

## ***Interactive comment on “Warming increases soil respiration in a carbon-rich soil without changing microbial respiratory potential” by Marion Nyberg and Mark J. Hovenden***

### **Anonymous Referee #1**

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General comments: I enjoyed reading this well written and well presented paper. The use of the orthogonal experimental design is well considered with very thorough statistical analyses. The authors find that warming increases soil respiration but plant community manipulations have no effect on soil respiration. These findings are well interpreted and their implications discussed. I have included some comments below which the authors may wish to consider.

Specific comments: L33-35: Can you briefly expand on, for the reader, why C loss increases with C content please? Is it because there's a higher potential for C loss or a greater proportion of unprotected C or some other mechanism? L120: Please

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can you clarify how long the OTC's were in place for and were they in place year-round or during certain seasons only. L146-150: Based on your description of the CO<sub>2</sub> flux measurements carried out, it seems that vegetation within the PVC collars was left intact. If this is the case your CO<sub>2</sub> flux measurements will have included root, shoot and soil respiration which amounts to ecosystem respiration rather than soil respiration as described. Given that the focus of the paper is on soil respiration I think the contribution of plant respiration to the in situ CO<sub>2</sub> flux measurements should be addressed. L150-151: It is not entirely clear what you did here. Did you measure the efflux rate three separate times and take an average of that or did you measure the CO<sub>2</sub> concentration at three separate time points and use this to calculate the efflux rate? Please can you clarify this. L157-159: How deep is the organic horizon in these soils? Does 5cm depth cover the whole organic horizon? If not, can you include some details on how representative the top 5 cm of soil might be of the whole of the organic horizon? L421-424: Please can you clarify what you mean by “surface soil layers”. I assume from the context you mean soil <5cm deep, but it is not entirely clear from the way it currently reads. Would it be possible to speculate on the variation in temperature between the soil surface and at 5cm depth from literature? This would be useful information to have here, if it exists. L501-502: I think it is worth considering here (or at another appropriate place within this paragraph) that increased C input not only stimulates microbial C mineralisation and C efflux but also increases stable SOM formation through microbial decomposition products. I appreciate that SOM formation is not the focus of this work but I think for balance it is worth highlighting the multiple fates of soil C inputs. L518: In this paragraph you rightly discuss the limitations of your (and most) soil incubations. You mention roots and macrofauna as being absent from the incubated soils. It strikes me that mycorrhizal fungi, which play an important role in soil C dynamics and indeed Rs, are absent from your discussions here. I am not familiar with the plant species at your field sites and they may not be mycorrhizal in which case their omission makes sense, however if the plant communities in question are mycorrhizal it would be worth acknowledging the potential consequences of this in

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your incubation experiments.

Technical corrections: L32: Delete .. "and so on".. L44: Correct to: "The effects of temperature on.. " L147: correct "m2" to include the "2" as superscript. The use of subscript rather than superscript occurs a few times throughout (e.g. L223 & 224). This may be a formatting error in the conversion to pdf or the authors personal preference, just check that it is as you want it and aligns with journal specifications. L317: Delete ... "the situation"... L338-340: For clarity and flow I suggest re-writing this sentence to: "Post hoc analysis revealed the greatest differences in k were observed between; i) warmed x no removal and warmed x dominant removal plots, and ii) warmed x dominant removal and ambient x dominant removal plots." L401: I think the word "warming" is missing from this sentence. I assume it should read: "There are 4 possible mechanisms whereby warming could have increased Rs: " L532: Consider re-writing to: "Large C stocks within this type of peaty habitat are important for the global C cycle, ..."

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