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Biogeosciences Discussions

Interactive comment on "Biogenic isoprenoid emissions under drought stress: Different responses for isoprene and terpenes" *by* Boris Bonn et al.

Anonymous Referee #2

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This manuscript describes the drought response of BVOC, especially terpenoid, emissions with a focus on a German beech forest. BVOC emission drought response is an important topic that has received relatively little attention and is a subject suitable for readers of Biogeosciences. There are three main components of the paper: 1) a literature review of ∼13 BVOC drought studies, 2) the development and description of 3 terpenoid emission drought response parameterizations, and 3) observations at a site in southwestern Germany. Each of these components is a potentially worthwhile contribution to the paper but there are issues with each component that should be addressed before this paper is published.

General comments

Literature review: This is a significant effort given the lack of similar reviews on this topic. An especially valuable aspect is the compilation of literature data shown in figures 1,2 and 3. How were these data were obtained? i.e., were they from tables in the referenced papers, by digitizing figures in the papers, by contacting the authors of the referenced manuscripts? It would be especially useful contribution to the scientific community if the authors reported these data (all the values in figures 1, 2 and 3) in a table in the supplementary material so they could be used to compare with other studies. Almost all of the reviewed studies represent European sites/trees even though there are some BVOC emission drought response studies from other parts of the world (e.g., Asia, US, Israel, Australia). This may be reasonable given the focus on a site in Germany but this limitation should be mentioned in the text, and perhaps the title, to make it clear that this is not a comprehensive review but rather is focused on European vegetation. In addition, the authors should consider the different vegetation types in their analyses and indicate the different vegetation types (e.g., temperate, Mediterranean, etc) in the Figures etc.

Drought response equations: The authors propose three algorithms that they have labeled as "biological growth curve", "hydrological conductivity" curve and "oxidative stress" curves. The term "biological growth curve" is not a good fit here since that term refers to a change with time. Also, section 2.3 focuses on the different pathways for BVOC to escape from a plant (i.e., diffusion control or stomata control) but the authors do not demonstrate that this is the main control over the drought response of these emissions. The numerical form of these parameterizations are fine but the labels are misleading and the authors should discuss alternative controlling processes and provide more convincing evidence that the escape pathway is the important factor controlling drought response behavior.

Observations: Section 2.4.1 indicates that BVOC enclosure measurements were made on beech saplings and then mentions OH and ozone reactivity of observed emission

rates and corresponding forest air composition. But then there is no mention at all in the paper about forest air composition measurements and the only mention of the seedling BVOC enclosure measurements is in Figure S1 which is not discussed and does not appear to be relevant to the paper. These BVOC observations should either be removed from the paper or the presentation and discussion of this data should be substantially enhanced.

Specific comments:

line 16, “whereas of others”: delete “of”

line 19: “On the contrary, OH and ozone reactivity enhance”. Contrary to what?

line 26: “largest contribution to global carbon flux besides carbon dioxide and methane” seems to suggest that methane emission is larger than BVOC but the authors state an annual BVOC emission of >1 Pg which is higher than most (or all) methane emission estimates.

Line 137: What is meant by “least barrier”

Line 189: what is meant by “ emissions of any vertical mixing “

Line 191: tenths or tens? What is the point of this sentence? Is it regarding characterization of the source footprint of the BVOC observed in the air? What is meant “next kilometers”. Either better describe what is being said here or delete this sentence.

Line 230: “extend” => “extent”

Line 261, 331 Figure 2/3): It should be noted that Guenther 2006, 2012 (i.e., MEGAN2 and MEGAN2.1) applies this soil moisture algorithm ONLY to isoprene and did not recommend using it for monoterpenes or sesquiterpenes.

Line 293: ent-kaurene is not a sesquiterpene. It is a diterpene.

Line 310: fasted => faster

Line 344: What is the evidence for this generalization that overall BVOC increases with drought? An incorrect doi is listed for the “Rombach, J.” reference (the one given is for the Lupke et al. 2017 paper).

Figure 5: The legend does not seem to describe what is shown in the figure. What are the two conditions? What are the individual fluxes?

Figure 6 and 7: Clarify whether these are model results or observations.

Figure 7: Show the induced drought periods.

Some sentences could be improved with editing for English usage. For example, sentences in line 20, 52, 79, 91, 92, 110, 149, 154, 176, 264, 284, 297, 322,339, 382, 410 and others

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