Answers to referee comments

The authors have improved the paper, providing more detail than previously, and I support publication in ACP. However the authors have still not fully addressed two of my original comments; these need to be fixed before this work can be published. (Other minor comments are also given below.)

> It´s only better than 96.9% with [SO2] = 2.4x1014 molecule cm-3. Calculation was done with
>
> [SO2] = 1.6x1014 molecule cm-3 and later in the a-pinene system also with 1.9 and 2.4x1014
>
> molecule cm-3. (With [SO2] = 1.6x1014 molecule cm-3 it was better than 97.7%.)
>
> But nevertheless, 3.1% of prompt OH could be transformed to additional SA, but only for the
>
> highest SO2, otherwise it is much lower. It is speculative at the moment what´s the prompt OH
>
> yield for a-pinene andlimonene. The effect of additional SA via OH+SO2 should be clearly
>
> smaller than 10% for highest SO2 regarding SA formation via sCI+SO2. And for lower SO2 is
>
> can be totally neglected.
>
> k(OH+C3H8) = 1.09x10-12 cm3 molecule-1 s-1 (R.Atkinson, ACP, 3, 2233 – 2307 (2003) )
>
> k(OH+SO2) = 1.3x10-12 cm3 molecule-1 s-1 (R.Atkinson, ACP, 3, 4, 1461 - 1738 (2004) )
>
> highest [SO2] = 2.4x1014 molecule cm-3 and [C3H8] = 8.2x1015 molecule cm-3 as given in
>
> ”Laboratory Experiments” and table 1

Actually these calculations are at odds with the information given in Table 1. The above calculation was only for the highest values of both [SO2] and [propane]. However Table 1 gives ranges of concentrations used, and one needs to use the full range of experimental conditions to make these calculations. The “worst-case scenario” would be the lowest level of propane used (1.64e15 molecule cm-3, about five times lower than the value used) and the highest level of [SO2]. In that case the fraction of OH reacting with propane is actually much smaller than 96.9% (and the fraction reacting with SO2 is much higher than 3.1%). Based on the authors' comments, these “worst-case conditions” were presumably never used; but you can’t tell this from Table 1. If that’s the case, then Table 1 and Section 2.2 need to be made more specific as to the actual reaction conditions employed.

It should also be noted that the authors' calculations of the fraction of OH reacting with propane apparently neglect the OH+alkene reaction. This is not negligible for the isoprene experiments; in that case, the OH+isoprene reaction drops the calculated percentages somewhat. (However this does not affect calculations of H2SO4 production.)

The worst case calculation is valid and is not at odds with table 1. The point is that high C3H8 was used for a range of high SO2 and low C3H8 for relatively low SO2. The exact ranges are now given in updated table 1, so the reader will see that it´s really better than 96.9%. And OH+alkene is neglected, to guarantee our percentages represent worst case scenario. We modified text "Since OH formed in reaction (R5) is efficiently scavenged (>96.9%, at highest [$SO_2$], see Table 1 for propane concentrations used for different ranges of $SO_2$)"

> From a-pinene 3 different structures (isomers incl. syn/anti conformers) and 4 from isoprene as

> given in the manuscript.

As stated in the original review, this is incorrect. There are five sCIs formed from isoprene ozonolysis: CH2OO, two methacrolein-O-oxide isomers (syn and anti), and two methylvinylketone-O-oxide isomers (both syn, but distinct isomers nonetheless, likely with differing reactivities). Similarly, a-pinene ozonolysis forms four sCIs, with the -O-O moiety on one of two carbons, with two isomers possible per carbon (in total, one anti and three syn).

Ok, we see now! Referee is correct and we wish to thank her/him from pointing this out. Paper is corrected. Now it reads: "In case of α-pinene, possible sCIs include two different isomers, one *syn* and one which can be either a *syn* or *anti* conformer, with *syn* having two different structures possible; all in all sCI from α-pinene ozonolysis can have four different structures" **and** "For isoprene, due to the structure of the parent alkene, five different sCI structures are possible."

Other comments:

P. 4, line 27: "assumed" is the wrong word here, since that study actually found a low reactivity of sCIs toward SO2 (relative to unimolecular decomposition) from a set of scavenger experiments.

"assumed" changed to "suggested"

P. 5, lines 24-26: The results from 2012 and 2013 papers should not be described before those from 1996 through 2000. The earlier papers are the ones that established sCI bimolecular reactivity, not the recent ones by Taatjes, as is implied in the text.

Order was changed to follow the time of publication, as suggested.

P. 10, lines 2-3: This is not strictly true, since carbonyls are also formed from OH+propane, so carbonyl formation can be higher than alkene loss (depending on OH yield). This doesn't affect the conclusions at all, but the text should still be corrected.

Chapter was modified: "Also carbonyls or acids formed as products in the ozonolysis reaction or in reaction of OH with propane could affect the results via the reaction of sCI + carbonyl/acid in competition with sCI + $SO_2$. Carbonyl concentration from alkene ozonolysis cannot exceed the reacted alkene concentration (should be clearly lower). Total OH produced upon ozonolysis cannot exceed reacted alkene concentration and thus also carbonyls resulting from OH + propane cannot exceed reacted alkene concentration. Thus, maximum carbonyl concentrations in our experiment are in the range of few $10^8$ molecule $cm^{-3}$ , i.e. 3 – 6 orders of magnitude lower than the $SO_2$ concentrations used..... "

P. 10, lines 25-28 (and other equations): The equations may be easier to read if the rate constant nomenclature used the reaction numbers (reactions R1-R6) as subscripts.

I disagree, with my personal visual capabilities, subscripts that contain subscripts are not readable from normal printed paper, or then subscirpted "$SO_2$"need to be written as "SO2" which is not correct way. I can change them, if required, though, but consider the present way better. Also the text to be subscripted is often long and e.g. "**$k(sCI+CH_3COOH)$** " becomes quite difficult to read.

P. 13, lines 24-27: It might be worth mentioning here that the differences in pressure between the two sets of experiments may also affect results.

**Added: "Since pressures in our work and the study by Welz et al. (2012) were completely different, differences related to pressure effects may arise."**

P. 16, lines 12-13: This should be clarified to “atmospheric oxidation chemistry”, since the importance of sCIs for other aspects of atmospheric chemistry (OH production, SOA formation) is well-established already.

Changed.