Atmospheric Chemistry and Physics Discussions

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Comment on acp-2021-284

Anonymous Referee #2

Referee comment on "Nighttime chemistry of biomass burning emissions in urban areas: A dual mobile chamber study" by Spiro D. Jorga et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-284-RC2, 2021

The manuscript by Jorga et al. reported the night-time SOA production from the urban ambient air influenced by biomass burning using a mobile dual smog chamber. By injecting ozone into one reactor while leaving another one unchanged as a reference, the authors found significant SOA production, which was attributed to NO3 oxidation. The authors compared the AMS mass spectra in this study to the OOA formed from the NO3 oxidation of fresh biomass burning emissions and found high similarities. Organic nitrate production was also investigated and the results are helpful to better understand the organic nitrate formation from urban air influenced by biomass burning.

However, there are quite a few issues throughout the manuscript, which need to be addressed before it can be considered for publication.

- L86-89: These lines should not be here. The advantages of using a mobile dual chamber compared to traditional chambers need to be introduced before Line 81.
- L100: It is recommended to provide a map of the site, probably in SI.
- L102: A general description of RH and temperature of all experiments is needed here.
- L160: PIKA version is not right.
- L168-169: The theta (θ) angle is quite an important parameter in this paper. The authors should provide more details about it, rather than only citing references here. Otherwise, the readers won't know how it is calculated, and why it can be used as a parameter for similarities.
- L180: Just curious when was the sunset? The experiments were supposed to start only after the sunset.
- L191-192: Should provide a reference or more details about the PMF analysis.
- L209-211: The authors need to be careful when stating this. The OA formation rate of 25 μg m-3 h-1 is only true with the extremely high ozone concentration here (240 ppb). These lines need to be revised.
- L219-221: The calculation details of organic nitrate need to be provided in SI.

- L223: Why the ammonium concentration increased? Need some discussion here.
- L225: This sentence needs to be moved to somewhere around L189-196.
- L232-233: What is the threshold of similarity for θ? The authors mentioned θ several times in this paper but never said anything about the threshold. Without this, one can not tell if the mass spectra are similar or different from each other.
- L234: Move this line to the beginning of this paragraph.
- L247: "particle loss rate constant".
- L276-282: The authors should summarize the produced OA concentration, the OA enhancement ratio, and the O:C after oxidation in a table, probably in Table 1. Besides, it's better to use numbers rather than percentages when describing O:C.
- L290-291: Not only this, the authors should also consider the non-BB emissions in urban ambient air.
- 4.2: The OH concentration is 15%-30% of the atmospheric average concentration, and the ozone concentration is extremely high. Therefore, the authors need to estimate the fractions that react with OH, ozone, and NO3, rather than simply stating that NO3 oxidation dominates the overall reaction. It should be done for the major VOCs at least.
- L302-303: The NO3 concentration did not increase immediately. As shown in Fig. S1, the NO3 concentration is still 0 at 0.3 h. Need some discussion here.
- L318-319: Why low initial NO leads to lower SOA production? Because of lower NO3? If so, should say that here.
- L320-321: How is the relationship between NO3 and formed OA? Better show it in Fig. 8 as well.
- Table 1: Ozone and total VOC concentration should be included.
- The theta (θ) angle needs to be included in Figs. 2 and 5.
- SI: Merge Table S1 and Table S3. If possible, put them in Table 1.
- SI: It is better to show the VOC species in Figure S2.