

Interactive comment on “Anthropogenic influence on SOA and the resulting radiative forcing” by C. R. Hoyle et al.

C. R. Hoyle et al.

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Reply to reviewer 1

We would like to thank the reviewer for their helpful comments and suggestions for the improvement of this manuscript. The changes we have made are described below.

- 1)** Added “(Defined here as the difference between the pre-industrial and the present day run)”
- 2)** A change in SOA burden caused by a change in temperature, precipitation etc, (i.e. climate) is defined as a feedback and not a forcing according to the definition of RF used by the IPCC. Thus using pre-industrial meteorology would mix forcing

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and feedback effects. It would of course be nice to know the potential for a feedback here, but that should be the subject of another study. We have added the following paragraph to the manuscript: “Although the consideration of changes in SOA due to meteorological factors is outside the scope of this study, it must be noted that any systematic differences in precipitation or temperature between pre-industrial times and the present would affect the burden or production of SOA through deposition or partitioning processes respectively.”

3) We have added an explanation of the use of ammonium sulphate aerosol as a partitioning medium in our modelling work, near the end of the Oslo CTM2 section. We have removed the sentence stating that the experiments where partitioning to sulphate was allowed are the main focus of the paper, as the discussion of the two cases is actually similar, and this sentence was therefore misleading. The abstract has also been re-arranged slightly so that the cases with and without partitioning to sulphate aerosol are mentioned together.

4) A substantial new section has been added (“Comparison of SOA production and burden with other recent modelling studies”). We believe the only way to really determine the cause of variations between different models production and burden figures is to carry out a thorough model inter-comparison, however several probable reasons for the differences have been described. Among other things, as the reviewer themselves pointed out in an earlier comment, differences in temperature in the meteorological fields used by the models could affect the SOA production because of the temperature dependence of partitioning.

5) The positive RF values come about because of reductions in the present day POA emissions from biomass burning in these areas relative to the pre-industrial emissions inventory, due either to actual decreases in these areas, or shifting of the location of

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high emissions between the two data sets. This is now described in the text.

6) Figure 1 has been changed to include the values below 0 (SOA decreases). There are decreases in POA emissions in a few areas between runs Pind_std and Pind_BBpres, however, globally there is a net increase, as shown in Table 2. The labels in this table have been corrected to be consistent with the rest of the manuscript. The increase in upper tropospheric SOA at 400hPa in the south of panel A of Figure 2 (note the panels have been re-arranged as the reviewer suggested), despite the decreases in panels B and C, is due to the non-linear dependence of the SOA partitioning on the condensed organic mass. Once more semi-volatile species partition to the aerosol phase, the mass available for partitioning increases, and even more of the species partition to the aerosol phase. The combination of increased SOA precursors, POA and ammonium sulphate like aerosol from both the present day industrial and present day biomass burning emissions can lead to an increase relative to the pre-industrial run even when panels B and C show small decreases. The results shown in panel A are therefore not simply the sum of the increase shown in panels B and C.

Technical corrections

- 1) Changed 28 Tg/yr to 26Tg/yr.
- 2) Corrected.
- 3) Corrected to 0.5.
- 4) Table labels have been made consistent.

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5) Axis labels corrected.

6) Panels have been re-arranged.

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