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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical characterization of biogenic SOA generated from plant emissions under baseline and stressed conditions: inter- and intra-species variability for six coniferous species" *by* C. L. Faiola et al.

Anonymous Referee #3

Received and published: 21 October 2014

This paper presents an interesting set of laboratory experiments investigating the effect of plant stress on SOA composition. The research is original and likely to be of great interest to the research community studying biogenic SOA, and is well within the scope of this journal. I make a few suggestions below that I believe would help to better focus the reader on the key points, better constrain some of the uncertainties, and structure the flow of the paper better. Otherwise this is a very well-written paper with good visual aids that is nearly ready for publication.

General suggestions:

1. Organization: It feels strange to discuss the “exception” so thoroughly before showing the “typical” plant response. I would suggest reversing the order of sections 3.3 and 3.4, and adding a panel to Fig. 4 showing an AG-Post mass spectrum, so this figure doubles to show a “typical” pre to post change, as well as showin the atypical Pre example.

2. I think it would be useful to add a brief discussion of the motivation for selecting the particular trees investigated here.

3. The molecular formula and structure for methyl jasmonate should be in the manuscript somewhere, at least in the supplemental, to help readers interpret your results. What is its O:C ratio?

4. I think the fact that you ignore nitrogen-containing ions could introduce some bias and should be discussed more thoroughly (around 25180 lines 6-11). If these come from soil NOx, they are likely to be NO3-initiated SOA, which carry a lot of O’s with them and could skew your O:C ratios high. NO3 has highly variable rate constants with terpenoids, often much faster than O3. If, for example, it’s reaction rate with MeJA were anomalously high, this could be a big part of the increase in O:C. Is there any way you can estimate (e.g. from subsequent measurements?) the [NOx], to report a ballpark guess? Can you put an upper limit on NO3’s contribution to the O:C change?

5. I think it would be very useful to report the general trend in total SOA mass pre/post, and the difference in O3 decay rates, perhaps around 25182 line 25. I’m curious if the addition of MeJA could affect the concentration of O3 in the pre/post experiments, and hence the total aerosol loading, skewing the volatility distribution of what’s condensing? This could lead to composition shifts even with the same total {gas+aerosol} product distribution, just due to partitioning changes. I know your MeJA MS data suggests that there is some role for the MeJA as an SOA precursor in itself, but this would help think more about what else it could be doing to the gas-phase chemistry.

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6. Can you do elemental analysis of residual spectra? This would be an interesting way to say something more specifically about the non-MeJA SOA stress response composition.

7. Based on its vapor pressure, could MeJA condense onto particles and itself contribute to the particle phase?

Specific comments: 1. I'm puzzled by the climate feedbacks paragraph in the introduction (25169 lines 20-25). Based on the first 2 sentences of that paragraph, I expected a negative radiative forcing from BSOA. Why is the radiative perturbation then positive?

2. The format of plant species names is a bit odd and inconsistent: why is it "grand fir" but then "Douglas-fir" with a hyphen?

3. 25175, line 27: is -> in

4. 25178, line 23: "1.6 +/- 40%": why is this error range reported as a %, where the other are all +/- 1 SD? Suggest making consistent.

5. 25180 line 8: Suggest reminding the reader via a brief parenthetical what the negative control experiments were. It was a very brief mention and many sentences previous that it was explained.

6. After you have introduced the abbreviated MeJA, I suggest using that consistently throughout. (e.g. 25182 line 2, 25188 line 19)

7. Top of 25191: two uses of long dashes are strange sentence structure. Use semicolons?

8. 25191 line 4: insert citation about expected H:C ratios after "ozonolysis reactions."

9. 25192 line29: remove comma after "rich"

10. Isn't it "van Krevelen", not "Van Krevelen"? (very minor point!)

11. 25193 around line 11-14: Make clear that this is true for OZONE-initiated chemistry,

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not necessarily with different oxidants

12. 25193 line 19 spectra -> spectrum

13. 25194 line 24: couldn't this also be from more highly oxidized C10 products, not necessarily adding other hydrocarbons?

14. Aesthetic point: Figs 4,6, and 8 are all similar but slightly different colors of green & thickness of lines. Make uniform?

15. In Figure 8 caption, recap the key text about these figures omitting negative residual peaks.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 25167, 2014.