Atmos. Chem. Phys. Discuss., 9, C11808–C11811, 2010
www.atmos-chem-phys-discuss.net/9/C11808/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Elemental analysis of chamber organic aerosol using an aerodyne high-resolution aerosol mass spectrometer" *by* P. S. Chhabra et al.

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Received and published: 30 March 2010

Response to Referee 4:

The authors appreciate the helpful comments and suggestions provided by the reviewer. The referee's comments are in italics, followed by the authors' responses.

Why was V-Mode data not analyzed as well for the O/C and H/C ratios? In other studies V-Mode only data is often used for chemical characterization of OA at low concentrations, and a comparison of the two different modes of the HR-ToF-AMS would be beneficial for at least some of the cases presented in this manuscript.

A paragraph discussing the differences between the measured elemental ratios in V and W-mode has been added to Section 4.3.

The authors have chosen to use the f44 ratio determined from V-mode to compare the O/C ratio determined from W-mode of the HR-ToF-AMS. It would make more sense to compare the f44 from W-mode with the O/C ratio from W-mode, and similarly with Vmode f44 to O/C from V-mode. As suggested in the previous comment, an analysis of V-mode elemental ratios is very important to present in addition to the W-mode values, at the very least for a few cases to demonstrate the reproducibility of the analysis among the different operation modes.

We decided to use V-mode data to estimate O/C ratios so as to maximize the signal to noise in the calculation. The reviewer is correct in stating that W-mode data could have been used for the O/C estimation for experiments that were not signal limited. We compared f_{44} between both modes of operation and found little difference across all systems that were studied. This discussion has been included in the paper.

For high-NOx chamber experiments the authors have included NO+ and NO2+ as ions in the calculation of the elemental ratios. As noted by the authors in ambient datasets these ions are excluded from this analysis as they are typically attributed to inorganic nitrate. It would be of interest to compare the O/C ratios determined in these experiments when NO+/NO2+ are excluded from the EA calculation to the O/C ratio when they are included. The impact on the O/C ratio from the inclusion of these ions for organic nitrate species is extremely useful information for interpreting field data where organic nitrate species may make up a fraction of the organic aerosol.

The reviewer makes an excellent comment. In the systems considered here, the effect of the inclusion of NOx family ions to the O/C measurement varies across VOC type. Inclusion of these ions increases the measured O/C of m-xylene SOA formed under high-NOx conditions by approximately 20%, the largest contribution for all systems investigated. This has been added to the manuscript in Section 4.3.

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Interactive Discussion

Discussion Paper

As noted by several other reviewers, a more complete discussion and presentation of errors is warranted in this paper before publication in ACP. A comparison of the V-mode derived O/C ratios with the W-mode O/C ratios may also shed some light on this topic in terms of the repeatability of the ratios for the two operating modes of the instrument.

Section 4.3 has been expanded by about two pages and completely rewritten to give a comprehensive discussion of possible sources of error.

P27486/L6: Change "glyoxal" to "glyoxal uptake experiments" so that the reader does not get the impression that this is the O/C ratio of glyoxal itself.

Fixed.

P27489/L6: O/C ratios for LV-OOA from Aiken et al. 2008 show a range from 0.8 to 1 for the O/C ratio. Please correct text.

The O/C ratios of PMF components for different ambient data sets can vary. While Aiken et al. (2008) reported an O/C ratio of 0.8-1 for OOA-1 (LV-OOA), Jimenez et al. (2009) reports O/C ratios of at least 0.6 for LV-OOA across North American ambient datasets.

P27490/L7: units incorrect. should be micrometer3 centimeter-3

Fixed.

P27492/L3-4: m_i *is the mass of the ion fragment assuming that the ion is singly charged. Suggest rewording this line to reflect that.*

Fixed.

P27497/L1: This line reads as though the ammonium reactions are responsible for the decrease in the O/C ratio. Are the authors implying that the decrease in the O/C ratio is due only to this? Perhaps the authors could estimate the decrease in the O/C ratio due to this based on the increase in the N/C ratio.

As was seen in Galloway et al. (2009), the contribution of glyoxal marker ions to the total AMS signal decreased once the chambers were diluted with clean air. This decrease (corrected for wall losses by dividing out the sulfate concentration) coincided with an increase in imidazole marker ions (fragments with nitrogen). We believe the decrease in O/C is primarily due to the volatilization of glyoxal. We have removed the last part of this line.

P27503/L1: sentence incomplete.

Fixed.

Section 4.3: This section reads as part of the methods, it is recommended that the authors move this section there.

Since Section 4.3 has been expanded considerably, we have decided to leave it in its current position.

P27513/L11: suggest adding: "to a significant extent" to the discussion of glyoxal uptake in the ambient atmosphere.

Fixed.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27485, 2009.