

The manuscript „CO₂ fluxes and ecosystem dynamics at five European treeless peatlands – Merging data and process oriented modelling“ by Metzger et al. deals with a very complex process based carbon model and is, in general, well suited for the Special Issue “Carbon and greenhouse gases in managed peatlands”.

While the manuscript was considerably improved after revision, I would still recommend a further minor revision before publication. Technically, the main issue is that the authors addressed the concerns raised by the reviewers rather well, but it is, firstly, quite difficult to judge whether actual changes have been made as statements frequently conclude with phrases such as “we consider rephrasing some sentences” or “we might consider... in the revised manuscript”. I would strongly suggest including page and line numbers (or quotes) of actual changes. Secondly, the authors frequently provide comprehensive answers to the reviewers’ questions, but fail to incorporate the explanations (or a shorter version of them) into the manuscript. An example for this is the issue of spin-up times (section 2.2.1), which was raised by both reviewers.

Both reviewers asked for a comparison with other models or modelling studies. While it is certainly true that the aim of the study is not a model comparison, the following points should nonetheless be addressed in the introduction or discussion:

- why was CoupModel chosen?
- what is new compared to other multi-site studies?
- what are the key messages to other peatland modellers?
- how much complexity is required (reviewer #1 suggests several important aspects)?

It was pointed out also by both reviewers that water table depth and hydrological processes are crucial for peatland carbon dynamics. I would support a more detailed description of this part of the model, of the parameters involved and the derivation of their values (for example, of the saturated hydraulic conductivity and the parameters of the water retention curve) and a more critical discussion of the modelled soil moisture content, which will of course influence decomposition dynamics etc. For example, I am not sure whether the Brooks and Corey-function is a good choice for a peatland model, as the soil is assumed to be saturated until the air entry point. This is a strong simplification, and Brooks and Corey might not be the best choice for peat soils.

Reviewer #1 also proposed adding a conceptual figure showing model pools and fluxes. I would support the idea as it would help the reader to follow the manuscript without having to read the CoupModel manual.

Furthermore, I would suggest adding all parameters discussed in the main text to Table 2 (for example, $p_{0\text{satact}}$ is missing) to improve readability.