Reviewer comment in italics

Author response in plain text

RC1 Comment

The manuscript represents a case study related to peatland management's influence on aquatic carbon concentrations and fluxes in the UK. Peatland restoration actions are of interest in scientific communities globally and especially in the northern hemisphere where peatlands have been traditionally been used for active land use purposes. In overall study is well written. All information about the influence of peatland management actions on carbon dynamics is important to document and share with the scientific community and land-use managers. Few further suggestions for authors to improve their manuscript and analysis

Thank you for your positive comments about the paper and for your helpful suggestions to improve it.

The authors state already in the abstract that long-term monitoring is needed. I fully agree with them and was wondering that since measurement for this study has been done already ~10 years ago (2008-2010) may authors have some new data to be added to the time series? This would strengthen results a lot and give also long-term perspective.

Unfortunately, as with many studies, these data were collected over a relatively short time frame dictated by the associated PhD project's timeline. However there has been further monitoring of the Halladale catchment into which these sub-catchments drain (e.g. Williamson et al., 2021) and indeed of some of the same sub-catchments (Gaffney et al., 2020, 2018). We refer to the Gaffney et al. (2018, 2020) papers in the discussion to provide further context about our findings, and have since added a comparison with the Williamson et al., (2021) findings. These comparisons have highlighted that our measured fluxes from the non-drained sites are low and we further explore this as a function of dry-out in our paper revisions, as described in the next comment.

Authors should use "specific discharge, l/s/km2" instead of discharge eg in fig 4. This would enable better comparison between the catchment as their catchment size varies. Also, non-drained and restoration sites dry out (no discharge) during several periods. Authors need more to discuss that how this is influencing their concentration and fluxes.

We have amended figure 4 as recommended by the reviewer, and it now shows the specific discharge for each sub-catchment. We agree that the periods of dry out experienced in the non-drained and restoration sites, whilst referred to in the discussion, may be having a negative influence on the overall fluxes. We have stress-tested this effect by removing occurences of dry out (i.e. zero flow) from the carbon flux calculations and have added this comparison to the methodology to outline the overall effect on fluxes in percentage terms. This is discussed further in the overall interpretation and we highlight that dry-out is partly responsible for the comparatively low fluxes measured, particularly from the non-drained catchments.

One of the author's main conclusions is that future studies should use a before-after-control experiment. I fully agree with the statement but would like to note that this procedure has been already implemented to monitoring programs over 10 years ago for example in Fenno-Scandinavian countries. Also, there are several studies done using the before-after-control-impact approach related to peatland restoration and authors should update their references.

Upon reflection, we agree that our literature is too UK-focussed and have expanded our references in the discussion to include more international studies, with a focus on Fenno-Scandanavian studies employing a B-A-C-I experiment design, as per the reviewer's comment (e.g. Haapalehto et al., 2014; Menberu et al., 2017; Strack et al., 2015).

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