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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of aging on organic aerosol from open biomass burning smoke in aircraft and lab studies" *by* M. J. Cubison et al.

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SC.1) "The authors present a targeted look at chemical aging in biomass burning aerosol using AMS mass fragments as tracers, which provide a valuable tool for future comparisons with AMS measurements. In distinguishing between less and more aged biomass burning OM, the authors rely heavily on m/z 60 and m/z 44. While these fragments have generally shown predictable relationships to other markers of biomass burning (CO, acetonitrile) and photochemical oxidation, the authors could strengthen their arguments by including some of the findings regarding chemical aging of smoke from Hawkins and Russell, 2010 in their introduction and analysis."

The authors wish to thank Dr. Hawkins for bringing to our attention her interesting study on organic matter (OM) samples influenced by the 2008 California wildfires using Fourier Transform Infrared Spectroscopy (FTIR) and AMS. Their observation that up to three-quarters of OM was of BB-origin during fire periods, and significantly, the correlation of their results with data from a co-located AMS, does indeed support the arguments presented in the introduction to this study.

SC.2) "To support that AMS spectra can be used to accurately identify and quantify BBOM, the authors could refer to Fig. 2, which shows a strong correlation between PMF-derived BBOM from AMS and FTIR measurements in an aged biomass burning plume. It is worth noting that no correction factor was applied to the AMS OM and that the correlation between BBOM from these two methods is stronger than any previously published OM comparison using the same two methods. This indicates that they are indeed quantifying the same fraction of organic mass and makes any chemical comparisons quite meaningful."

We have added the following text to the introduction of our paper to note this point:

“BBOA identified with the AMS was also recently shown to be strongly correlated (R=0.89) with BBOA extracted from factor analysis of Fourier Transform Infrared Spectroscopy (FTIR) data (Hawkins and Russell, 2010, their Fig. 2).”

SC.3) "In addition, the authors could support their conclusion that aging biomass burning plumes have unique organic signatures detectable by AMS (and other methods)by showing how well AMS signatures and organic functional group signatures complement one another. Increased carboxylic acid groups were found in the more aged smoke, consistent with higher fractions of a more oxygenated BBOM factor from AMS measurements. This factor, unsurprisingly, had a much higher f44."

We have added the following text to the introduction of our paper to note this point:

[Higher f44 is also associated] “with increasing carboxylic acid content (Takegawa et

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al., 2007; Duplissy et al., 2010; Hawkins and Russell, 2010). . .”

See also the response to comment R2.2.

SC.4) "These changes would help broaden the AMS-based conclusions about specific fragment contributions to OM toward a better understanding of the actual chemical changes taking place in aging smoke plumes. They would also make the results presented here more accessible to the non-AMS community."

We agree and we thank Dr. Hawkins again for bringing this paper to our attention.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 12103, 2011.