

We want to thank the editor for the opportunity to further improve our manuscript. Please note that our answers are in blue and that the line numbers correspond to the updated manuscript. The quotations in italics are the modified parts of the manuscript.

Reviewer 1

The authors have done a nice job addressing my previous comments. I have some minor comments below that are mostly editorial, but I do have some remaining requests for the authors to clarify their methods further. Overall, this paper is a nice contribution to the literature.

We like to thank reviewer 1 again for their time they put into reviewing our manuscript, we appreciate the effort and additional editorial comments.

Lines 15-17: do you mean to say “we modeled the relationship between..... on all three pathways?

We think “compared the influence” is a better word here than “modelled”

Lines 54-55: reads as an incomplete thought... This could actually be the topic sentence of the next paragraph (and just drop “though”)

Amended.

Line 140 & 147: I’m a bit lost here... did you introduce headspace to the 150mL bottles you mention in the beginning of this paragraph? Or are these two separate things (e.g. the headspace method applied to the spatial transects)?

We applied the headspace method to all samples collected in borosilicate bottles. We used a 90 ml subsample of the 150ml water collected. We added “*All water samples in borosilicate bottles were analysed as followed: ...*” (145-146)

Line 156: I wouldn’t call this a “floating bubble trap”, I would call it a floating chamber (sounds like you had a second smaller floating chamber that was used for diffusion). It differs from a traditional (funnel) bubble trap in that there is not a narrow chamber (with a small surface area: volume ratio) to reduce re-equilibration of escaped bubble methane back into the water column). I think adding a sentence that states that ebullition was quantified as the difference between total flux and diffusion (and then referring the reader to the following relevant section) would help clarify what was done here.

We changed ‘bubble trap’ to ‘floating chamber’. We stated in section 2.8 (lines 199-200):” *As our chambers (section 2.5) measured total flux (i.e. diffusive + ebullitive), the average diffusive flux was subtracted from each ebullition chamber to estimate the ebullitive flux, ...*”

Figure 2: I don’t think I would call this an “ebullition chamber”. It is commonly referred to as a floating chamber (and you subtracted a diffusive flux to get at ebullition).

Caption changed to: “*a floating chamber to collect ebullition (f),*”

Line 168: plotting clay? Or pottery clay?

Amended

Line 171: add “smaller” before the diameter to clarify this was a second floating chamber

Added

Line 185: Is “GasFlux” the name of an R package? And that is why you are giving a version? If so, cite the package.

Yes, we removed the version and added the correct citation.

Line 193: Why did CO₂ help assess leakages? Also, did you visually exclude floating chamber data where a bubble was obvious?

All trees emitted CO₂ whereas some trees emitted little to no CH₄. Therefore, when the CH₄ fluxes were low (featuring low r^2) and the CO₂ flux r^2 values were strong, we assumed that there were no leakages. This is now clarified in the manuscript (lines 193-194):

“In lower CH₄ fluxing trees, the CO₂ flux linear regression r^2 values were used as a proxy for assessing air-tight chamber seals, as all tree stems emitted CO₂. “

Floating chamber data where a CH₄ bubble was obvious were re-set in the field, therefore not noted down, and a new measurement was started.

Lines 194-200: This approach probably underestimates ebullition since less diffusion will occur as the floating chamber headspace becomes more and more enriched with methane... maybe just something to mention at some point in the paper.

We added the following in the discussion (lines 557-559): *“Also, our approach to collect ebullition likely underestimates this term, as CH₄ saturation within the headspace of the floating chambers may limit the continued diffusion of the gas.”*

Line 203: Not an appropriate use of “i.e.”... maybe just say “even though”

Amended

Line 204-205: Not sure what you mean by “for tree stem...reservoir upscaling”?

Thank you. We changed it to (lines 205-206): *“... beyond this point. The upscaled tree stem CH₄ fluxes were used in comparison between sites and in total reservoir upscaling.”*

Line 240: “wer” should be “were”

Amended

Line 242: “testes” to “tested”

Amended

Figure 3: Can you use dashed vertical lines for the sampling timeframes instead of arrows... would make it easier to see how the dates overlay with the lower panel especially. Also consider breaking up the figure legend to describe top and bottom panels in sequence.

Amended

Figure 6- If I’m understanding this correctly, shouldn’t the units be per tree?

