

Interactive comment on “CO₂ and CH₄ budgets and global warming potential modifications in Sphagnum-dominated peat mesocosms invaded by *Molinia caerulea*” by Fabien Leroy et al.

Anonymous Referee #2

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This study examines the influence of plant community change from the dominance of Sphagnum mosses to vascular plants *Molinia caerulea* on CO₂ and CH₄ fluxes via a mesocosm experiment, and estimate the annual carbon balance (e.e. gross primary production, ecosystem respiration and CH₄ emissions) via modelling. The result of this study may provide clues on how plant community change due to global changes can affect the greenhouse gas carbon budget in a peatland. The ms falls in the scope of the journal. I suggest the ms should be revised before accepting for publication in BG.

Major comments .*Molinia caerulea* appeared in May but GHG flux measurement started on April. This means the measurement between April to May may have no

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difference in the two treatment (Sphagnum and Sphagnum + *Molinia caerulea*). I think the comparison of GHG flux in both treatments are only meaningful after the appearance of the vascular plants, and remove your measurement between April to May. .Your model in equation (2) includes the number of leaves and uses it as an estimate for ER. This is OK as you find a correlation between ER and leaf number. However, the problem is the equation shows the covary of leaves and temperature (i.e. the number of leaves multiply the temperature factor). I think you should be cautious and better set the number of leaves as an independent estimate for ER as this is what you find so far.

Specific comments P2: line 24, the site is invaded by not only *Molinia caerulea* but also *Betula* spp. Why do you only investigate the invasion of *Molinia caerulea*? P3: line 4-6: how do you measure CO₂ and CH₄ flux? You'd better give a detailed description of the measurement and collection process. P5: line 12: Check the latest IPCC report if the GWP100 of CH₄ is 34 times that of CO₂. P6: Table1 only show the result of one-Way ANOVA. You also need to add the standard error of each variable. A typo: significance should be significance. P7: line 3-5: Fig.1b does not show GPP increased with the number of *Molinia* leaves. Also, Fig.1c does not show the difference of NEE between the two treatment. You stated GPP did not differ between the two treatment but it seems there are some differences between May and July 2016. Line 13: replace increased with decreased P9: Figure 3: There are too few data (i.e. 4) to conduct regression analysis. Normally, the minimum number of data is 5. Either improve the analysis with more data or remove the figure. Line 9: some typos: replace 0.82 with 0.83 and 46.8 with 44.3 to keep consistency with Figure 4. P11: Table 2: where is the result of NEE? P13: a typo in the caption of Figure 7. Replace NEE with GGCB. P14: line 13: add 'root decomposition' (Ouyang et al. (2017) Earth-Science Reviews, 166: 53-63), which also contributes to ER in wetlands. Line 14-5: the meaning of the sentence is not clear since it does not explain how it relates to root exudates. P15: line 17: you mentioned the root production of Taylor et al. (2001). Does this study relate to your study? If so, in what way?

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