

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-141

Anonymous Referee #2

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-RC2>, 2022

General Comments

The manuscript by McGlynn *et al.* describes measurements of BVOCs in a US forest across two consecutive growing seasons. The authors focus their analysis on the observed monoterpenes and highlight the different behaviour of some monoterpene species with respect to incoming solar radiation. In particular, they describe how the emissions of some monoterpenes appear driven by incoming radiation as opposed to temperature alone, and how in turn these affect the overall reactivity of monoterpenes towards the two main atmospheric oxidants, OH and ozone.

The data presented ultimately supports the conclusions drawn by the authors. However I found some of the vocabulary used in the description of the results somewhat hyperbolic. I also found the method section lacking in detail, in particular the part about the measurement site and the measurement routine (see specific comments below). I understand the authors cite a paper where these details are presented, but the information in that reference should be summarised here to allow this manuscript to stand on its own.

There are also a number of sentences and expressions throughout the manuscript that come across as rather vague and imprecise, and these should be made clearer. Overall, the manuscript would have benefitted from a more thorough proof-read.

In summary, I recommend publication once the comments below are addressed.

Specific Comments

Line 11 – “driver” is not the correct word here. You are separating by “emission type” (light dependent vs light independent)

Line 16 – BVOCs are indeed SOA precursors but they are not precursors to oxidation reactions, they are co-reagents! This needs to be rephrased for clarity.

Line 21 – “they also require light”. This is a bit vague, please rephrase to something along the lines of “they are linked to photosynthesis and therefore require photosynthetically active radiation (PAR)”

Line 37 – also add dispersion as a cause of the drop in concentration

Lines 50 and 51 – representation where? I assume the authors mean something along the lines of “Despite accounting for light dependent and independent monoterpene emissions

in models, discrepancies exist between these models and observations". This whole sentence needs to be revised as it is unclear.

Line 77 – you need to also add OH reactivity

Line 78 – same as above.

Line 88 – The authors need to provide more details on the measurement site. What type of forest is it? What are the dominant emitters of monoterpenes?

Line 91 – Can the authors comment on the choice of sampling air from mid-canopy rather than from the top of the canopy? Any advantages, disadvantages or caveats?

Lines 92-95 – Please provide a brief account of how the GC-FID was calibrated.

Line 112 (equation (1)) – please explain where the value of 0.15 arises from

Line 127 – replace ~10% with ~10-16%. You gave a range on line 125, it needs to be double that range here.

Line 128 – Given how some of these reaction coefficients are poorly characterised, what additional uncertainty does this add to the reactivity calculations, and ultimately your conclusions? Can the authors comment on this?

Line 141 – Emissions are temperature driven, not concentrations!

Figure 3 – There appear to be some very low values in all three panels after Jul 2020 and before the gap in the timeseries. Are these real? If not, please remove.

Caption to Figure 3 – Please state what the three arrows indicate. I know it is in the main text, but the caption and the figure it accompanies need to be somewhat "self-contained"

Figure 4 – A correlation plot of the Light Dependent and Light Independent monoterpenes vs Isoprene would support what the authors say in lines 186-187 better than these three timeseries.

Line 204 and then again Line 212 – I have an issue with the words "prevail" and "enormous" in this context. I can see the peak emergence in the reactivity plots in Figure 5, but it still does not prevail over the night-time peak. Please rephrase. Also replace "enormous" with "significant"

Figure 5 – Why not show both years together?

Caption to Figure 5 – Please explain what the dashed lines are

Line 214 – It is not that they "have little diurnal pattern", but they have a less pronounced one. Please rephrase.

Line 226 – Can the authors speculate on what processes might lead to the emission of LD monoterpenes?

Technical Corrections

Line 9 – should read "concentrations" (plural)

Line 7 – add "USA" after Virginia

Line 24 – "primarily with a temperature dependence". A bit colloquial. Rephrase to "primarily driven by temperature".

Line 34 – should read "peak around midday"

Line 35 – replace light with PAR

Line 55 – replace "not light dependent" with "independent of light"

Line 79 – replace "coming" with "arising"

Line 86 – Virginal should read Virginia

Line 88 – add USA after VA.

Line 89 – replace "a gas chromatography flame ionization detector" with "a gas chromatograph with flame ionization detection"

Line 91 – replace "seen" with "found"

Line 118 – "i" should be subscripted

Line 121 – add "are": "are listed"

Line 132 – add "to" after "contribute", and replace "large" with "largest"

Line 140 – replace "evening" with "night-time"

Line 141 – replace "due to" with "modulated by"

Line 148 – replace "lows... highs" with "minima... maxima"

Line 150 – “the reaction rate of limonene with OH radical, and ozone, is 3, and 2.3, times as fast, respectively, as those of α -pinene.” Very convoluted with all the commas. Replace with “the reaction rates of limonene with the OH radical and ozone are, respectively, 3 and 2.3 times faster than those of α -pinene”

Line 158 – add “to” after “through”

Line 164 – “Driver” should be plural

Line 165 – remove “species”, it is redundant

Lines 171-172 – Replace “exhibit a tendency to have high daytime concentrations” with “exhibit a tendency to daytime peaks”.

Line 195 – “more evenly split”?

Line 201 – I think the authors mean “illustrates” here?

Line 205 – add “relatively” before “lower”

Line 252 – Replace “Small gaps such as these” with “These small gaps”