Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
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Comment on hess-2021-265

Anonymous Referee #3

Referee comment on "Does maximization of net carbon profit enable the prediction of vegetation behaviour in savanna sites along a precipitation gradient?" by Remko C. Nijzink et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-265-RC3, 2021

The study discusses the approach of vegetation optimality models to predict the hydrological and carbon cycle. The paper evaluates one optimality model in detail and contrasts the results with TBMs which allows for an interesting discussion of the benefits and downsides of the optimality model used. The introduction (and especially the abstract) describes the motivation for the study clearly and support the usefulness of the study.

In general, I felt the authors could have been a bit more careful with their writing. For example, they confuse their hypotheses throughout the manuscript (see below specific comments) which sometimes makes it hard to follow their argumentation. The introduction is a bit too long and, in parts, not very well linked. I liked how the authors explicitly point out the four hypotheses they aim to explore, however, it is not quite clear to me how hypotheses 2 and 3 emerge from the introduction. It further would be nice to have more details on the model description – you could move table 2 to the supplement for example to make more room. Your discussion is detailed but I'd like to see more about possible future directions.

Specific comments

Line 41-44 The sentence is very long and hard to follow

Line 61 Doesn't the default version of LPJ-GUESS have more than five plant functional types?

Line 91-92 The contents of the sentence are not linked very well

Line 98 Increase or decrease in annual rainfall?

Line 118 ‘optimizing vegetation properties to maximize the NCP’?

Line 136 Do timescales of precipitation matter? I.e. is annual PPT driving the rooting depth or are seasonal timescales more important?

Line 136 Therefore instead of but? ‘[…] therefore is likely to change over […]’

Line 162 In table 1 it’s AU-How

Line 173 In table 1 it’s AU-DaS

Line 199 ‘[…] is defined by maintenance respiration, projected cover to the turnover and maintenance of leaf area’ – I find this sentence a bit unclear

Line 208 How can seasonal vegetation cover vary on a daily basis? Maybe rephrase

Line 225-230 Does SILO provide point data or are the site met data derived from a spatial dataset (if yes which resolution?) I understand the argument that a longer timeseries helps to run the model, but it would be nice to see any sort of comparison between the observed met data at the site and the SILO dataset. I guess in general I would just like to have more information about the input forcing to get an idea about the uncertainty. Do the models from the Whitley paper run with the same meteorological forcing or do they use the data collected at the site?

Line 235-236 Can you provide a bit more detail about the water retention model? It was never mentioned before

Line 247 Can you specify what the ‘usual energy fluxes’ are

Line 249 LE has already been introduced two sentences earlier

Line 264 Isn’t the last hypothesis about rooting depth?

Line 265-276 I might have just overlooked in your submission – but can you describe in more detail what the model set up is for the model intercomparison you use from the Whitley et al paper? Surely there will be more detail in the Whitley paper to help understand but while reading your submission I was for example wondering whether there are changes to some of the parameters in the models to capture the site specifics better or whether they 'just' ran in their original configuration with the meteorological forcing from the sites [...]

Line 277 Third and fourth hypotheses?

Line 294 In the introduction it says -0.1-0.1 for the cost factor for water transport (but I might have understood?)

Line 297 second hypothesis (also Line 298)

Line 300 ‘Regardless of the result here’ can you explain why you make this decision?

Figure 2: Maybe include shaded areas for dry and wet season, but also include dry and wet season months in caption. Can you include what the ensemble years are too? Panel e says Daly Uncleared but it was referred to as Daly River before

Line 306 Can you define dry/ wet season (which months)?

Line 327 Not sure, it looks like the minimum is quite similar for the models but for the maximum values, LPJ-GUESS and MAESPA seem to be too low

Line 400 I’m not sure I agree with this. It may be true when you look at the annual values in figure 3 but based on figure 2 you can’t really reach this conclusion.

Figure 3: Why are the data points connected in panel a and b? It already is hard to distinguish the data points, the lines make it even harder. You also do not connect them in the other panels – it might be nicer to be consistent. Further, it might be helpful to offset

the points in a and b (like in c-f). You could also increase the size of the observation marker, it gets lost in all the other points. Lastly, it could be helpful to include an arrow below the lower x-axes indicating whether the sites go from dry to wet or the other way around (but a lot of this is personal reference of course)

Figure 4 and 7: Maybe use a global legend and remove obs legend from panels. Are you ever using the information of Qflag in the results or discussion? If it never comes up you might as well delete it.

Figure 6 the text on the x- and y-axis is too small

Figure 8 It would be nice to stay consistent in the color choice for the models

Line 569 Aren't some of the models (all?) processed based and not empirical?

Figure S2.1, S2.4, S2.7, S2.10, S2.13, panel h – can you maybe add padding between 100% projected cover and the figure edge, the way it is now it looks like you're cutting off at 100%

In general, you have a lot of supplementary figures but don't refer to all of them in the manuscript.