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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary aerosol formation from photochemical aging of aircraft exhaust in a smog chamber" *by* M. A. Miracolo et al.

Anonymous Referee #2

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The authors present some interesting work on the secondary aerosol formation potential of an aircraft engine operating at 4%, 7%, 30%, and 85% load points. The paper is generated as a companion paper to an AE paper (unpublished) that apparently details the sampling platform and basic emission factors for these engines. This paper focuses on the surprisingly large secondary aerosol formation measured during these tests using a portable Teflon chamber. The authors compare the predicted SOA formation from the monoaromatic compounds to the SOA formation observed, noting that the monoaromatic compounds appear to attributable for significant SOA formation but unable to explain the total SOA formation seen. The remaining SOA is attributed to the IVOC emissions in the chamber. Overall, the paper is written well with sufficient explanation as to the experimental and modeling approach used.

Comments/questions Presumably transport losses of particulate matter through the necessarily long sample lines and at the sample inlet are discussed in the companion paper. However, some indication as to the extent of these losses is necessary since the paper discusses the ratio of secondary aerosol/primary aerosol. These losses have been reported to be quite significant in other aircraft emission sampling papers/reports. How much of a change in the ratio is seen when the loss of particles in the lines is accounted for?

Additionally, at what point are losses accounted for in the chamber? Are the losses corrected back to the point of introduction of aerosol in the chamber? Were the losses similar for these early, very small particles compared to the larger particles later in the experiment? A bit more discussion of these effects will be helpful.

How repeatable were the experiments conducted at the same load points (is that the error bar in Fig 6a, if so, is that one or two standard deviations)? Perhaps a table summarizing the observed SOA and secondary sulfate formation along with primary emission rate of EC, OC, BC and particle number for each test is warranted.

How did you verify that the engines were warmed up? What was the load sequence put on the engine? Some work has indicated that the emissions, especially at the low-loads are influenced by the testing sequence.

SO2 loss was used to estimate the OH levels in the chamber. Why is SO2 decaying before the lights were on? Also, was there any difference in the experiments conducted with the UV lights and the experiments using outdoor light? How similar is the light intensity of the blacklights to outdoor light used in these experiments? Also, why do you suspect the AMS sulfate formation and SO2 decay varied as much as they did?

The SOA model calculations indicate an underprediction by about 50% the SOA predicted using only from the monoaromatic compounds. They then go on to discuss

IVOC emissions and how they trend with the missing emissions. I do not disagree with the observation. However, could it also be possible that the model is off by a factor of two for the monoaromatic compounds given uncertainties remaining in SOA chemistry from monoaromatic species?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 27893, 2010.