

Interactive comment on “Molecular composition of biogenic secondary organic aerosols using ultrahigh resolution mass spectrometry: comparing laboratory and field studies” by I. Kourtchev et al.

I. Kourtchev et al.

ink22@cam.ac.uk

Received and published: 17 January 2014

We would like to thank Referee #3 for very helpful comments and suggestions. All of the comments and suggestions have been considered. Point by point responses to these comments are listed below.

Referee #3 comment: In this paper, the authors present a comparison of the molecular composition identified in laboratory SOA samples and ambient samples using high resolution mass spectrometry. The presented results from two different laboratory gen-

C11185

erated SOA experiments and two different ambient samples are very interesting. First of all, the SOA from the BVOC mixture containing α -pinene, β -pinene, d3-carene and isoprene is not remarkably different than the SOA from individual α -pinene. Thus, the two laboratory generated SOA samples were both very similar to the ambient OA collected in an SOA influenced region, but dissimilar to the urban sample. This may be expected, however some of the markers of monoterpene SOA may exist in the ambient urban sample since SOA is a large source of ambient OA. Interestingly, the authors did not observe ambient SOA dimers in this work. The authors ruled out the possibility for analytical artifacts, but did not discuss ambient OA processes/implications related to this. Overall, this is a very good paper with a careful analytical approach that addresses a topic of substantial interest to the community.

1. Authors may be interested in reviewing the findings of Muller et al., *Rapid Communications in Mass Spectrometry*, 2009; Kristensen et al., *Atmospheric Chemistry and Physics*, 2013; and Zhao et al., *Atmospheric Chemistry and Physics*, 2013 for observations of monoterpene SOA “dimers”. Perhaps the lack of observation is significant with respect to condensed phase OA processes or aerosol aging.

Authors Response: As we stated in the text (p. 29613, line 15) the observation of dimers exclusively in the chamber experiments requires further investigations. We believe at this stage any discussion of this discrepancy would be highly speculative.

The suggested references (Müller et al., 2009 and Kristensen et al., 2013) and the following statement have been added to the manuscript (p. 29608, line 7): ‘It is worth mentioning that the HMW compound at m/z 357 has been previously identified in SOA produced from the ozonolysis of α -pinene and attributed to a hydroxyperoxyhemiacetal (Müller et al., 2009) and pinyldiaterpenylic ester (Kristensen et al., 2013).

The work by Zhao et al. (2013) is focused on the composition of cloud water and is not deemed to be especially pertinent to the discussion of the current work; this reference is therefore not cited in the revised manuscript.

C11186

2. Authors interchange the terms BVOC mixture and VOC mixture, which I believe refer to the same experiment. For clarification, one consistent term is preferred.

Authors Response: The term VOC has been changed to BVOC throughout the text.

3. Please add a legend to figures 3 and 4.

Authors Response: Figure legends are described in the figure captions.

4. Despite the significant similarity between the α -pinene ozonolysis SOA and the BVOC mixture ozonolysis SOA, the mass spectra in figure 1 appear to be different. Could the comparison of the compositions be made clearer in the discussion? This might provide hints regarding the significance of the lack of observation of the ambient SOA dimers in this work.

Authors Response: The mass spectra of laboratory generated samples from the BVOC mixture, a single precursor system and ambient aerosol were mainly shown to demonstrate the mass spectral differences in the dimeric region. This was explained in the text (p. 29606, lines 1-7). As suggested by the reviewer we clarified the differences in the monomer regions of the mass spectra by adding the following statement (p. 29607, line 8): 'The mass spectral differences observed in the monomeric region of the SOA from the single precursor and BVOC mixture were mainly associated with variation of the ion intensities caused by the differences in the number of products with the same mass in the single component and BVOC mixture experiments as described above'.

5. In the abstract, do you refer to 70% of the laboratory generated SOA compounds or the ambient compounds?

Authors Response: The statement in the abstract has been clarified (p. 29595, line 16.): 'The molecular composition of SOA from both the BVOC mixture and α -pinene represented the overall composition of the ambient sample from the boreal forest site reasonably well, with $72.3 \pm 2.5\%$ (n=3) and $69.1 \pm 3.0\%$ (n=3) common ions, respectively'.

C11187

6. Please correct the reference, Hatfield and Hartz, 2011. I believe the last name is Huff Hartz. Also note, the name is misspelled on page 29597

Authors Response: The reference has been corrected.

The authors place a strong emphasis on this work being the first time SOA from BVOC mixtures is compared to the ambient OA, but didn't emphasize the differences in the composition between the SOA from the mixture and the individual α -pinene. As stated above, the differences in the composition from HRMS do not appear to be significant.

Authors Response: We believe we addressed this remark above in the point 4.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 29593, 2013.

C11188