

This manuscript investigates the spatial patterning and environmental controls (namely water table depth, dissolved oxygen, soil temperature, GPP and various vegetation parameters) of methane emissions from a small sedge valley fen over a three-year period. They found methane emissions were lowest in the driest part of the fen, increased as moved towards the stream in the middle where the water table was seemingly in the optimal position and then decreased again closest to the stream due to the high amount of dissolved oxygen in the peat. Given the complexity in understanding CH₄ emissions from northern peatlands, the authors have done a good job of identifying the properties that are likely to influence them. The methane emissions recorded from this site are within the range of other similar peatland systems.

I thank the authors for putting together a neat study which is well written and reads well. It will be a useful addition to the literature. The results section could do with some clarity, as the wording used is a little confusing and I found myself having to go back and remind myself a few times. I shuffle of some figures to and from the supplementary information will provide the reader with better clarity. I think the discussion overall is well written and the authors clearly have a strong understanding on the controls on CH₄ emissions in this site. However, I do think there needs to be some more information included for this system in the context of the wider landscape/hydrogeomorphic setting? The link to 'climate change' is a little tangible – with much of the work being focused on the environmental characteristics measured. I think giving the reader a greater understanding of the context of these ecosystems in wider landscape will help improve the 'impacts of climate change'.

Specific comments:

Line 19: I find the phrase 'climate changed caused variations' rather awkward and would recommend tweaking it.

Line 55: Given the novelty of this study is the focus on valley fens which according to the authors are understudied, it would be useful to note approximately how much land they cover in Finland? It's not clear to me if these are a common peatland type in this region or whether this study (although scientifically sound and interesting) may not be applicable across larger areas?

Section 2.1 Give more context to the wider area here.

Line 116: What do you mean by different habitats? Distance from stream or different vegetation communities – this is not clear here.

Line 123: What do you mean by relatively dry areas? Are they just a 'bit drier' than the completely saturated area or is the water table consistently well below the surface?

Figure 1: Would be useful to include a scale bar to 1c and change the colour of the floating chambers so the difference between the static collars is clearer to the reader. Or use the drone image as the base image for the experimental design.

Line 199: I find it confusing that use the word 'clusters' for location of sampling plots but also for the different plant communities. I think you should change one for clarity. When it comes to the results, it becomes difficult to follow.

Figure 3: I would recommend moving this to the supplementary information. I would actually replace it with Figure A2 as I think it is interesting for the reader to see the spatial variation in the landscape of the different vegetation communities rather than an ordination plot.

Line 252: Typo: should be *S. warnstorffii*

Line 262: This is where the use of cluster becomes confusing. Could you change it to Plots?

Figure 4: Given you have 7 symbols; I think these figures would benefit from colour rather than being black. It's hard to tell the difference between some of them. Again, the use of cluster here is confusing – I think plots would make much more sense. I would maybe use capitalised letters for the significant difference between studied year for each plot or cluster. I'm not sure I understand this as it seems you are looking at (for example) CH₄ in 2017 at 10, 20, 30, 40 m from stream and see there is no significant difference? How does that differ from the letters above the plot? Are the letters below just looking at differences WITHIN plot/cluster? And not across years?

Line 306: Do you mean there was variation within each of the three plots at each distance from the stream but also there is overall difference in CH₄ with distance from stream. This is a little confusing.

I have to admit, I find it rather confusing you create vegetation community classes but then don't use them once you start focusing on distance from stream?

Figure 5: Can you use a different colour for the circles, the red and pink colour used are quite similar. Also do the pink circles in 5a represent 26m? Why 26 m? It's unclear to me here why you have 1m and 26 m?

Figure 6: I find these figures quite hard to interpret given you have a combination of each interaction between variables. Again, the colours are very similar and should be changed to more contrasting colours.