

Interactive comment on “Secondary organic aerosol production from modern diesel engine emissions” by S. Samy and B. Zielinska

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Final Authors Comments on the manuscript ACP-2009-463 (Atmos. Chem. Phys. Discuss., 9, 17665–17704, 2009), entitled “Secondary organic aerosol production from modern diesel engine emissions” by S. Samy and B. Zielinska

Dear Editor,

We are please to submit our final comments in response to the Interactive Comments by the anonymous referees #1 and 2. We thank the referees for their thoughtful and constructive comments – we have reviewed carefully their suggestions and have revised our manuscript to address them as best as possible. Specifically, we addressed the following comments:

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Referee #1:

General comments:

1. “The work is technically sound and the quality of the experiments and measurements is high. There is some nice data here that should be published, and some interesting results are presented. Unfortunately, I find the manuscript very difficult to read. In particular, I do not come away feeling I have learned anything definite, other than that reactions of complex mixtures are complicated. The manuscript seems to be more of a report of observations, with none being emphasized more than the others, so there is little sense of what is important here... I think there must be a few major points the authors want to make, and then these should be supported with the appropriate data. . .”

Answer: We agree with the reviewer and we made every effort to improve the clarity of presentation and emphasis on the major findings of this work. The revised version reflects these changes. We feel that the novel experimentation presented and discussed in this article provides well defined results (e.g. SOA production and associated changes in chemical character; % yield determination), which have not previously been evaluated with similar experimental design criteria for a complex mixture (i.e. modern DE).

2. “I would also suggest that some thought be given as to how to avoid so many references to experiment labels (e.g., D-1, L-2a, L-3b, : : :) throughout the text. . .”

Answer: We agree and we included more clear description of each experiment in the revised version of the manuscript.

3. “Since there is also EC in the system, do you have any idea how much SOA might be formed by adsorption onto EC instead of condensation?”

Answer: No, this issue was not investigated

4. “The experiments are all carried out at RH < 1%. What might be the effect of higher

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RH on the results?”

Answer: We did not perform experiments in higher RH. We anticipate that the SOA yields might be higher (water adsorption on polar products) The technical corrections listed by the reviewer were all implemented.

Referee #2:

General comments:

“...Overall the manuscript has excellent experimental information and with some minor improvements in the interpretation the manuscript should be published. Comments on the individual sections follow...”

1. “Introduction: The strategy for conducting the study should be explained better in terms of why a radical source (HCHO) is needed and the motivation for the experiments with added toluene...”

Answer: We added the explanation to the Introduction

2. “Experimental section: The major missing piece from the experimental section is a consideration of the procedures for conducting the experiments including the addition of the diesel exhaust to the chamber...”

Answer: We added the description of these procedures to the Experimental section

3. “Many of the features of the NO_x rich exhaust from diesel emission described in lines 131-139 is fundamental to the motivation for the study and would be better suited in the introduction where it might have more visibility. Both investigators and readers need to understand these concepts before they can appreciate the difficulty of conducting such experiments with diesel exhaust.”

Answer: We agree and we moved these features to the Introduction

4. A description of the measurement of glyoxal needs to be provided (values given as

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yields of reacted toluene in Table 4)... The references provided only pertain to glyoxal; what references apply to the determination of the methylglyoxal yield for the same table? Finally, provide the reacted toluene concentrations at the listed aging time which would give the reader the corrected glyoxal and methylglyoxal chamber concentrations based on the yields...”

Answer: This detailed information was added to Experimental section.

5. “This section has a considerable inconsistency in the introduction and use of acronyms...” Answer: We corrected the acronyms

6. “For the final paragraph of the current experimental section (line 250-259), some context needs to be provided before a discussion of toluene addition experiments can be understood, especially in light of the dramatic changes in SOA formation upon its addition.”

Answer: Additional statements about toluene addition (as a representative VOC) are included in the revised manuscript. In addition, several references highlighting past work with toluene have been included.

7. “Results and Discussion: In my opinion, the major finding in this study is the relatively low yields of SOA formation found for the irradiated diesel emissions according to Table 2 (and S3)... As noted above, this appears to be contrast to the findings of Robinson et al. (2007)... Thus, some comparison of the present work with that of Robinson et al. (2007) is warranted...”

Answer: We addressed this issue in our revised manuscript. Basically, several factors may explain this difference between the EUHPORE and Weitkamp et al (2007) results. A few of these include the use of a single-cylinder 4.5 kW generator for a DE source by Weitkamp et al; differences in NO_x concentrations (Weitkamp et al did not monitor NO_x, but define conditions as “high NO_x”) and chamber volume/light source (Weitkamp et al use a 10 m³ Teflon bag with artificial lighting). These substantial experimental

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differences and lack of extensive chemical speciation data in previous work make direct comparisons between these two set of experiments very difficult if not impossible.

8. The specific comments of the referee #2 concerning the organization of the manuscript are all addressed in the revised version. The content of sections 3.1 and 3.3 has been reorganized and additional figures and tables requested by the reviewer have been added to the supplemental material. References have been corrected and the meaning of unclear sentences clarified.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 17665, 2009.