Atmos. Chem. Phys. Discuss., 15, C10726–C10728, 2015
www.atmos-chem-phys-discuss.net/15/C10726/2015/

Atmospheric Chemistry and Physics
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Discussions

Interactive comment on "Substantial secondary organic aerosol formation in a coniferous forest: observations of both day and night time chemistry" *by* A. K. Y. Lee et al.

Anonymous Referee #1

Received and published: 21 December 2015

This manuscript reports the results from a field study conducted in a forested mountain region at Whistler, BC, in summer 2010. A main focus of this study was to investigate biogenic SOA formation in a coniferous forest and the discussions are primarily based on the measurement data acquired with an HR-ToF-AMS and a PTR-ToF-MS. The manuscript provides new information on SOA formation pathways in biogenic emissions and the discussions are thoughtful. Overall, this work fits well within the scope of ACP and I recommend it to be accepted for publication after the authors address the following comments.

PTR-ToF-MS can measure a large number of VOC species but only 8 are reported in

Table S1. It would be useful to provide information about additional VOC species, e.g., BTEX for anthropogenic emissions and acetonitrile for biomass burning emissions. For example, showing the time series of BTEX in Fig. 1 could provide additional support for the classification of periods into anthropogenic, biogenic, or mixed.

Given that most HR-ToF-AMS studies so far reported O/C and H/C values using the Aiken's method, in order to understand how the values reported here compare to those from other locations, it would be useful that the authors provide some information about how the elemental ratios of OA determined from the Aiken and the Canagaratna methods compare for this study. Maybe providing in the supplemental material scatter plots of the O/C and H/C values from the two methods.

There was very little information on how PMF was performed and how the solution was selected and validated. Given that this study relies heavily on the mass spectra and the time trends of the PMF OA factors to infer BSOA properties and formation pathways, it is necessary that more technical details are provided about the PMF work in this study.

Line 8, page 28012, the chemical formula for hexafluoropropene is wrong

Line 1, page 28014, methanol has both primary and secondary sources. What is the relative importance of the two sources for methanol during this study?

Line 28 2013, Fig. 4 shows the correlations of OA with methanol, acetone, and acetic acid. However, the term "SOA" is used at here. I think it is necessary that the authors justify first the assumption that all OA mass was secondary in this study.

Line 24, 28014, change "values" to "value".

Same page, the volatility of an OA does not necessarily correlate with its O/C. Unless volatility measurements (e.g., using a thermodenuder) were available during this study, it is not appropriate to claim the volatility order for the 3 OA factors.

Line 6, page 28017, define LT and its relationship to UTC.

Line 15, page 28017, what are the f82 values in different OA factors? Give the ion formula at m/z 82 for isoprene SOA.

Section 3.5, I would like to ask the authors to elaborate a bit more on f91 and its utility as an indicator of BSOA. It could be useful to show f91 values in the mass spectra of the other OA types, such as urban/anthropogenic SOA, BBOA, HOA, and COA. What compound(s) or classes of compounds in BSOA that could produce $C_7H_7^+$ in the AMS?

Showing the ion-speciated mass spectra of different OA factors in Fig. 3 is more informative. For example, it is interesting that the mass spectra of BSOA-1 and BSOA-2 look quite different but their O/C ratios are very similar. Do the m/z 43 peaks in the three factors have the same composition or do they have different ratios of $C_3H_7^+$ to $C_2H_3O^+$? I would like to see the relative contributions of C_xH_y ions and oxygen-containing ions at each m/z.

It may be helpful to scale the y axis of Fig. 3d to allow the H/C differences among data points more clearly seen.

Fig. S5 was not discussed. It was only mentioned in the figure caption of Fig. 3 and the purpose of showing it is not clear. In fact, how were the “biogenic” data points selected?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 28005, 2015.