

Interactive comment on “Modelling effects of seasonal variation in water table depth on net ecosystem CO₂ exchange of a tropical peatland” by M. Mezbahuddin et al.

Anonymous Referee #3

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This paper applies the complex *ecosys* model to a point scale representation of a tropical peatland located in Indonesia. Whereas the research focus in the peatland and wetland community has been on northern peatlands during the past years, the authors point out that interesting carbon dynamics can be found in the tropical peatland as well. Because of the different mechanisms at play, most of the ecosystem models are inadequate to represent what actually happens in such particular environments. The model is able to simulate CO₂ fluxes depending on the water table position and compare them to eddy covariance measurements. The authors also show a sensitivity experiment with comparison between runs with overgrown water table, and runs with drained conditions. Results are presented clearly and extensively, but the discussion

C5771

part could be improved.

General comment: I think that the paper addresses an interesting and important issue in peatland research, which has not been as extensively tackled before as it has been in this study. The results are consistent and interesting.

The authors focus their study on CO₂, as mentioned in the title, but they mention methane emissions from time to time. It is clear that methane is important to have a realistic carbon balance, but it is not the focus of this paper. I suggest to leave it, or to mention it only in the discussion. The discussion part as a whole could be improved, since there is some confusion between results and discussion. In particular, section 4.5 shows a sensitivity experiment which has been mentioned in the Methods section, but not in the Results section. It should be presented before being discussed, as it is a rather important sensitivity test. I also feel a summary of the discussion is missing.

13354, line 25: Please, define WTD in the text.

13355, line 25: What do the authors mean with "certain level"? Are there quantitative measurements to define it?

13364, line 25: When the authors talk about the 44 years of simulation, actually they mean 40 years of spin up time, and 4 years of simulations. I suggest to use this terminology for sake of clarity.

13366: Does this change in the WTD change also the water exchange between the hollow and the hummock surface? How does the hydrology react to this change?

13368: The authors mention "carryover effects" from the hydrology of year 2002, but the major discrepancies between model and observations as reported in figure 2 appears towards the end of the season, and it is not clear why. Could the authors be more clear about it?

13369, line 12. Both in the text and in the Fig. 6 caption you mention the significance of the quadratic fit. Which method did you use? did you try to fit other curves?

C5772

13377. A very important issue in DGVMs is about upscaling the results of complex, small scale mechanistic models. I think this is a point worthy to be discussed, even briefly. How representative are the results of a point scale model for an ecosystem-scale perspective?

In general, the final part of the conclusions should be moved to a more comprehensive and summarizing discussion part, or subsection, including a more extensive summary of limitations and assumptions. A better discussion of further work is also needed. For example, the authors claim that the results could be useful to the REDD+ scheme, but they do not mention how the results at a point scale can be linked to a larger scale project.

13379, line 5: Please, define REDD+.

Figure 6: It would be useful to give more information about the statistical tests performed to get these results. Is it a goodness of fit test?

Figures 1-4: It would be better to insert the year of the simulations on the x axis of the plots, rather than just mention it in the caption.

A minor technical point. References to the auxiliary materials are kind of confusing. In particular, references to the equations in square brackets cause confusion when in the same paragraph the author discuss concentrations, e. g. $[M]$ and $[O_{2S}]$.