

## ***Interactive comment on “Experimental investigation into the volatilities of highly oxygenated organic molecules (HOM)” by Otso Peräkylä et al.***

### **Anonymous Referee #1**

Received and published: 25 August 2019

This manuscript presents an experimental investigation of the volatilities of highly oxygenated organic compounds (HOM) formed in the ozonolysis of  $\alpha$ -pinene. The condensation behaviors of HOM upon seed injection in continuous flow chamber experiments were interpreted using box modelling to offer insights into their volatilities. The authors found that HOM dimers, along with the majority of HOM monomers are of low or extremely low volatility, while a small fraction of HOM monomers are semi-volatile. The authors further developed a parameterization for assessing the volatilities of HOM using their molecular composition, and compared the results with those derived by existing volatility parameterizations. This manuscript provides valuable information on the volatility of HOM derived from  $\alpha$ -pinene oxidation and also a methodology for the

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determination of volatility of organic species, especially for thermally labile species. I recommend the publication of this manuscript in ACP after the authors address several important issues as detailed below.

Major comments:

P16, Sect. 3.5. As shown in Fig. 6, the possible reactive or solubility-driven uptake of oxidation products resulted in a difference in the condensation behavior of some of HOM (both CHO compounds and organonitrates) between experiments with effloresced and deliquesced seeds. How big was this difference? To what extent this difference affected the determination of the fraction remaining of gas-phase HOM upon seed addition and hence their volatilities? A quantitative evaluation of the effect of particle-phase processes of HOM should be included in the revised manuscript.

In addition, since the HOM monomers and dimers may decompose after condensation, producing more volatile products that may partition back to the gas phase, I am curious if the authors observed any oxidation products showing an increase in their gas-phase concentrations upon seed addition.

P18, Sect. 3.6.1. In my understanding, the oxidation products that were possibly affected by the particle-phase processes represented a source of uncertainty in volatility determination and should be excluded from the model. However, these species were actually included in the model. The authors should explain this.

P21, L11. The authors stated that they couldn't exclude the role of particle-phase processes in artificially lowering HOM volatility estimated using their parameterization. Have the authors tried to develop a parameterization excluding HOM species affected by particle-phase processes from the model and compare the results with existing volatility estimates?

Minor comments:

P7, L16. I suggest the authors provide details as to how the wall loss lifetime of ELVOC

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was estimated from their condensation behavior upon seed addition.

P8, L12-14. Since the lifetime of gas-phase ELVOC depends on the condensation sink (CS). The authors should specify the value of CS leading to a 60

P12, L20. Replace “as well as” by “and”.

P15, Fig. 5 and P17, Fig. 6. A logistic fit to the data in these figures may help to demonstrate the trend more obviously and also help to locate the transition mass between the high- and low-volatility limits.

P16, L6. Delete “in the differences”.

P19, L4. Delete “the”.

P24, Table A1. Why the numbering of experiments starts with 2? And the numbering of expts. 17-21 is not in numerical order.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-620>, 2019.

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