

Dear Editor,

We thank you for your helpful comments. We have addressed all these comments. In the following, please find our responses to the comments point by point and the corresponding revisions made to the manuscript. The original comments are shown in italics. The revised parts of the manuscript are highlighted.

Dear authors,

Thank you for your detailed response. The reviewers comments have been sufficiently addressed. I only have a few minor comments that might be useful to take into consideration for completion of literature discussions:

1. Massoli et al. (ACS Earth Space Chem. 2018, 2, 7, 653–672) reported HOMs from SOAS. It would be useful to mention (or discuss if applicable) results from Massoli et al. in the context of the current study.

Response:

Accepted. We have added this paper in our discussion in the revised manuscript. Accordingly, we have revised our discussion on the comparison with literature.

“A number of C₅ organic nitrates have been observed in field studies. For example, C₅H₇₋₁₁NO₆₋₈ and C₅H₇₋₁₁NO₄₋₉ have been observed in the gas phase (Massoli et al., 2018) and the particle phase (Lee et al., 2016; Chen et al., 2020), respectively in a rural area of southeast US, where isoprene is abundant. Xu et al. (2021) observed a number of C₅ 1N-HOM such as C₅H_{7,9,11}NO_{6,7} in polluted megacities of Nanjing and Shanghai of east China during summer. While many of these HOM have daytime sources and are attributed to photo-oxidation in the presence of NO_x, nighttime oxidation with NO₃ also contribute to their formation (Lee et al., 2016; Chen et al., 2020; Xu et al., 2021). C₅H₇₋₁₁NO₄₋₉ were also observed in chamber experiments of the reaction of isoprene with OH in the presence of NO_x (Lee et al., 2016). C₅H_xNO₄₋₉ and C₅H_xNO₄₋₁₀ have been also observed in the gas phase and particle phase, respectively, in a monoterpene-dominating rural area in southwest Germany (Huang et al., 2019).” (Sect. 3.2.2)

“2N-monomers have also been observed in previous field studies. For example, Massoli et al. (2018) observed C₅H₁₀N₂O₈₋₁₀ in rural Alabama US during the SOAS campaign. Xu et al. (2021) observed C₅H_{8,10}N₂O₈ and C₅H₁₀N₂O₈ in polluted megacities of Nanjing and Shanghai during summer.” (Sect. 3.2.3)

2. In response to the last comment by Reviewer #1 regarding isoprene dimers in the real atmosphere, it was noted that C6-C10 HOM were reported in Chen et al. (2020). While these species are more likely to arise from monoterpene oxidations, Chen et al. noted that other sources including dimer formation from isoprene is also possible. I think it would be useful to note this in the current manuscript to inform the readers as the community continue to elucidate the sources of these compounds in the atmosphere.

Response:

Accepted.

In the revised manuscript, we have added the following discussion.

“Few field studies have reported HOM dimers formed via the reaction NO₃ with isoprene. This might be because

NO₃+isoprene-HOM dimers can have the identical molecular formula to the HOM monomers from monoterpene oxidation. Possible contribution of dimer formation in the isoprene oxidation to C6-10 HOM in the particle phase observed at a rural site Yorkville, US is reported by Chen et al. (2020), although these HOM are attributed to be more likely from monoterpene oxidation.” (Sect. 3.3)

“We are not aware of field studies reporting NO₃+isoprene-HOM trimers, which is likely due to the same reason for dimers discussed above. It is challenging to distinguish HOM trimers formed in the reaction NO₃ with isoprene from the dimers formed by cross reaction of the RO₂ from monoterpene oxidation (C10-RO₂) with that from isoprene oxidation (C5-RO₂) as their molecular formula can be identical.” (Sect. 3.4)

3. On a related note, other than Huang et al. and Lee et al. (line 350-357), these species have also been reported in Massoli et al. and Chen et al.

Response:

Accepted. We thank you for pointing out our overlook. In the revised manuscript, we have improved our discussion to also include these two studies as in our response to the comment #1.

Besides the revisions above, we have also corrected a few typos and format throughout the manuscript.