Yes, they are. We corrected the y-axis units to: “Tree stem CH₄ flux ($\mu\text{mol tree}^{-1} \text{ d}^{-1}$) 2.5m” and to the corresponding CO₂ flux figure (supplementary data).

Table 3- You have both less than or equal to 200 and greater than or equal to 200 in your stem height categories (the first row differs from all the others). I'm thinking the first row is correct and the others are incorrect since you already have specific fluxes reported below 200?

Correct, we changed all to ≥ 200 .

Line 389- taking should be taken

Amended

Line 400- I suggest deleting "Answering question 1" and just leading straight with the statement... it sounds a bit informal & the reader may have to go back to remind themselves about what question 1 was which is distracting.

Agreed. We initially added those based on previews comments from reviewer 2, but have now moved it to the end of the sentence for flow.

Lines 410-412- I'm confused by these two sentences (first of which is not a complete sentence). Didn't all the trees in this ghost forest die at the same time? As a discussion point, you could still point out that this pattern has been observed in other systems & then posit a scenario where it might matter in a reservoir/ghost forest (perhaps very slowly rising water levels for reservoir fill??)

We agree and we reworded as (lines 412-417):

"Decomposition stage is known to influence tree stem CH₄ fluxes, with recently dead trees exhibiting both elevated internal CH₄ concentrations (Covey et al., 2016) and higher CH₄ fluxes (Sakabe et al., 2025). In this study, all trees died simultaneously following reservoir inundation, meaning decomposition stage is unlikely to introduce meaningful variability among individual flux measurements. However, this dynamic may be relevant in other reservoirs where water levels rise gradually, producing ghost forests of mixed decomposition stages."

Line 415: By "strong" soil CH₄, do you mean high soil CH₄ concentrations?

Amended to (line 419): "... ecosystems featuring a clear soil CH₄ source"

Line 425: changing "that" to "and"

Amended

Line 460: the "every 6 degrees" is out of place unless you tell us by how increase per 6 degrees

Changed to (Lines 463-464): *"Sediments from boreal and temperate lakes have shown that CH₄ production and release increase exponentially with rising temperature"*

Line 486-487: There are quite a few other studies that have found this in other countries too... listing just the three makes it sound like only a few others have reported this. I suggest just providing these 3 papers as example references without naming countries.

Agree and amended

Line 491-492: Another relevant study is Berberich et al. 2020
<https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lno.11392>

Added

Line 502: Also check your wording here, add a “to” after “due” in two places

Amended

Lines 508-509: It’s a bit confusing what these numbers are referring to next to the different studies, although I can figure it out when I look at Table 5... I suggest omitting the numbers and referring the readers to the table.

Amended

Table 5- I suggest also including the negative fluxes in this table.

Amended

Line 551: Again, I wouldn’t start your sentence this way

We have now moved it to the end of the sentence.

Line 556: This seems like a strong statement... what if the reservoir doesn’t have any ghost trees? I would rephrase to say that the flux should be considered...

We added (lines 560-561): “... consider for ghost forest tree stem emissions, when ghost forests are present, ...”

Lines 566-576: Many elements of this paragraph feel repetitive, please try to shorten and keep concise.

We deleted repetitive statements.

Line 580: change “typically” to “sometimes”... I think this can really vary regionally

Amended

Reviewer 2

The authors addressed all the concerns I had raised. They added research questions and incorporated the answers to these questions into the discussion, removed data relating to CO₂ and carbon isotopes, clarified the distinction between diffusive and ebullitive fluxes, and improved imprecise terminology. All my minor comments, with one exception, were considered. I agree that they are free to use the units of their choice. I have no further suggestions; the revised manuscript is good.

We again thank reviewer 2 for their supportive comments which helped improve our manuscript.

References

Covey, K. R., Bueno de Mesquita, C. P., Oberle, B., Maynard, D. S., Bettigole, C., Crowther, T. W., Duguid, M. C., Steven, B., Zanne, A. E., Lapin, M., Ashton, M. S., Oliver, C. D., Lee, X., and Bradford, M. A.: Greenhouse trace gases in deadwood, *Biogeochemistry*, 130, 215-226, <https://doi.org/10.1007/s10533-016-0253-1>, 2016.

Sakabe, A., Liu, Z., and Kosugi, Y.: Methane Emissions from the Stems of Living and Dead *Chamaecyparis obtusa* Sieb. Et Zucc, *Wetlands*, 45, 54, <https://doi.org/10.1007/s13157-025-01941-9>, 2025.