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Interactive comment on “In-situ submicron organic aerosol characterization at a boreal forest research station during HUMPPA-COPEC 2010 using soft and hard ionization mass spectrometry” by A. L. Vogel et al.

Anonymous Referee #2

Received and published: 2 September 2013

General Comments:

The authors present results of a field study conducted in a forested area in Finland in which they investigated the chemical composition of organic gas and aerosol compounds using mass spectrometry and FTIR. The mass spectrometric methods included chemical ionization with MS/MS analysis, which provided detailed information on the identity of single compounds, as well as AMS analysis, which provided information on the oxidation state and amounts of a few fractions of the organic aerosol that can be ex-

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tracted from the data using positive matrix factorization. FTIR analysis of filter samples provided information on the composition of functional groups. The manuscript focuses on organic acids, a major component of secondary organic aerosol for which standard mass spectra are available for a number of compounds formed from the atmospheric oxidation reactions of monoterpenes. The manuscript presents a self-consistent interpretation of the results obtained with each instrument in terms of expected reaction products, atmospheric oxidative aging, and the history of air masses which I think represents a significant improvement over many previous field measurements because of the level of molecular detail obtained through time resolved MS/MS analysis. The ability to measure the composition of both gases and particles is also valuable because it allowed for an interesting investigation of gas-particle partitioning of reaction products. The technical quality of the study is very high and the interpretation of the data is appropriate and honest, in that no attempt is made to over-interpret or make claims beyond what is justified from the measurements. I think this is a very well done study and well-written manuscript, and hope that it inspires others to pursue similar kinds of molecular-level detail in field studies. I think the manuscript is suitable for publication in ACP, but think the authors should first address a few minor comments.

Specific Comments:

Page 17915, lines 15-25: What about aging due to gas-phase organic oxidation reactions?

Page 17916: The ambient measurements are compared only with products formed from reactions of monoterpenes with O₃, but for typical remote air conditions monoterpenes react nearly as fast or faster with OH radicals. Although very limited laboratory studies indicate that there are some similarities in the reaction products for these two oxidants, on the basis of the reaction mechanisms it is to be expected that there will be many different products. It is worth mentioning this and considering how it might affect the data interpretation.

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Page 17917: It would be worth comparing measured gas phase product concentrations to the saturation concentrations calculated solely from the vapor pressures of the pure compounds in the absence of OA. These saturation concentrations should provide an estimate of the upper limit on gas phase concentrations since if these values are exceeded the compounds should condense regardless of the nature of the organic particle phase.

Technical Comments:

Page 17916, line 9: It sounds from the wording of this sentence that the most abundant biogenic compounds had concentrations from a few pptv to over a ppbv, and thus the concentrations of all other biogenics must be less than a few pptv. I don't think this is what is meant, so I suggest rewording the sentence to convey the correct meaning.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 17901, 2013.

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