

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2022-141

Anonymous Referee #1

Referee comment on "Minor contributions of daytime monoterpenes are major contributors to atmospheric reactivity" by Deborah F. McGlynn et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-141-RC1>, 2022

General Comments:

This paper makes an excellent argument for the need of long-term speciated terpene data to correctly model atmospheric chemistry. Compounds with small ambient concentrations can still play a large role in oxidative capacity and potentially aerosol formation.

To me, this paper provides quantitative support for something that has been stated or implied in the literature for some time. I do not consider the light-dependence emission of limonene or the light-independent emission of α -pinene to be novel, but the quantification of these patterns is nice to see. It gives the atmospheric community a lot to think about in terms of how to approach modeling these complicated systems.

This paper raises two question in my mind:

- Since there is a link between chemical structure and reactivity and some of the light-dependent emissions are highly reactive, then there must be a link between chemical structure and emission pathway (or at least internal synthesis). Can the authors explore this?
- If compounds with small ambient concentrations matter, what about sesquiterpenes? I can see that they were measured in this study (at least 2 are mentioned), but they are not mentioned in the results. How do they factor into this conversation?

Specific Comments:

The introduction needs some work. First, the references are sometimes distracting; some are repeated multiple times – for example, it is in each sentence within one paragraph. I think there is a more efficient way to use the literature. I'm not sure that all references are necessary in each sentence; ensure that they all refer to what you think they do. I do not understand the "discrepancy" found in the literature. Are the authors trying to say there is disagreement about what terpenes are light- or temperature-dependent? I think this entire paragraph should be reframed. The emission of most monoterpenes are thought to be light-independent, but there is some evidence for light-dependent emission (similar to isoprene). This paper is going to use factor analysis to tease out how much of the emissions are in each category.

Although this is not the paper that describes the location and instrumentation, I think a little more detail is warranted. Specifically, I would like to see how sampling and calibration was accomplished because you are highlighting reactive species. Accounting for reactivity and deposition is so critical to the accuracy of these measurements. In that same vein, Lines 115-116 is confusing – normalized values are multiplied by the sum of the concentrations – how does that provide speciated data?

Limonene is used throughout as a model for light-dependent emissions, but according to Table 1, only 57% of its emissions are described that way. Can you comment on this?

Technical comments:

There are some wording issues. For example, I think line 13 is better communicated as: "the need to monitor species with high atmospheric reactivity, even though they have low concentrations, to more accurately..."

Line 18-19: "with secondary effects of other ecological factors" doesn't make sense to me. I understand ecological effects play a role in BVOC emissions, but what is meant by "secondary effects"?

A few issues with parentheses (missing or incorrectly placed) – e.g. Line 49, 50, 248

The formatting is awkward when referring to papers that provided software or equations.

Line 99: between May and September

Line 179: the black arrows are not present in (b)

Figure 3: the caption should have "and" instead of a comma. The black arrows should be noted in the caption.

Table 1: the caption is insufficient; it implies that the percentages are calculated based only on light-dependent emissions. LIF and LDF acronyms must be defined here. Why are there only 11 species – where is the data for the other measured species? I think isoprene would be a great addition, since it is referenced and plotted throughout the paper. Also, the sesquiterpene data would be interesting (see comment above).

Line 201: "illuminate's clear differences" – first, the apostrophe is incorrect. Secondly, I don't see clear differences in Figure 5; the shape is actually quite similar.

Figure 5: explain the dotted lines in the caption. Citing "figure 5a" twice in the same line (214) is not necessary.

Word choice should be considered with care. Words like "belies" and "concomitantly" are not commonly used.

Line 233: is the 20% for both ozone and OH reactivity?

Lines 253-255: This sentence is very awkward and should be rephrased.