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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Insights into the O : C dependent mechanisms controlling the evaporation of α-pinene secondary organic aerosol particles" *by* Angela Buchholz et al.

Anonymous Referee #2

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Buchholz et al propose a study investigating the mechanisms controlling the evaporation of biogenic-derived secondary organic aerosol (SOA) formed from the photooxidation of alpha-pinene. Two mass spectrometers were used to retrieve the chemical composition of the SOA throughout the evaporation processes. The size distribution of the particle was also characterized. Overall this study is very well constrained and the results well presented. However, I have a few comments/concerns, mainly regarding the FIGAERO data, that should be at least discussed in the manuscript.

My main concern is the absence of blank measurements with the FIGAERO. As it has been initially discussed by Lopez-Hilfiker et al. and later in other studies, performing

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Discussion paper

blank measurements is crucial to validate the chemical information obtained using a FIGAERO. The authors should discuss this point and explain how they made sure that their results were not impacted by the background of the instrument. To me, this discussion is important since the mass collected onto the filters was particularly low. In addition the authors should clarify the following points: Was the FIGAERO sampling the gas phase coming from the lab, the PAM chamber or clean air during the aerosol sampling time? This is important to know as it can significantly impact the background of the instrument.

page 6, lines 15-17: Some information regarding the declustering strength should be provided (e.g., 173/127). Why did the authors make this choice rather than reducing the declustering and be more sensitive to a wider variety of compounds?

page 7, lines 1-5: If the gas phase was sampled during the PAM chamber experiments it should have been possible to observe the larger formation of small carbonyls. Please clarify.

page 7, lines 5-10: How do the thermogram look like for those small compounds? Are the thermograms consistent with SVOC or (E)LVOC?

page 7, lines 15-20: The observations made by the authors are not consistent with a recent modeling study performed by DeRieux et al (https://doi.org/10.5194/acp-18-6331-2018) and not well constrained. The authors mentioned that the slower evaporation under dry conditions is due to diffusion limitation. While the LWC and alpha-pinene-derived SOA viscosity at 40% and 80% can be anticipated to be significantly different (i.e., at RH 0% 10E+8Pa s, 40% 10E+6 Pa s and 80% 10E+2) the evaporation rates are similar. That's confusing and it should be discussed and the results better constrained (estimation of the LWC, viscosity,...) in the paper.

page 8, lines 3-7:How do the O:C ratios evolve as a function of evaporation? Does it increase or decrease? The authors should be able to track these changes.

page 8, lines 17-20: Could it be possible that sampling wet air (i.e., 80%) leads to larger adsorption of gaseous compounds onto the filter (i.e., positive artifact)?

page 9, lines 18-20: The authors should compare some of their results with the recent work published by Riva et al. 2019 (doi.org/10.1038/s41612-018-0058-0). In this earlier study, the authors have shown that particle phase processes lead to the formation of oligomers that further decompose into C7-C9 compounds. How do the average DBE value change?

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