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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biogenic oxidized organic functional groups in aerosol particles from a mountain forest site and their similarities to laboratory chamber products" *by* R. E. Schwartz et al.

Anonymous Referee #1

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The paper investigates the organic and elemental components of submicron aerosol particles collected in a boreal forest site in Canada. The work focuses on secondary organic aerosol, and for the first time gives a complete description of ambient biogenic SOA mass by means of its organic functional group composition. A wide suite of measurement techniques support the results, including elemental analysis of aerosol particles and gas phase biogenic volatile organic species. The paper contributes substantially to the understanding of ambient SOA chemical properties in boreal forested areas and in regions affected by biogenic emissions. The scientific approach was

already applied with success in the investigation of other aerosol types, as adequately cited. Measurements are analyzed by statistical multivariate techniques (analysis of correlation and positive matrix factorization PMF). The correlation analysis reports the parameter “r” instead of “r2”, making the correlation significance occasionally difficult to interpret. “Results” and “Conclusions” sections are clear and well-structured; the number of figures and tables is appropriate.

Specific comments

The correlation between FTIR and AMS is reported in Figure 1. The higher FTIR OM concentration relative to AMS is explained by the presence of OM that is not detected by AMS and associated with dust particles. It would be interesting to additionally report the correlation between the FTIR and AMS OM when the samples characterized by high dust content are removed, in order to support this explanation. It is important to discuss qualitatively and quantitatively the potential interference of dust components (i.e. silica and other metal oxides) in the FTIR OM quantification. Specifically, do metal oxides absorb infrared radiation and if so what is the intensity of this absorption? Which functional group could be affected by the interference? For example, Si-OH groups of silicate may absorb IR radiation at 3400 – 3600 cm^{-1} and this would lead to an overestimation of OH hydroxyl group concentration and O/C ratio. How could you exclude or quantify dust interference?

The difference between AMS and XRF sulfur concentration indicates that that 70% of S is apparently not present as sulfate, or if it is sulfate it is not detected by AMS. This discrepancy needs further explanation.

High concentrations of submicron dust were observed during the entire campaign. Would it be possible to implement the discussion of dust sources, reported at page 4798, comparing the observed dust elemental ratios with those expected for local dust sources? Are there super-micron dust data available for the same site that corroborate a local source for certain wind directions?

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The correlation of PMF factor 4 with fossil fuel combustion sources could be further discussed by investigating the correlation of factor 4 with integrated average BC concentrations.

The correlation between the biogenic factor and Si seems driven by the two high concentration data points. It would be useful to re-evaluate the correlation introducing a normalization function to validate the linear fit.

Technical corrections

Page 4790, line 8-9
The sum of percentage is larger than 101%. Please verify the values.

Page 4792, line 25
The discussion of the oxygen to carbon ratio as measured by AMS is very detailed for the non-AMS user. I would suggest rephrasing the sentence, and explaining the acronyms.

Page 4793, line 14
"Spectroscopy" should be added to Fourier Transform Infrared (FTIR).

Page 4793, line 17
"Gas Phase species" instead of "gas phase"

Page 4794, line 18
I guess you meant "enabling a distinction between hydrocarbon (C_xH_y) and oxygenated hydrocarbon ($C_{x-1}H_{y-4}O$) fragments".

Page 4796, line 21
There are two references called "Hawkins et al. 2010". Please specify which one you want to cite on this line or verify the publication date in the reference list

Page 4797, line 26
Please verify the percentage values; their sum is 101%.

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Page 4799, line 20
Figure 5 in the text is commented before figure 4. The figure order should be reversed.

Page 4801, line 15
Use adl as acronym for above detection limit.

Page 4819
For consistency, “BDL” should be replaced with “bdl” (lower case).

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