

Interactive comment on “Simultaneous high C fixation and high C emissions in *Sphagnum* mires” by S. F. Harpenslager et al.

Anonymous Referee #1

Received and published: 16 April 2015

The manuscript investigates the relation between soil pH and *Sphagnum* moss population in transitional mires using a mesocosm experiment. Species succession and changing soil properties are timely research subjects relevant for Biogeosciences. The manuscript is well written but I have some concerns about the data analysis which will have to be addressed before the manuscript can be considered for publication.

Comments:

1. P. 4470: explain why you grow species of *Sphagnum* on a substrate they do not favour in natural conditions.
2. P. 4473: I do not understand the correction factor applied to the C-fluxes based on the ratio of the surface areas of the mosses. You assume that all growth occurred

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horizontally which is probably not the case. What you measure is the net flux per chamber volume and you must clarify what this is an underestimate of. If the aim is to quantify the increase in C-fluxes due to changes in biomass, you could consider normalising the fluxes at time 0 (t_0) and time 1 (t_1) with the bulk volume of the mosses at t_0 and t_1 respectively. Using the ratio of surface areas most probably over-estimates the fluxes you are trying to characterise.

3. P. 4477: these numbers must be revisited in the light of the previous comment.
4. Line 4-5, P. 4478: You forget the plant respiration term (the biomass increases, and hence the respiration too).
5. P. 4478: you use C and CO₂ interchangeably. Please, change to CO₂, especially when defining the terms of eq. (1) which all seem to have to do with respiration, etc... Not sure where CH₄ fits in.
6. Line 20-25, P. 4478: you omitted the temperature dependence of the fluxes (e.g. respiration follows an exponential relationship of the form $R = a \exp(bT)$). You may find that the daytime fluxes > night time fluxes due to this temperature dependence. This might give rise to a “residual” respiration term which would then feed into the “C” term of eq. (1) and thus overestimate it.
7. The values of C-fluxes in the rest of the manuscript must be revised in light of the previous comments.
8. Overall, CH₄ fluxes seem underused or amalgamated into a general C-term. It would be interesting to treat CH₄ and CO₂ independently and compare them to literature values.

Specific comments:

9. Line 4, p. 4468: in which way is *Sphagnum* “strongly influenced” by water?
10. Line 7, p. 4468: again, qualify the “direct influence”.

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11. Line 25, p. 4469: move (n = 8) to the end of the parentheses block which provides details of the monolith dimensions.

12. P. 4470: how was the organic matter content determined?

13. Line 5-10. P. 4470: define "rich" in Ca-HCO₃⁻. Clarify whether the Ca-... rich water was replenished over the course of the experiment.

14. Line 12, p. 4470: 16 hours of daylight; this doesn't seem realistic for the end of March in the NL!

15. P. 4470: it is unclear whether each vegetated monolith had all four species of Sphagnum growing on it or only 1.

16. Overall, the linkage between the body of the manuscript and the figures and tables is insufficient. Much of the tables and figures data is described only in their captions and insufficiently referenced in the text. This makes the latter seem data-poor.

Interactive comment on Biogeosciences Discuss., 12, 4465, 2015.