

Dear editor, dear reviewers,

Thank you for the positive evaluation of our manuscript. Please find below a point-by-point response to the technical comments. We hope this clarifies the remaining problems in the text, and will make the manuscript acceptable for publication.

On behalf of all authors
Johannes Oberpriller

Reviewer 1:

I thank the authors for addressing the comments by both reviewers. I recommend its publication with following minor comments (line numbers refer to the revised untracked manuscript):

L48: I would like to clarify that while I agree with the arguments authors make about UA and SA in general, I just think saying SA is agnostic of magnitudes of uncertainty could be a bit misleading. To me, knowledge about the magnitudes of uncertainty & variability is part of coming up with a proper prespecified range (L261) and expecting/exploring a certain behaviour from the model.

This feels like mostly semantics, but I would also say uncertainty propagation and sensitivity analysis are main tools of uncertainty analysis (L44), not the other way around (just like authors say in their response $UA = SA * \text{uncertainty}$). Overall I would revise this paragraph starting with L44 along the lines of:

"The two main tools to uncertainty analysis (UA) where the aim is to attribute uncertainty in model outputs to different inputs (drivers, parameters, and model structure) are sensitivity analysis (SA) and uncertainty propagation. The key difference between these two approaches is that uncertainty propagation considers the magnitude of uncertainty in the model inputs (e.g. parameters, typically determined via expert elicitations and previous studies) and translates them into uncertainty in model outputs, while SA translates a change in inputs into a change in outputs. Next, UA combines information from model sensitivity and input uncertainty to identify inputs with a high influence on model outputs, with the underlying idea that better constraining these will increase robustness and reliability of model projections."

I believe the rest of the text can remain unchanged but I leave the final decision to the authors, I don't think the overall results and messages of the study are affected by these definitions.

We understand what the reviewer means, but were not entirely happy with the formulation that was suggested. We have again re-formulated the paragraph, hoping to capture the spirit of this suggestion.

“The two main tools to understand how uncertainties in model inputs (drivers, parameters, and model structure) affect model outputs are sensitivity analysis (SA) and uncertainty analysis (UA) (Cariboni et al., 2007; Caswell, 2019; Saltelli, 2002; Saltelli et al., 2008). The key difference between these two methods is that in an UA, the central starting point is the quantification of uncertainty in the model inputs (e.g. parameters, typically determined via expert elicitations and previous studies (Matott et al., 2009)). This uncertainty is then propagated to the model outputs, and back-attributed to the different inputs. An SA, on the other hand, calculates how the model output changes per unit or percentual change of the respective input (Jørgensen and Bendoricchio, 2001). This calculation is primarily independent of the inputs’ uncertainties, although local SAs can be affected by the reference point and global SAs by the range over which the sensitivity is calculated. Overall, however, both methods share the goal of identifying inputs with a high influence on model outputs, with the underlying idea that better constraining these will increase robustness and reliability of model projections (Balaman, 2019).”

As the reviewer stated that we are free to change or not, we assume this will be satisfactory.

L82: Could the authors provide citation(s) for this newly added sentence as well: "...whereas soil hydrology parameters were not identified as very sensitive in earlier studies."

Authors’ Response: Done.

L350: I believe one of the interactions in the parentheses was supposed to be changed to radiation-temperature but it remains the same.

Authors’ Response: Thank you, we indeed missed this and changed it now.

L441: Authors could consider citing Fisher et al. 2018 (a paper they're only citing in the first sentence currently) in this paragraph regarding the establishment and mortality discussion.

Authors’ Response: Done.

L466: Authors could consider citing Dietze 2017b at the end of this sentence again.

Authors’ Response: Done.

Reviewer 2:

I appreciate the substantial efforts the authors have invested into the revision of this manuscript. The manuscript has been greatly improved, particularly the discussion section. The study is now described in a concise way and the conclusions fit the objectives. The findings of this study, other modelling studies and empirical findings are now clearly separated, which strongly improves the discussion of the results.

All my comments have been addressed and I only have a few technical remarks:

Authors' Response: Thank you.

L147: Is there a noun missing after 'mechanical'?

Authors' Response: No, this was meant to read "mechanical (.) and functional balance". For better readability, we have added balance after mechanical as well.

L391: linked instead of link

Authors' Response: Done.

L438: 'would be' instead of 'is'

Authors' Response: Done.

L442: 'this process contributes' instead of 'these processes contributes'

Authors' Response: Done.

L884: 'grouped' instead of 'group'

Authors' Response: Done.

Colors of the processes (Drivers, Establishment, etc.) in Fig. 3: They are not consistent across the bioregions (e.g., mortality is either blue or green). Do these colors have a meaning? If yes, please add a short explanation. Else, you may consider to use the same colors as in Fig. 4?

Authors' Response: Yes, they have a meaning, described in the figure label, which was probably missed by the reviewer. It says there: "In the radar plots of each environmental zone, the color and percentage value of the process label indicates which simulation setup (monospecific with corresponding species or mixed) has contributed most uncertainty and how much."