

Undetected BVOCs from Norway spruce drive total ozone reactivity measurements

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Reviewer 1 comments and response

In this revised manuscript, authors appropriately responded to reviewer's comments and the descriptions are improved and clarified. Especially, the new nomenclatures as 'TOZRE' and 'COZRE' are clear for readers to distinguish them. Therefore, this work is good enough to be published in this journal. Note that, for the revised points, the reviewer has to indicate a few technical suggestions.

1) Line 14 in Abstract:

To clarify and distinguish TOZRE and COZRE in Abstract, the following suggestion is possible.

(Now) However, the observed emissions ...

(Suggestion) However, the observed emissions (COZRE) ...

Revised Version

However, COZRE made up only 35% of the TOZRE, with sesquiterpenes being the most important sink for ozone.

2) Lines 138-139:

Why does 'the continuous injection of ozone into the reactor counteract ozone decay'? However, it is not clear.

Authors described in the answer to the previous comment, 'this underestimation arises due to the instrumental design ...'. The reviewer guesses that such a counteraction is possible when the 'flasks' (not 'flow tubes') are utilized as the reactors. In the flasks, the decayed (decreased) ozone ($[O_3](t)$) can be mixed with the continuous injection of ozone ($[O_3](0)$) and the ozone decay can be 'diluted'. Is that right? If so, would you please clarify that such a counteraction was due to the reactor design (mixing in the flasks) as the following suggestion, for example?

(Now in Lines 138-139) The continuous injection of ozone into the reactor ...

(Suggestion) In this study, flasks were utilized as the reactor. The continuous injection of ozone into the reactor (flasks) ...

If the counteraction is due to other factors, would you please add a short description in the text?

Revised Version:

TORM utilizes glass flasks as the reaction chamber unlike the flow tube reactor in Sommariva et al. (2020). The continuous injection of ozone into the reactor (flasks) counteracts.....

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Reviewer 2 comments and response

I think the authors have addressed most of the reviewers' concerns satisfactorily. I have two minor comments and, if they are satisfied, I think the paper can be accepted for publication.

1) With regard to Figure 8, and the associated discussion in section 3.5, it looks like a large fraction of the "high reactivity" data points actually overlap with the "low reactivity" data points. I would expect more, or better, separation between the two groups. Can the authors comment on this?

Certainly, your observation about the overlap in Figure 8 and the discussion in section 3.5 is valid. The overlap between "high reactivity" and "low reactivity" data points is due to the method of categorisation. We separated the periods based on daily averages: if the reactivity surpassed a specific threshold ($1 \times 10^{-9} \text{ m}^3 \text{ s}^{-2} \text{ g}^{-1}$), it was marked as a high reactivity day; otherwise, it fell into the low reactivity category. Consequently, there are instances where reactivity and temperature coincide between days in both periods. For instance, reactivity might be similar during certain night-time and morning hours for both high and low reactivity periods. However, a clear separation exists between the two categories, supported by numerous data points indicating high reactivity.

2) With regard to the calibration of TORM (appendix B1), I understand the authors' argument that the "two points" calibration has similar slope as the other calibration, but I still think it is not appropriate. I would suggest to consider the 5 points together in Figure B1 and show only one fitting line and equation. As I understand it (please confirm) the average slope is used throughout the paper anyways, so that would be more consistent in any case.

Thank you for your comments. Indeed, the same coefficients were used throughout the paper. We have made corrections to the calibration graph and also the data. Since the values have changed a bit, all the calculations were redone.

Revisions:

Changes have been made to Figures 5, 6, 7, and 8 in the main content, along with Figure B1 in Appendix B1, incorporating updated values. Some values in the text have also been revised, although the differences were not significant. The data file has also been updated along with the link to the repository.