indicate that the recent advent of soft ionization methods that facilitate the identification of the dominant fraction of the compounds constituting SOA opens up a window onto the pathways of SOA formation and aging that was heretofore unavailable. This is not entirely consistent with the results. In the molecular corridors shown in Figure 1, the biogenic plots are from traditional analytical methods. The alkane-derived SOA constituents obtained from soft ionization methods provide a larger number of data points and better credibility. But it doesn't necessarily make a huge difference if only using data from traditional methods. In another word, this study could still be performed with only the traditional analytical methods; new techniques do not "open up a window" in terms of the content of this study, just providing more data points. Some of the sentences need to be rewritten.

Response:

Based on your comment, we will delete the sentence of "...opens up a window...".

3. In the revised manuscript, the authors explained why the biogenic SOA data from different NO conditions are shown in one plot (fewer data points and relatively tight molecular corridors). The authors also mentioned, "the molecular corridors of alkane SOA formed under low and high NO conditions are also quite similar". So the alkane SOA data under different NO conditions were shown separately only because too many products were observed under each condition? If so, need to clarify.

Response:

Alkane SOA was plotted in a separate panel for different NO conditions due to high number of data points and biogenic SOA was combined due to small number of data points. We will add the following sentence in the revised manuscript.

“By the combination of an Aerosol Mass Spectrometer (AMS) and DART-MS, close to 100% identification and quantification of the particle phase for each of the three alkane systems was achieved (Schilling-Fahnestock et al., 2014). Thus, alkane SOA are plotted for low and high NO conditions in separate panels due to large number of identified products, whereas biogenic SOA data are shown in one panel due to the relatively small number of data points.”

Reference:

Schilling-Fahnestock, K. A., Yee, L. D., Loza, C. L., Coggon, M. M., Schwantes, R., Zhang, X., Dalleska, N. F., and Seinfeld, J. H.: Secondary Organic Aerosol Composition from C12 Alkanes, *J. Phys. Chem. A*, doi: 10.1021/jp501779w, 2014.