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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling the Formation and Composition of Secondary Organic Aerosol from Diesel Exhaust Using Parameterized and Semi-Explicit Chemistry and Thermodynamic Models" *by* Sailaja Eluri et al.

Anonymous Referee #3

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The authors present VBS and SOM modeling of SOA formed from oxidation of a range of diesel exhaust conditions in an OFR. They compare the models with measurements of both aerosol mass and atomic O:C. In general, the models more readily agree with the mass of SOA formed, while some disagreement was observed for O:C. Possible reasons for this disagreement are discussed. A brief but favorable comparison with gas phase CIMS measurements was also presented. Sensitivity of the models with regard to a variety of parameters was investigated. In general, this analysis is very thorough and clearly presented. It represents an important step towards understanding

the chemistry and physics that occurs in OFR experiments, and how such experiments can be used to learn about atmospheric chemistry and physics. I would recommend this paper for publication in ACP after addressing these minor comments:

General Comments:

Pg. 4 Ln. 149: Somewhere in Sect. 2.1, can you state the OFR residence time used in these experiments? It must be given in Jathar 2017a, but it would be useful to quote it here directly for context when you discuss specific condensational sink lifetimes below.

Pg. 7 Ln. 271: How well does this method of estimation of the diffusion coefficient work? Can you provide any references where this method has been tested and used before? If not, please state your reasoning for using it, or better yet include a simple figure comparing the values of D estimated using this equation with independent measurements/calculations of D for several typical species, to illustrate that it works well enough. (It might also be the case that your results are insensitive to variations in D).

Pg. 10 Ln. 357: Your numbers 1 through 3 here are mostly repeating information you have already given the reader in the prior sections (number 4 is mostly new text). It's OK to leave this text if you want to summarize and emphasize the paper organization, but you could consolidate/remove the duplicate text to streamline your Methods section.

Pg. 18 Ln. 691-696: I think it would really enhance this section if you could expand upon your discussion of Fig. 8 and related text. For instance, you've calculated for a 100s residence time, but what does it look like for the residence times of 2-4 min that have been used in most of the ambient studies, e.g. Palm et al. 2016 that you cite previously? How does this compare to the discussion in Sect. 3.3 of Palm et al. 2016, which is similar to the analysis presented here? They have suggested that the use of seed aerosol (to increase condensational sink) and the use of longer residence times could avoid such issues; can you use your results to provide support for such conclusions, or better yet provide quantitative guidance for future OFR studies (e.g.

use residence times greater than X min or a minimum seed surface area)? Such suggestions would provide a great reference for the growing OFR user community.

Technical Comments:

Pg. 5 Ln. 168: Please define 'THC'.

Table 1: Are some/all of the values reported in this table already reported in the Jathar et al 2017a reference, or are they new data presented in this work? If the former, you should cite that paper in the table caption.

Pg. 5 Ln. 192: It's confusing that you're using 'VOC' to represent all of the organic gases including SVOCs and IVOCs. I suggest you refer to them as 'organic gases' instead of 'VOCs' in such instances, so you keep the nomenclature clean.

Fig. 1c: Please label the yellow pie slices in the VBS and SOM pies.

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