

Biogeosciences Discuss., referee comment RC1  
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## **Comment on bg-2021-223**

Anonymous Referee #1

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Referee comment on "Long-term incubations provide insight into the mechanisms of anaerobic oxidation of methane in methanogenic lake sediments" by Hanni Vigderovich et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-223-RC1>, 2021

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General:

I think this manuscript would benefit from some more proofreading by the more experienced authors. It could use improvement on the structure and the writing, to improve the flow and make it more condensed. Please also pay attention to the switching between different tenses, and to improve the clarity of the methods section. Many different experiments have been performed in this study, which is wonderful. It makes it, however, difficult for the reader to keep an overview. Please structure the manuscript in a way that provides the necessary overview and clarity. Present the results in a structured way in the methods section, and don't be tempted to already interpret them – this belongs to the discussion. Also prevent the use of language that is either too strong (This means..), or is not specific enough (warm, very few etc.) Overall, I think the experiments are cool and valuable, but improvement is needed to bring this across to the reader.

Abstract

Introduction about sediments is too long. Could skip most of it, one or two sentences is enough.

Instead, tell us more about the two stages of incubations and  $^{13}\text{C}$  additions, multiple TEA and inhibitors. What did you use, what were the aims? If you don't want to stress these, give less detail, now it creates more questions than answers.

25-27. This sentence is a bit clunky, with the two words for the same process (oxidation and AOM). Also, here you name it methanic sediments while these were the incubations/reactors right?

The abstract could use re-structuring, please have in mind what are the most important messages you want to convey, stress those and don't give too much details about other things. It could also be nice to give one or two sentences at the end that place your results into a broader context.

Keywords: I would add mcr and methanotrophs

General textual: Methanic is not a word that is commonly used I think. Methanogenic is the more general term, at least, I think that is what you mean? But this is personal preference, to choose what you want to use.

## Methods

- If you want to say it's warm, give a temperature.
- Similar to what?
- Are there methane profiles?
- You have not mentioned the central lake or station A yet.
- which leaves = leaving
- Did they receive new methane after that?
- This sentence is weird, 'in case of' is not fitting.
- This seems more like discussion or results, not methods ('the variations...')
- The black coffee comes out of nowhere and the explanation about why only 1 replicate is not fitting.

This whole paragraph is chaotic, try to restructure to make it a bit more schematic and easier to follow, to help the reader understand.

Do you mean real porewater every time you write porewater, or an artificial substitute? It seems like a lot of porewater to extract, which is possible I guess, but I'm just not sure and curious!

- Don't switch between past and present tense within a paragraph.

249 I don't think this paragraph is necessary.

- Can you start with simply describing your results? You dive in deeply directly, it would be nice as a reader to get a bit of a gentle overview first, of what you measured and what that showed, to start with.
- No need to note that here.
- This was not subsequent but different experiments, right? The word first suggests otherwise.
- Discussion, not results. Stick to just listing the results, so the values that you measured and their patterns, here.

Fig. 2. What is the difference between the colors of the pre-incubated experiment? The legend calls them the same.

Fig. 3. The text is too small and therefore hard to read. Why don't you merge the replicates of each treatment into one line with error bars? They seem to nicely follow the same trends. Also, it would be nice to have the same y-axis and x-axis for easy comparison between the treatments.

Fig. 4. Similar to Fig 3: please merge the lines of the replicates.

Table 1. The names of the treatments could be improved. What is a typical fresh sediment bottle?

I'd be happy to provide more comments on a next version of the manuscript.