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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol production from diesel vehicle exhaust: impact of aftertreatment, fuel chemistry and driving cycle" *by* T. D. Gordon et al.

Anonymous Referee #3

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Gordon et al. report chamber studies on SOA formation from photo-oxidation of vehicle exhaust from medium- and heavy duty diesel vehicles running with 3 different ultra-low sulphur fuel. Also the effect of different after-treatment devices on emissions and SOA formation are studied. The study is scientifically relevant and the paper is quite well written. The paper could be published in ACP after the following comments have been taken into account by the authors.

Experimental section:

- more details of on the UV lights should be provided (intensity, wave length)

- Why some of the experiments were performed by using UV lights and some by sun light. Could this affect the results? This should be discussed in the manuscript.

- Page 24232, line 13: Authors mention that there was a pig variability in temperature and RH conditions during the experiments. How much T and RH varied between the different experiments? This could have an effect on measured SOA productions and should be discussed more detailed.

- What was the OH concentration in the beginning of the experiments? Was it the same in all of the experiments?

- Authors mention the wall losses of vapors and refer e.g. to the paper of Matzunaga & Ziemann (2010). As shown by them and also recently by Kokkola et al (2013) wall losses may truly be important and their effect on results should be discussed more thoroughly.

Results

- I guess that the mass concentration of different compounds (SO4, SOA, POA) are from AMS? This should be mentioned in the text. When DPF was used, were the concentrations high enough for AMS? If you use the SMPS data to estimate the SOA production, are the results comparable to those presented in figs 2-3?

- SMPS data: Number concentrations for different cases should be presented and the SMPS concentrations should be compared to the AMS results (See the comment below).

- Page 24236 lines 10-15. I don't understand why SOA production doesn't decrease during the experiments. If HONO is added only in the beginning of the experiments, the OH concentration should go down during the experiments hence also the SOA production should go down.

- The gas phase results (including VOCs) should be investigated more detailed. Do you see changes in the gas phase when you compare e.g. DOC cases? What about

in the case of different fuels?

- SOA mass closure: the SMPS volume increase should be compared to the SOA masses analysed from AMS. Based on supplemental material there is a clear difference in the results. Is the difference similar in all cases? What if you estimate the SOA yield from SMPS results, are the conclusions still the same?

- I don't quite understand why the yield would be too sensitive for the seed particle concentrations- If the seed concentration is lower shouldn't particles just grow more (in size) compared to the higher seed concentration case? This should be explained more detailed. The yield might be sensitive to the seed size if the size range is small (Kelvin effect).

References: H. Kokkola, P. Yli-Pirilä, M. Vesterinen, H. Korhonen, H. Keskinen, S. Romakkaniemi, L. Hao, A. Kortelainen, J. Joutsensaari, D. R. Worsnop, A. Virtanen, and K. E. J. Lehtinen. The role of low volatile organics on secondary organic aerosol formation, Atmos. Chem. Phys. Discuss., 13, 14613-14635, 2013

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 24223, 2013.