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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A model framework to retrieve thermodynamic and kinetic properties of organic aerosol from composition-resolved thermal desorption measurements" *by* Siegfried Schobesberger et al.

Anonymous Referee #1

Received and published: 12 June 2018

The manuscript by Schobesberger et al. entitled, "A model framework to retrieve thermodynamic and kinetic properties of organic aerosol from composition-resolved thermal desorption measurements" is a wonderful addition to the discussion on the thermodynamic and kinetic properties of secondary organic aerosol. The model framework is described in detail and the analysis of how each fit parameter affects the shape of the desorption curve is useful. Since the best model fit was achieved by characterizing the SOA as being mostly composed of oligomeric-like molecules with parameters that agree well with previous studies, the current manuscript is moving the commu-

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nity closer to a robust set of parameters for describing the thermodynamic and kinetic properties of SOA.

Minor revisions suggested: Page Line 6 – “related measures of volatility” are mentioned. Could the authors expand on this? In Section 3.7 running a distribution of particle sizes is said to be too computationally expensive. Since this is the case, I would suggest size selecting particles during the experiment so that this source of uncertainty is minimized. Page 16 line 23 – what was the geometric standard deviation of the particle distribution? Page 18 line 16-17: The sentence would read better if “of which” was after the “,” and before “the relatively slow decomposition” Page 18 line 19: needs to be “(see also section 4.5)” Page 20 line 3: should be “We used the model” Page 21 line 5 (Section 5.3): Could you please restate the initial values obtained with alpha = 1? Page 23 line 1: should be “convincing and suggests that we are able to attribute” Figure 4: The plots are mislabeled: C should be B and B should be C. The summed trace in what is currently plot 4b is truncated, please give the maximum value of the curve in the caption. Figure 8: should be “A particle size of 197 nm corresponds to the volume median diameter” Figure 9: It would be good to keep the colors consistent between Figures 8 and 9. There are numerous typos, please proofread. What does “N.B.” stand for? Add that the black traces are non-volatile to the legend for panel D.

1. Does the paper address relevant scientific questions within the scope of ACP? Yes, the paper discusses experiments and a model framework that aim to further our understanding of the mechanisms of particle evaporation. 2. Does the paper present novel concepts, ideas, tools, or data? Yes, the model framework, supporting experiments, and uncertainty analysis are all novel contributions. The main experiment, the analysis of SOA formed from the dark ozonolysis of alpha-pinene with FIGAERO CIMS, is an important expansion on previous experiments. 3. Are substantial conclusions reached? The quantification of volatility parameters using the model fits to experimental data are substantial conclusions of this manuscript. 4. Are the scientific

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methods and assumptions valid and clearly outlined? The model framework and all assumptions and sources of uncertainty are described in great detail. 5. Are the results sufficient to support the interpretations and conclusions? The model runs clearly show good agreement with the experimental results and thus support the conclusion that the model parameters describe the thermodynamic and kinetic properties of the system. 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes, the descriptions are all very thorough. 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes, previous work is cited where needed and compared to current results. 8. Does the title clearly reflect the contents of the paper? Yes 9. Does the abstract provide a concise and complete summary? The abstract is a little heavy on describing the methods. More of the abstract could be devoted to the conclusions and best-fit model parameters. 10. Is the overall presentation well structured and clear? Yes 11. Is the language fluent and precise? Yes 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes, there is no explanation for the color scheme in Figure 4. Additionally, the panels are mislabeled in Figure 4. The traces in Figure 8D all appear to be the same color while a legend indicates there should be different colors based on volatility. Figure 9D should have the same color scheme as Figure 8D. The caption for Figure 9 does not read well; it seems as though text became jumbled. Figure 13 is difficult to interpret and needs some more explanation. In general, the axes need to be adjust to show the top portion of the graph, or information given in the caption as to the maximum value when it cannot be seen. 14. Are the number and quality of references appropriate? Yes 15. Is the amount and quality of supplementary material appropriate? Yes

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