

Biogeosciences Discuss., referee comment RC3  
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## Comment on bg-2022-15

Anonymous Referee #3

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Referee comment on "Reviews and syntheses: VOC emissions from soil cover in boreal and temperate natural ecosystems of the Northern Hemisphere" by Valery A. Isidorov and Andrej A. Zaitsev, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-15-RC3>, 2022

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The manuscript by Isidorov and Zaitsev aims to provide an overview of what is known about the contribution of litter and soil cover to ecosystem bVOC fluxes and emphasize the need to study these sources and their controls so to improve predictive models for atmospheric chemistry and our understanding of species interactions mediated by these emissions. The review focuses on northern, boreal forests and is comprehensive in scope and very-well cited. My main issues have to do with structure, synthesis, and the impact of the tables and figures. First, the way the text is structured into sections/sub-sections and the lack of clear topic sentences made it challenging to follow the logic and key points of the paper. There are a number of areas where the text can be re-worked for brevity and more streamlined by providing only important details or results of studies without so much extraneous details. At times, the text becomes quite "listy" and references are related, but not well-integrated in making an overarching statement or generalizable comment. This is related to my other main concern, which was the lack of substantial synthesis despite the incredible amount of literature cited. What can we say with some certainty that might hold true across biomes in these regions and how much is site, species, and climate specific? An outline of the major knowledge gaps should be explicit at the end, but it might also be helpful to touch on these at the end of each section, presenting what we do know followed immediately with what limitations exist and how they might be addressed. Finally, a number of the tables and figures appear to simply re-package data from a single paper and it's unclear why those studies were chosen and thus, the impact of these data displays are minimal.

Specific comments:

L18: Repetitive with L11, consider deleting

L40: Delete "to" after the comma

L40-44: Consider making this one topic sentence by combining and streamlining. E.g. Terrestrial living vegetation is the main source of atmospheric VOCs that significantly affect chemical processes in the boundary layer. These emissions have garnered considerable attention due to the majority of them being highly reactive, and thus, impacting atmospheric chemistry..."

L80: It's unclear why methyl chloride is emphasized here, instead, you could use the Bahlmann et al. citation to support the statement that significant biological sources remain elusive.

L84: What does the acronym TOHRE stand for?

L87: identify and quantitatively characterize is repetitive, could simply say "identify and quantify." Also, it's unclear how we can characterize unknown reactive VOCs...this is a point that could be elaborated upon, and other well-known processes and effects (like the production and destruction of ozone, etc.) could be more streamlined and concise.

L108: This sentence is unclear; the concentration of many secondary metabolites is significantly reduced compared to what? Fresh and living leaves?

L134: While interesting, the text in this paragraph can be significantly reduced and streamlined. Also, it is unclear how the natural source of reactive VOCs has remained unaccounted for and unquantified if the Zimmerman et al. (1978) paper reported the magnitude of VOCs from leaf litter. Is it that this has remained relatively unexplored since? Please clarify.

L154: Specify "these important components" as leaf litter and soil cover and consider moving the definitions of these terms (L172-186) up after L154 and end the paragraph with L154-158.

L187-189. This sentence is quite long and the clause "available information regarding the emission rates of separate VOCs" seems out of place and not well integrated. Consider revising for brevity/clarity.

L217: Change "they" to "that"

L233: Please provide a citation for this statement.

L226: The relative proportion or importance. It would make sense that a lot or most of these processes are occurring all the time, but perhaps at different rates and interacting/overlapping in various ways depending on prevailing environmental conditions. This makes it sound like processes like leaching appear and disappear, where in fact there is always that potential, but it becomes more and less important during certain times of the year and under specific conditions. Also, this topic sentence is inconsistent with the content. The biotic processes are mentioned, but this paragraph only focuses on abiotic factors. L236 is vague and not effective in supporting the rest of the text in this section.

L239: More pronounced distinction of what? Please specify and construct a more robust topic sentence.

L254: What does "with the influence of experimental conditions determined" really mean? Please clarify. Did they test in the absence of O<sub>2</sub> and then in humid air? Also, L257-261 seem irrelevant considering the initial speculation was made on very limited data.

L283-286: Please provide a citation for this and it also seems like a bit of a non sequitur between paragraphs.

L331: Please write out LSC in words to remind reader of the acronym.

L408: This entire paragraph is about one study, and instead, could be briefly summarized to follow up on what was stated on L405, emphasizing that VOCs after sufficient decomposition by microbes were likely the products of their metabolism and point out these specific classes et.g., C<sub>3</sub>-C<sub>8</sub> carbonyl compounds, lower alcohols, etc.

L445: the microbial succession section can be simplified and some information from the preceding paragraph incorporated within (instead of it standing alone with lots of extraneous information). Also, L459 is vague and uninformative as no other details are provided. The following sentence is equally confusing in terms of whether these patterns are generalizable or are site/ecotype specific.

L470: I think this sentence is missing something at the end (a verb?).

L630: There are studies on soil cover and below canopy VOCs from deciduous US forests that might be relevant here (See Stoy et al. and Trowbridge et al. 2021).

I'm not quite sure I see the relevance of Table 1.

The inclusion of Tables 7 and 8 are also confusing: Why list all the compound emission presented from one paper? Might this be a copyright issue? The same can be said for Figures 1 and 2 (reproduced data from the author's 2010 paper). Why are these being specifically highlighted when the review should be synthesizing and compiling data from many sources.