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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Acidic reaction products of mono- and sesquiterpenes in atmospheric fine particles in a boreal forest" *by* M. Vestenius et al.

Anonymous Referee #1

Received and published: 25 March 2014

The manuscript presents new data on concentrations of a series of carboxylic acids in secondary biogenic aerosols in the boreal zone. The results are interesting, but the spelling, grammar and style need to be improved before the manuscript can be accepted for publication. I have listed some of the language errors, but not all. In addition I have pointed out a number of scientific issues which needs to be resolved before publication.

General comments Abstract: The abstract should list the concentration levels of the acids, as both median concentrations and ranges.

An overview of the sampling strategy should be presented in the text (such as: In June and July samples were collected every xx day, while in December and January

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weekly samples were obtained). Table A1: Why is it called A1 and not just Table 1? This is quite confusing. Furthermore the list of sampling periods seems to be in a mess, with some periods listed as 1-2 months of sampling. Please check all dates carefully and put them in order (e.g. sampling start 4 August is listed before 2 August). Please explain and/or discuss the discrepancy between concentrations observed during parallel sampling periods (e.g. start 11 June 2010 and 25 Oct 2010).

There is a lack of details to describe how the results were averaged into monthly and seasonal values, especially since there is a considerable variation in number of samples and concentrations above the detection limit. One example is October 2010 where only one out of 2x2 samples shows concentrations above the limit of detection (LOD). How were concentrations below LOD treated in the averaging procedure? Did you use the start date or end date to group samples into monthly values? Figure 2 shows total concentrations in September and October 2010 around 10 ng m-3, but it is not clear from Table A1 how these numbers were calculated. Please describe this in more details.

The uncertainty on quantification and average concentrations should be more clearly stated. Specifically the uncertainty on the calibration curve should be listed. The ambient concentrations vary more than three orders of magnitude. How were these concentrations accurately determined with 4-point calibration curves? All average concentrations should be stated together with the associated standard deviation (Table 1) to inform the reader of the level of certainty. In Table 2 please provide the median or average value as well (and standard deviation).

Regarding yields, the authors should keep in mind the work in recent years on volatility and influence of aerosol mass, which affect yields of compounds with different vapour pressures. This also complicates the comparison of smog chamber results with ambient measurements, where a background (accumulation mode) aerosol is often present.

Specific comments

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Page 2858 line 2: I suggest to change to: Biogenic acids were measured in PM2.5 aerosols from the SMEAR II station... I would prefer to leave out the word "PM2.5" since ideally you should explain an abbreviation the first time it is presented. Furthermore, you use "measured" in both the first and second sentence, please consider using another word in one of these. line 7. It is unnecessary to mention in the abstract where the standards were synthesized. Page 2859 Line 9: Should probably read something like: Therefore detailed knowledge of occurrence of individual compounds...

P2860 L19: What was the result of this test? Were the samples analyzed in negative or positive ESI mode?

P2861 L5: fast -> quickly L10: matrice -> matrix L13: detection limits were typically 0.1-0.8 ng m-3, but please describe if this variation was between individual compounds or due to differences in sampling time. L23: for -> as L26. Remove this sentence.

P2862: write calcd out completely

P2864 L.14: Could other tree species, such as birch, be responsible for limonene emissions in this area? L. 24: with -> at. Kamen -> Kamens. L28. and next page: It seems that the typography of Rˆ2 has been changed during technical production. Please correct. When comparing with Fig. 5, it seems that the correct description of the degree of correlation would be "somewhat correlated".

P2865 L1: "averagely" should be changed to "on average" or "in general". L8: The last sentence should be more specific about which other previous studies are referred to - those mentioned in Table 2? L. 18: The sentence "most of the time they were not matching" needs some further explanation to merit the following discussion of ratios. To what degree, where they not matching? In comparing your data with previous smog chamber studies, you should be careful and consider differences in reaction conditions (seed aerosol yes/no, temperature) and quantification. Did these previous studies have authentic standards available?

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P2866 L. 1-2: Limonic acid was detected by Glasius et al. in 2000 (Environ. Sci. Technol., 34, 1001). L5-6: Due to the large associated uncertainties I propose to change "suggests" to "could indicate" or a similar term. L. 27-28: The description of the sampler belongs in the experimental section.

P2867 L25-26: Is "concomitant" the right word here, given the statement on Page 2865 L18?

Table 1: Please add standard deviations as discussed above. Table 2: In addition to high and low values, you should present the mean and median. Figure 1: Please give names indicating cis-trans isomers.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 2857, 2014.