

## ***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.***

**Anonymous Referee #2**

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Review of Burger, Berger, Spangenberg, and Blodau: Summer fluxes of methane and carbon dioxide from a pond

General comments The manuscript reports CH<sub>4</sub> and CO<sub>2</sub> exchange along a peatland-floating mat-pond transect in southern Ontario, measured in summer period. The scientific basis was clearly defined and the study design was appropriate. The objective of the study was to determine the spatial variation in CH<sub>4</sub> and CO<sub>2</sub> fluxes in a peatland pond environment and specifically to assess the role peatland ponds and peatland transition as CH<sub>4</sub> and CO<sub>2</sub> sources. This is a topical issue as many studies have highlighted high process rates in small aquatic habitats, which are numerous, but small in area. Improved spatial resolution of remote sensing techniques may help to

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account these in landscape analyzes in near future. Authors set two hypothesis: (I) ebullitive and diffusive CH<sub>4</sub> fluxes increase from the open water towards a floating mat surrounding the pond. (II) if CH<sub>4</sub> and CO<sub>2</sub> effluxes from the system increases with temperature and wind speed, and falling air pressure. These are okay, but maybe authors could use also the background research question as a hypothesis: peatland ponds with the floating edge/transition are significant elements in the peatland C-exchange.

The methodology was valid, measurements conducted properly, results were clearly presented and conclusions were supported by the measurements. 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. 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.

Specific comments and technical corrections

Abstract, please define CO<sub>2</sub> equivalents also in the abstract. p. 1., l. 19. Hot spot of CH<sub>4</sub> emissions in summer

p. 2., l. 27. The focus in on peatland ponds here but it is relevant also recognize some lake wide studies showing that the terrestrial –aquatic interface, often vegetated, has high CH<sub>4</sub>/CO<sub>2</sub> fluxes relative to the area. e.g. Juutinen et al. 2003 GBC; Larmola et al. 2004 JGR.

P 3., l. 6, Maybe include some last century papers about the importance of plant mediated transport in ecosystems. There are many.

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P. 3, L. 18. You could try to explain this. For example, in Huttunen et al. 2003 (Chemosphere) the deep of a eutrophic lake had the highest ebullition rates, because it is the site of highest sediment accumulation.

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

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

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

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?

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

p. 11, l. 8- This is the most interesting piece. Maybe compress the previous results section to make this stronger and report gases as CH<sub>4</sub> and CO<sub>2</sub> (now only CO<sub>2</sub> equivalents). Could you do a spatial extrapolation too? How the pond and floating mat contribute within the whole peatland 'complex'

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

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

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

I did not checked the reference list.

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