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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol formation from the photooxidation of isoprene, 1,3-butadiene, and 2,3-dimethyl-1,3-butadiene under high NO_x conditions" *by* K. Sato et al.

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Thank you very much for your valuable comments. We reply your comments as follows:

".... The authors suggest that oligoesters containing nitrooxypolyol residues could be a possible source for 2-methyltetrols found in ambient samples collected under high-NOx conditions. This could very well be the case; however, another likely source that is not considered in this study are organosulfates containing nitrooxypolyol residues. The latter organosulfates have been detected in ambient fine aerosol but it remains to be

seen whether oligoesters containing nitrooxypolyol residues are also present. A short note on this issue would be appropriate."

This issue is briefly discussed in the first paragraph of section 4.3. It is also discussed why organosulfates are more commonly be detected than are nitrooxypolyols citing a recent paper by Darer et al. (2011). A description of organosulfates is also added in the introduction section as mentioned in the latter part of this letter.

Reference: Darer, A. I., Cole-Filipiak, N. C., O'Connor, A. E., and Elrod, M. J.: Formation and stability of atmospherically relevant isoprene-derived organosulfates and organonitrates, Environ. Sci. Technol., 45, 1895-1902, 2011.

"Page 4314 – line 17 (and page 4332 – line 17): The verb "discovered" is too strong in my opinion; I would write "characterized"."

We revise it in the new manuscript.

"Page 4315 – line 8-11: The authors write: "The products formed from isoprene oxidation (i.e., 2-methyltetrols, C5-alkenetriols, and 2-methylglyceric acid) have been observed in ambient fine particles" and cite a number of suitable references. It is noted that the first study in which 2-methylglyceric acid [although under the wrong name of 2,3-dihydroxymethacrylic acid, which was corrected in a subsequent study (Edney et al., 2005)] was characterized in ambient fine aerosol from K-puszta, Hungary, is not mentioned. I suggest to include this reference."

We included this reference in the new manuscript.

"Page 4316 – line 9: Another group of SOA tracers that are worth mentioning in this context are organosulfates containing a nitrooxypolyol residue. These compounds are formed from isoprene in the presence of NOx and sulfuric acid (also present in the polluted urban environment), and have been detected in ambient fine aerosol with the LC/(-)ESI-MS technique. "

We add here a description on these organosulfates. We cite three references you

mentioned.

“Page 4319 – line 13: ESI is used as ionization technique; I do not understand why a corona current is used. A corona current is generally used in the Atmospheric Pressure Chemical Ionization (APCI) but not in the ESI technique.”

Thank you for the comment. This is our mistake. We remove it in the new manuscript.

“Page 4320 – line 8: Molecular weight (MW) has no dimensions but molecular mass has (Da): thus correct would be “. . ... having a molecular weight of 68 . . ...” or “. . .. . . having a molecular mass of 68 Da . . ...””

We fix it.

“Page 4320 – line 8: The term “protonated ions” is a wrong term; the correct term is “protonated molecules”. If an ion would be protonated, we would have a doublycharged ion.”

Your comment is correct. We fix it.

“Page 4320 – line 12: “. . . were detected as protonated molecules at . . ..””

We fix it.

“Page 4324 – line 11: The term “quasimolecular ion” is deprecated according to the IUPAC guidelines. I would write: “Generally, analyte molecules are deprotonated to form [M –H]- ions during the negative-mode ESI process”, and further on in the next sentence: “. . .. . . to be deprotonated molecules”.”

Thank you for the comment. We revise these two places following the comment.

“Page 4332 – lines 10 and 12: I suggest to be more specific here and replace “unsaturated aldehyde” by “methacrolein”.”

We replace it by “methacrolein.”

“Fig. 4: Replace in the x-axis “Mass to chage ratio (amu)” simply by “m/z (in italic)”.

According to the IUPAC guidelines, the three-character symbol m/z (in italic) is used to denote the dimensionless quantity formed by dividing the mass of an ion in unified atomic mass units by its charge number (regardless of sign).”

We revised it.

“Page 4317 – line 17: the abbreviation “GC-FID” should not be used to refer to the instrument but to the technique; I would write: “. . .. . . and gas chromatography with flame ionization detection (GC-FID; . . ...)””

We fix it following the comment.

“Page 4318 – line 16: . . ... two GC-FID instruments, ...”

We fix it.

“Page 4320 – lines 2-4: I suggest to write: “. . .. . . by high-pressure liquid chromatography/accurate mass (3 ppm) time-of-flight mass spectrometry (LC/TOFMS; Agilent, Model 6210). A 10-μL aliquot of analytical sample was injected into the LC/TOFMS instrument.” I suggest to use a slash (instead of a hyphen) to denote a hyphenated technique; also the abbreviation “MS” denotes “mass spectrometry” and not the instrument.”

The place pointed out must be page 4319. We fix it following the comment.

“Page 4322 – line 6: LC/TOF mass spectrum”

We follow the comment.

“Page 4322 – line 7: . . ... was conducted by LC/TOFMS (Fig. 4).”

We fix it.

“Page 4322 – line 8: The results obtained in the experiment with . . ...”

We fix it.

“Page 4326 – line 16: 2-Methylglyceric acid contains both a hydroxyl and a carboxyl group.”

We revised following the comment.

“Page 4329 – line 2: . . .. by LC/TOFMS analysis . . ..”

We fix it.

“Page 4329 – line 24: . . .. by LC/TOFMS analysis.”

We fix it.

“Page 4331 – line 3: . . . by LC/TOFMS analysis in . . ...”

We fix it.

“Table 2: replace “LC-TOF” by “LC/TOFMS””

We fix it.

“Fig. 4 - legend: Flow-injection LC/TOF mass . . ...”

We follow the comment.

“Fig. 5 - legend: Typical LC/TOFMS base peak . . ..”

We fix it.

“Fig. 10 – legend: . . .. and (b) LC/TOFMS during . . ...”

We fix it.

“Fig. 11 – legend: . . ..., and (c) LC/TOFMS . . ...”

We fix it.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 4313, 2011.