Biogeosciences Discussions

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Comment on bg-2021-276's methodological approach

Peatland Research

Community comment on "Cutting peatland CO2 emissions with water management practices" by Jim Boonman et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-276-CC1, 2021

Carbon fluxes from drained peatlands receive increasingly attention within various scientific disciplines. This paper follows this trend promoting an interdisciplinary approach. The authors have provided a valuable theoretical attempt to improve the community's understanding of soil moisture and carbon fluxes interactions. At the first sight the modelling work focuses on combining soil moisture, temperature and potential carbon mineralization rates for an improved quantification of hydrological variables steering seasonal peat losses.

However, after a second read through there is more to the paper. The authors incorporate a new method to approximate carbon fluxes from drained grasslands on peat quantitively. The new method relies on closed chamber technique. Chambers were supposed to close automatically 2-3 times per hour. The static chambers are reported to be surprisingly high (full 20 inches).

To compare the new chamber method with published data the authoring team builds a soil-water-carbon model. The 3.5 model exploration (Figure 1) helps to quantify how well the flux method can approximate existing carbon flux data at an annual resolution. Figure 11 highlights that the gas flux method deployed for model calibration in this study may systematically underestimate carbon fluxes from drained peatlands. The comparison with Evans et al. 2021 seems vulnerable given the almost absent overlap in grazing intensity and primary production of the sites included in both data sets.

The paper's modelling approach would need a proper cross validation with more established gas flux methods on the one hand and multi-year data sets for calibration and validation on the other hand. Multi-year carbon flux data sets are essential for quantifying main drivers of soil carbon, climate and water interactions in peatlands (e.g., https://doi.org/10.1111/j.1365-2486.2006.01292.x https://doi.org/10.1111/j.1365-2486.2009.02104.x). More so where soil temperatures are likely to change methodically by static chambers that are commonly deployed for experimental warming at higher latitudes.

The title seems misleading. All 4 paddocks remained drained during the course of the experiment. 'Cutting peatland CO_2 emissions with irrigation measures' would fit the

content of the paper.

I enjoyed reading this version of the manuscript. Looking forward to updates of the model supported by cross-validation of carbon fluxes.