

First round of major revisions that were applied for “Cutting peatland CO₂ emissions with water management practices” – Biogeosciences Discussions

We thank the associate editor for the opportunity to revise our manuscript and both reviewers for their thorough comments and valuable suggestions. We have extensively revised our manuscript based on the reviewers suggestions with several new and improved results. The most important ones are listed here:

- We changed the title of our manuscript, as the a member of the peatland community anonymously suggested. *Rewetting measures* might be interpreted a full ecosystem restoration, instead, we focus on *water management practices* within our manuscript.
- We decided to process and add the data of measuring year 2021 to our manuscript. We expected that this would make the manuscript more robust, suggestions of both reviewers that multiple years of monitoring data could help improving the examination of our methodology. We do understand that the reviewing-process could be delayed by this addition, but in our opinion this is justified by the improved quality and potency of the manuscript.
- We changed Net Ecosystem Production (NEP) to Net Ecosystem Carbon Balance (NECB) as this definition is more accurate. Also, we changed the term *submerged subsurface irrigation systems* (SDSI) to *subsoil irrigation and drainage systems* (SSI) as suggested by reviewer 1.
- The formatting of the references was inconsistent with the Copernicus formatting. We corrected for this.
- We discovered an error in the calculation of C-export through harvest. We updated the calculations, outcomes. Also, the Supplementary information was updated and the data sheet has been restructured.
- We improved our gapfilling method and error estimation for chamber data. This slightly changed measured NEE and NECB.
- We simplified the visualization of R_{eco} and potential respiration rate dynamics in Fig. 6 and included Vlist as reviewer 1 suggested.
- The sand soil around drain tubes was not represented correctly in our model. This had consequences for the potential respiration rate in simulations with SSI. Results have been recalculated for SSI scenarios and figures and text were changed accordingly. Especially the outcome of Fig. 10 was affected by this error. Previously we found that the intercept of the estimated linear relations between mean summer water table depth and NECB differed for control and SSI simulations. However, now we find that the slope estimates differ instead of the intercept estimates. We further improved Fig. 10 by adding an extra subplot that shows the differences between SSI and control NECB simulations during a dry year. To present the linear models that were fitted, we inserted a table that also replaces Eq. 6, 7 and 8.
- Reviewer 1 indicated that our simulation outcomes might be sensitive to the WFPS and temperature curves that were used. This was especially the case for the WFPS curves, and we are happy to present our sensitivity analysis in Sect. 2.2.3, 3.4.1. and Supplementary information S2.
- We adjusted Fig. 7 and now also show the dependency of measured NECB on mean summer and annual groundwater levels.
- We elaborated upon various aspects of our research that were unclear to the reviewers and the community:
 - The aim of the research in Sect. 1.
 - The effects of a ‘micro-climate’ induced by the automatic transparent chambers in Sect. 2.1.4.
 - The extent to which we aligned our model simulations with the field sites in Sect. 2.2.

- The definition of potential respiration rate and how this concept should be utilized in Sect. 2.2.2.
- The comparison between potential respiration rate and R_{eco} in Sect. 2.2.3.
- The representation of pressurized SSI within our model in Sect. 2.2.4.
- The implications of our WFPS curve selection in Sect. 4.2.
- We improved axis labels of multiple figures as suggested by reviewer 1.
- As reviewer 1 suggested, we updated Fig 11. with the relation of Couwenberg et al., (2011). In Sect. 4.4. we also avoided a direct in-text comparison with Evans et al., (2021), following the suggestion of the peatland community reviewer, as extensive grasslands were indeed underrepresented in the study.
- We improved the conclusion by centralizing the aim of the article and avoiding repetition of results.