Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-416

Anonymous Referee #1

Referee comment on "Measurement report: Variability in the composition of biogenic volatile organic compounds in a Southeastern US forest and their role in atmospheric reactivity" by Deborah F. McGlynn et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-416-RC1, 2021

General comments:

McGlynn et al. report on long-term chemically resolved BVOC measurements by GC-FID in a temperate forest. Year-round data for chemically speciated BVOCs is still scarce, so the manuscript is a valuable addition to the existing literature. The analysis of the atmospheric impact of the measured terpene species by calculating their OH, NO3 and ozone reactivities adds to the significance of this paper. I recommend the publication of the manuscript in ACP after the following comments are addressed:

Specific comments:

l. 71: In the Goldstein 2000 reference cited here, there are no BVOCs, so it seems misplaced. The Helmig 2016 reference about natural gas VOCs also seems not very relevant in the BVOC context. An important reference to add in the list of long-term chemically resolved BVOC measurements would be https://doi.org/10.5194/acp-18-13839-2018 , and maybe , https://doi.org/10.5194/acp-18-3403-2018 .

l. 141 ff: Please comment on the uncertainty of these calculated rate constants. How does the calculation method perform for molecules with known rate constants? And what is the resulting overall uncertainty for your calculated reactivities?

l. 148-152: How complete is the method for monoterpenes? Is this a lower bound, too? E.g. do you know what the peaks between M7 and M8, or between M10 and M11, are?

Fig. 5 legend: You did not measure diterpenes which you mention in the introduction, therefore is it fair to call this "all terpenes"?

Fig. 5 caption: The term "total OH reactivity" usually refers to a direct measurement of total OH reactivity. Here you calculated reactivity from measurements of relatively few individual compounds, which means you cannot be sure that you really captured the total. Therefore, please replace the term "total OH reactivity" with "OH reactivity of total observed terpenes" as in the text, or something else, like "calculated OH reactivity".

l. 203-204: It would be good to mention here that these reports are direct measurements of total OH reactivity, so they are not directly comparable to your method. However, these papers usually also include speciated reactivity (e.g. Nakashima et al. does), which you could use to directly compare your terpene reactivity to their terpene reactivity.

l. 223 f: Please comment on the potential contribution of unmeasured diterpenes.

l. 235f: What is the sesquiterpene contribution and do you expect an influence of unknown SQTs to NO3 reactivity?

Data availability: Using a repository with a doi would be preferable to store the data for the long term and make them more easily accessible to the scientific community. Especially with such long term data this would probably help the modeling community use them.

Technical comments:

Caption of Fig. 3, and throughout the manuscript: Sometimes you call MACR and MVK "isoprene reaction products", sometimes "isoprene oxidation products". Please choose one for consistency - I'd suggest “oxidation products”, because “reaction products” is more ambiguous.

l. 155: Does +/- signify the standard deviation? Please specify by writing "average +/- standard deviation" at least the first time you use it.

Table 2 caption: Average and standard deviations? Please specify.

l. 154-162 inconsistent in past and present tense

Caption Fig. 8: the word “reactivity” is missing behind “nitrate”

l. 253: “would be allow” – remove the “be”