

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2021-585

Anonymous Referee #2

Referee comment on "Water level variation at a beaver pond significantly impacts net CO₂ uptake of a continental bog" by Hongxing He et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-585-RC2>, 2022

I apologize with the Authors for the time it took to provide my review. I enjoyed serving on this study and I do think it is of definite interest. My main concerns are related to the quantification of the uncertainties associated with model parameters and the way they can propagate to model results. I do think that a detailed discussion on this element can strengthen the quality of the results obtained. In the absence of such a quantification, I do think the quality of the model results is at best undetermined. It is with this spirit, and to provide the Authors with ample time to design their revisions, that I am recommending a set of revisions that can range from moderate to major (depending on the way the Authors decide to address these).

While the Authors state that the model they rely upon can lead to a reasonable match with available observations, they offer only limited insights about uncertainties associated with estimated model parameters. Additionally, I do think that the type of sensitivity analysis performed by the Authors does not provide too much quantitative insights about the relative importance of model parameters and I am not entirely sure if the Authors can rely on their results to rank importance of typically uncertain model parameters and the way this impacts model results. I do think at least some discussion on these elements should be included so that the readers can have a full picture at their disposal.

As an additional point of example, it is not clear how the uncertainty associated with parameters governing partially saturated flows (which can be marked while these can be spatially heterogeneous) can impact the quality of the results obtained by the Authors.

The lack (or partial lack) of a rigorous uncertainty quantification in this sense is an element that in my view hampers the way we can quantify the quality of model forecasts. The emphasis that is given to the model performance could be retuned in light of this element, which is critical, in my view.

The Authors find and discuss that NEE displays a linear relation with the water level at the

site analyzed. Can they provide some physical meaning to such a linearity? Can in their view this result be transferred to other sites? Perhaps this discussion is already included in the study and I missed these details. In this case, I do apologize with the Authors.

Can the Authors include some details about measurement uncertainties and their view about these can impact model parameter estimation through model calibration?