Response to Harald Saathoff (editor)

Dear Dr. Saathoff,

We would like to thank you very warmly for your acceptance of this manuscript subject to minor revisions and for your helpful comments. We have taken into account all your comments and answered all your questions, which have helped us a lot in improving the manuscript.

1) Regarding Table 2 (Page 22517, lines 6-7:): Please add a clear statement in the text that the differences between your results and the literature data are not significant. The reader should have no chance to misinterpret your data.

*Response: The sentence "Table 2 shows that the obtained yields were in good agreement with those from the literature" (P225117, lines 6-7) was replaced by "**Erreur ! Source du renvoi introuvable.** shows that, due to the indicated uncertainties, no significant differences between the obtained yields and those from the literature were observed. They were thus in good agreement. "*

2) Regarding Table 4: Please add a footnote to the table that the range of primary yield values from your work is partially caused by the variability in the initial NOx levels.

*Response: A footnote was added to table 4 : "*The range of primary yield values from this work was partially caused by the variability in the initial NOx levels".

3) Regarding aerosol mass yields:

3a) Demonstrate the almost negligible particle wall losses e.g. by showing the plot with the dilution correction in the supplement. Refer to this in section 3.1.3.

Response: The Figure was added in the Supplementary Material as Figure S4 and the sentence "Similarly to what has been shown by Wang et al. (2011), particles wall losses were not significant in our experiments (See Figure S4)." was added in the text (P22518, line 20).

3b) Show a control experiment in the supplement to define the background SOA formation level. Since most of your data was obtained from experiments without seed you should show a control run without seed or both.

Response: In order to add clear information about control experiments, we chose to add an explanation in the text instead of a graph in the supplementary material. The sentences added in the text (P22518, line 15) are "Table 1 shows that the maximum SOA mass observed during these experiments ranged from less than 0.1 to 12.4 µg.m^{-3}. Even if sometimes this SOA formation was very low, it was considered significant due to observed differences with control experiments (irradiation of a synthetic air/NOx/HONO mixture during several hours). Indeed, control experiments did not allow the detection of any significant aerosol formation with particle number remaining in the range of a few tens of particles per cubic centimeter when any experiment presented in table 1 led to the

formation of several thousands of particles per cubic centimeter (or more) even when the SOA mass remained very small."

4) 4a) Include our findings on wall losses of gaseous condensable species in your discussion in section 3.1.3. See section 4.1.1 in Saathoff et al., Atmos. Chem. Phys., 9, 1551–1577, 2009 for potential gas phase and particle losses in a metal (aluminum) wall chamber. Such losses are hard to quantify and depend on the chamber mixing time scale, wall surface type and the interaction potential of the lost gas. Hence the loss rates may be much higher for e.g. low volatile acids than for those compounds studied by Wang et. al. 2011. Furthermore, the direct gas phase losses can increase in relative importance for decreasing SOA concentrations and can therefore impact the methacrolein and isoprene experiments stronger than those done with a-pinene at higher concentrations (Wang et al., 2011). These losses can therefore strongly affect the yield calculation and also impact the observed nucleation behaviour. For example, we have seen more than 95% direct SOA mass losses via the gas phase in our 84 m3 aluminium chamber for pinene precursor concentrations in the 100-200 ppt range (not yet published).

<u>Response:</u> The sentences "In addition Saathoff et al. (2009) have shown that, in an aluminum chamber, considerable amounts of condensable material can be lost from the gas phase to the chamber wall in the course of an experiment and affect the SOA yield. These authors have modelled this effect and have shown that the gas mass lost to the wall could represent from 100% (for low SOA concentration condition) to 25% (at higher SOA concentration) of the measured airborne particle mass. " were added to the text (P22519, line 18).

4b) A reasonable uncertainty analysis of the yield data (best estimate) should be added to the manuscript identifying the major contributions. This should lead to reasonable error bars in Figures 3 & 7 and Table 1.

<u>Response:</u> We added in Table 1 uncertainties on VOC mixing ratio, SOA mass concentration and SOA yields. Error bars being too small to be visible in Figures 3 & 7 due to the scale, they were not added. Indeed, considering an absolute error of ca. 15ppb for FTIR isoprene and MACR measurements and 0.05 µg.m^{-3} for aerosol mass determination from SMPS,an uncertainty of 0.1 µg.m-3 on Mo and of 8.10^{-5} (for low isoprene SOA yields) to 3.10^{-3} (for high MACR SOA yields)on the SOA yields were calculated.

We hope that you will consider these explanations and modifications as being appropriate and one more time, we thank you very much.

Best regards,

Lola Brégonzio-Rozier et al.