

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-142

Anonymous Referee #2

Referee comment on "Growth and actual leaf temperature modulate CO₂ responsiveness of monoterpene emissions from holm oak in opposite ways" by Michael Staudt et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-142-RC2>, 2022

The manuscript describes a greenhouse experiment where the effects of elevated CO₂ and growth temperature on holm oak leaf scale monoterpene emission rates are assessed. This is very relevant research topic already for decades, and the authors manage to scrutinize the experiment in a way that they can eventually conclude novel and interesting results.

The monoterpene emission responses to elevated CO₂ and temperature were decoupled. Clear differences between cool- and warm-grown plants could be seen, the latter being more sensitive to CO₂ inhibition. Contrasting this, a lower actual measurement temperature seemed to lead to larger CO₂ inhibition compared to measurements at higher (35C) temperatures. This is rather surprising when the temperature difference is only 5C. The authors explain this with the leaf energy balance, similarly as has been shown for isoprene. Still, some explanations of the seemingly rather small temperature difference should be interesting for readers. In contrast, growth CO₂ had no significant effect on emission CO₂ sensitivity, although it promoted plant growth and the leaf's emission factor.

The methods are well designed and elegantly used. Several different normalisation methods are used for assessing the uncertainties related to plant chemotype, growth conditions and measurement conditions. Finally, the obtained non-linear responses are used to upscale the short term impacts to annual emission dynamics using the MEGAN algorithm.

Overall, the ms represents an elegant experiment and is well compiled. It could be revised by removing some of the speculations and using the figures more directly to show the reader the main results, this would lead to significant shortening and clarifications of the main messages. Some linguistic errors and typos should be corrected, and a few other aspects could be clarified in the manuscript:

- how old were the measured leaves, were they of same age?
- what part of the canopy? how tall were the saplings?
- what was their rooting size?
- emission measurements: how many adsorbent tubes per CO₂ level and leaf?
- was the humidity of incoming air controlled?
- Supplementary table 1 has remnants of non-english origin (mars)
- Figure 5 is an overview of the correlation network, but is does not really clarify the results and is almost impossible to read. I recommend removing it. However, I was missing a multivariate analysis where the combined effects of temperature and CO₂ levels could have been assessed.