

Interactive comment on “Summer fluxes of methane and carbon dioxide from a pond and floating mat in a continental Canadian peatland”

by M. Burger et al.

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Reviewer 2:

The manuscript was generally well written, but many references to supplementary information was irritating to my opinion. I recommend to consider better ways to refer to the supplement and diminish it's role.

I found the results section hard to read, because it was loaded with numbers i.e. listing means, medians and errors of the flux rates and results of statistical tests. Overall, there were very many statistical comparisons, and I think that not all of them are necessary to test the hypotheses.

C1

– We will carefully look through the results section and improve the readability as suggested, also by reducing the number of statistical comparisons.

The comparison of mid summer and end summer was not motivated and it is not related to a hypotheses. Was the question related to the algal mats? The role of algal mats on the seasonality of C-gas fluxes, mentioned in the discussion, could be an interesting theme if better included in the story.

– The reviewer is correct with this comment. The comparison of mid-summer (up to August 7th) and end of summer (after August 7th) did not follow an "a priori" hypothesis or objective but was the result of two periods with clearly differing dynamics of the fluxes. The distinction was thus operationally defined. The presence of the algal mat, which dissolved on August 12th following a major storm, may have played role in this difference. The storm fell in the week between sampling dates 7th and August 15th. The observation that fluxes behaved differently after the mat had disappeared is indeed very interesting (Figure S4) and could play a role elsewhere too. Yet we did not expect such a development beforehand. Our measurements regarding the effects of the mat were thus rather incidental and we feel that we cannot substantiate the discussion much more than already done in the manuscript.

Specific comments and technical corrections

P. 3, L 18: You could try to explain this (...).

– We agree and will add an explanation based on the provided reference and others.

p. 3, introduction. Acknowledge the pond work conducted in the Hudson Bay Lowlands.

– We agree that this work was crucial for the research and will acknowledge it.

p. 3, l. 27. Hypothesis II. Rewrite to keep the consistency in the style.

– We agree with this suggestion and will correct the style accordingly.

p. 4., l. 27. Is the supplementary information necessary?

C2

– We think that the detailed description of the instrumental parameters and setting of the measurements is helpful for other scientists and can't see why it should do harm in the manuscript. We would thus like to keep it in the Supplementary Information.

p. 5., l. 3-4, 6. Give the sensor make and model in the main text. Please, specify how you arranged the ice packs for the cooling. Did the packages block irradiation inside the chambers?

– We will provide more detail in the revised version of the manuscript and provide a photograph of the set-up that also shows how the ice-packs were arranged.

p. 11, l. 5-6. Total flux? I.e. ebullition and flux summed? Add this information also into fig. 9.

– We here considered the total fluxes. We will add this information to the caption of Figure 9 and also in the text. We will also clarify this point for the data presented in Table 1 and 2.

p. 11, l. 8- This is the most interesting piece. Maybe compress the previous results section to make this stronger and report gases as CH₄ and CO₂ (now only CO₂ equivalents). Could you do a spatial extrapolation too? How the pond and floating mat contribute within the whole peatland 'complex'

– We agree with the reviewer that this is an important information with regard to the role of ponds for the greenhouse gas budget of peatlands. However the data set is rather small for scaling up to the entire peatland complex, especially as the fluxes at the land-water interface are so variable. Also we captured only a relatively short period of time. We thus believe that the main focus should remain on the mechanisms and controls on fluxes in the current manuscript. We are currently doing more work on the ponds of Wylde Lake and may be able to present a somewhat more solid estimate in another manuscript in the future.

p. 11 Discussion. Discuss how the features of the floating mat could affect 'phys-

C3

ically' to the flux'. How you secured that the measurement/measurer did not cause disturbance increasing bubble release? Is it possible that gases are trapped under the floating mat? Is the water under the mat enriched with the gases? Etc..

– We used a long wooden board floating on canisters on the pond-end (floating boardwalk) to do our measurements and to minimize pressure on the ground. The other end was secured at the drier end of the floating mat. Furthermore we discarded all fluxes that appeared to be influenced by placing the chamber. As pointed out in the method section, we discarded all measurements where methane concentration increased sharply within the first 60 seconds of chamber placement. The measurement was then repeated, which may perhaps have led to underestimation of fluxes. On the open water the float with chamber was secured in one place by a couple of telescopic poles that were rigidly connected to the floating boardwalk. This way we avoided a constant drifting of the chamber when the algae mat was present. It seems possible that gas was trapped under the floating mat but we did not attempt to quantify the concentration under the mat, which in hindsight would have been a useful measurement to do. We thus think that we do not have enough quantitative information for an extensive discussion of these points in the discussion itself; rather we will add some more information to the methods section and images of the setup to the Supplementary Information. this way the reader can get a better picture of the way the data were obtained when wished for.

p. 11, l. 23-24. Please, include some of the references in the main document. Supplementary does not work well in this way.

– We will move the more important references and numbers to the discussion, as requested.

p. 13, l. 19. Reference to literature instead of Supplementary.

– We agree and will add appropriate references here. The point was to refer to the vegetation assessment, which is contained in the Supplementary Information.

C4

I did not check the reference list.

– We will check again.

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