

Anonymous Referee #2

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The authors thank the referee for his/her time and valuable comments. We have addressed all the referee's comments and suggestions below and revised the manuscript accordingly as follows:

Referee comment

The manuscript presents an interesting study about the influence of the drainage and forest in the CO₂, CH₄ and N₂O fluxes in peatbog in Scotland. They considered restored soil and the development of the GHG fluxes in there. The issue is contingent, and it involved the three major greenhouse gases in a little time series. It's very interesting the role of the pristine soil in the CH₄ contribution and the change in the dominant GWP between the soils treatments. Also, is interesting that the modelling should be useful in other peatlands in the evaluation of GHG budgets. In general the paper is well written, however sometimes is hardly to read, because the combination of the discussion with a lot of names and numbers. I suggest accepting the manuscript for publication. I have some minor comments detailed below.

Author response

We are pleased to note that the referee feels that this paper presents interesting experimental and modelling results of the role of peatland in CH₄ contribution to total GHG budget and that the paper is relevant to Biogeosciences.

Referee comment

Considering the coupling between CO₂ fluxes and the ambient and soil temperature, the extrapolation of fluxes in winter 2009-2010 must consider these variables. I'm not completely sure that the authors considered them.

Author response

This is a good point that we also considered, but extrapolation based on ambient or soil temperature patterns for the 'missing' period during the winter of year 2 would not have made any significant differences to the results. Our reasoning (as mentioned in the manuscript section 4.4) is i) there was a similar seasonal pattern in soil temperature between the two years of this study; ii) there were no significant differences in the ambient and soil temperature between both years of the measurement apart from the short snowfall period; iii) there were no significant differences in CO₂ effluxes in year one between the treatments during the winter period; iv) for the winter period alone CO₂ effluxes were minimal and the cumulative flux calculated was only ca. 10% of the annual cumulative flux; therefore a comparable method was applied to all gases by extrapolating the results by factors based on year one fluxes for that period.

Referee comment

I miss a discussion about the ecology of the soils in order to explain in a better way the CH₄ and N₂O production.

Author response

We are not clear what the referee means by 'ecology of the soils'. However, we did take vegetation survey measurements in the different treatments, but our results did not show a clear pattern between vegetation species and measured soil GHG fluxes.

Referee comment

Also, the discussion about the N₂O fluxes appears extremely oversimplified.

Author response

The discussion on N₂O was brief, but given the very low fluxes measured we do not agree that it is oversimplified. We made our focus on the CH₄ and CO₂ fluxes, because:

- N₂O fluxes were generally very low (0.13 to 0.65 kg N₂O ha⁻¹ yr⁻¹) compared for example to the reported range of values between -0.02 to 30 kg N₂O ha⁻¹ d⁻¹ for UK and European forest soils and for other vegetated sites on deep peat (e.g. chapter 4 in Morison et al. 2012);
- their contributions to the net total GHG fluxes were also negligible relative to those from CH₄ and CO₂ with insignificant impact on the overall results and;
- there were no significant differences between the treatment.

Referee comment

Please specify the units and label the axis in most of the plots.

Author response

All units and labels have now been revised accordingly.

Referee comment

There are high standard errors between replicates, mainly in N₂O fluxes, which make difficult the interpretations of some pattern of seasonality or between treatments.

Author response

This true because of the low N₂O fluxes and our conclusion was that there were no significant differences between the treatments.