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Biogeosciences Discussions

Interactive comment on "Modelling long-term blanket peatland development in eastern Scotland" *by* Ward Swinnen et al.

Anonymous Referee #1

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Although the manuscript could be published in its present form, I recommend a minor revision to make reported results reproducible and to clarify the concept of the work.

Below are my reflections that authors might find useful as a source of ideas for improving the manuscript.

The blanket peatland architecture reconstructed along 56 hillslope transects is a valuable source of information for validating the models of peat accumulation. Are this data available from authors? Or is there any plan to make these data open for re-use? I recommend to add a brief section about data availability if authors are planning to make data open or available under some conditions.

Which numerical method did authors use for solving the Eq (1)? I recommend to add

a phrase directing a reader to the article where the numerical method used for solving the Eq (1) is described.

It seems to me that the changes in hillslope topography resulted from peat accumulation do not affect the water storage (S (x)) given by Eq (1), because this equation takes into account only the bedrock slope (i(x)) which is not affected by peat accumulation. If my understanding is correct, then S(x) is the maximum water storage that could be achieved under given climatic conditions and the bedrock slope (i(x)).

The model used by authors is based on the concept of impeded drainage [1-3] suggesting that geomorphological conditions (i.e. bedrock slope) determine the maximum peat depth under given climatic conditions. Therefore, it would be interesting to see if there is a significant correlation between the measured peat depth (averaged over the transect) and the bedrock slope (averaged over the transect). The lack of significant correlation may suggest that the observed range of variations in the bedrock slope does not lead to a dramatic difference in the S (averaged over the transect).

[1] Ingram, H.A.P.: Size and shape in raised mire ecosystems: a geophysical model. Nature 297, 300–303, 1982.

[2] Clymo, R. S.: The Limits to Peat Bog Growth, Philos. Trans. R. Soc. B Biol. Sci., 303(1117), 605–654, doi:10.1098/rstb.1984.0002, 1984.

[3] Alexandrov, G. A., Brovkin, V. A. and Kleinen, T.: The influence of climate on peatland extent in Western Siberia since the Last Glacial Maximum, Sci. Rep., 6, doi:10.1038/srep24784, 2016.

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