

## Editor

Dear authors,

thank you very much for your thoughtful replies and revisions to the manuscript.

Both reviewers agree that most of the concerns raised in the first round of reviews have been adequately addressed.

I particularly appreciate the more careful tone in the revised version.

The reviewers only request a few very minor changes and corrections.

Please incorporate them and return the revised version to me.

Thank you very much in advance and best regards,

Markus Hrachowitz

We thank Dr. Hrachowitz for his feedback, and we are happy to revise the manuscript according to the feedback provided by the reviewers.

## Reviewer 4

Since this work has already gone through a review round and I am new reviewer in the process I have tried to refrain from given too detailed feedback. In general I think the manuscript is worth publishing in HESS. My main concern is the ambiguousness of the term 'water availability' which I argue in the attachment alongside a few other suggestions to improve the paper.

We thank reviewer 4 for their feedback comments and their suggestions to improve the manuscript. We reply in detail below to every comment whereby the reviewer comments are presented in blue and our reply is in black. Please note that the line numbers in our answers refer to the new version of the manuscript.

- *Comment line 14:* What is the definition of water availability? Is it simply runoff? If so, does this then make sense, in case the water was taken up by trees then it did not lead to runoff so in that definition it was not 'water availability', but on the contrary the water was available to the trees. Others may have used the term as such, but it is both confusing and misleading in my opinion. So not only should water availability be clearly defined, it's definition from both a semantic and hydrological point of view should be reconsidered or not used at all when it isn't necessary.

Thank you for raising this point, we agree that the term 'water availability' can be confusing, and that it needs a clear definition. On the other hand, the term is widely used in studies linking land cover change and the water cycle. Therefore, we will stay with this term, and add the following definition starting at line 55 in the introduction of the manuscript.

*'In this study the term 'water availability' refers to the remaining precipitation water after evapotranspiration takes place, i.e. the water available for (human) consumption purposes, on a yearly basis.'*

- *Comment line 89 and line 105:* Single letter symbols preferred in hydrology: <https://iahs.info/Publications-News/Other-publications/Guidelines-for-the-use-of-units-symbols-and-equations-in-hydrology/>

Thank you for raising this point, we adjusted the hydrological symbols in our manuscript to single letter symbols according to the provided guidelines.

- *Comment Table 2:* Please divide by 360 to give the actual resolution and not the number of grid cells on the globe.

Thank you for this comment, we changed Table 2 to provide the longitude and latitude resolutions in degrees instead of the number of grid cells.

- *Comment line 227:* I don't understand the point of having this figure in an appendix. Why not simply in the main text?

We chose to show Fig. A1 in the Appendix because our study focuses on the hydrological changes over land surfaces and we only include this figure to indicate that changes in potential tree cover could also affect the precipitation over water bodies. Also, please note that Fig. 5e in the main text conveys the same information as Figure A1, however, in Fig. 5e the precipitation over water bodies is excluded and the legend is different from Fig. A1.

- *Comment title 4.1:* This does not discuss implications of the study, but limitations of the study caused by using the SSP3, TCC map and Budyko method. Rename appropriately.

We agree with the reviewer that 'implications' should be renamed to 'Limitations', we adjusted this title accordingly to '4.1 Study limitations related to the SSP3-7.0 pathway, tree cover change map, and Budyko method'

- *Comment line 486:* This finding is similar to Wang-Erlandsson et al. (2018) and perhaps other studies that I don't know. Maybe the conclusions are not the appropriate place, but in the discussion such observations should be discussed a bit more than is currently the case.

We already referred to Wang-Erlandsson et al. (2018) in the introduction of the manuscript, however, we indeed did not yet compare our results to that study. We now mention Wang-Erlandsson et al. (2018) in the discussion of our results as follows, starting in line 236:

*'Contrary to our study, Wang-Erlandsson et al. (2018) concluded that the impact of global land use change on Q is much smaller than the global effects of CC. However, note that this study analysed a different land use change scenario compared to our study, focusing on human-induced conversion of land cover to urban areas, pastures, or cropland.'*

- *Comment line 500:* Which river basins/catchments? Not clear for someone who just reads the conclusions.

Thank you for this comment. We agree with the reviewer that this could be written more clearly in the conclusion and therefore we rephrase this sentence (starting in line 505) to:

*'The five river basins (Yukon, Mississippi, Amazon, Danube, and Murray-Darling) analysed in this study show that the effects of climate change and tree cover change can diverge substantially per catchment, whereby these basins (except for the Mississippi basin) could encounter dominant impacts of climate change on the regional water availability.'*

### Reviewer 3

The revised manuscript addresses the comments and feedback by the reviewers accordingly and also improves significantly on showing and discussing the results in the context of the studies' assumptions and limitations.

We thank reviewer 3 for their positive feedback and their suggestions to further improve the manuscript. We reply in detail below to every comment whereby the reviewer comments are presented in blue and our reply is in black.

I only have two very minor suggestions:

- Line 229: '... 15.5% increase in global potential tree cover.' instead of 'global tree cover potential.'

Thank you, corrected.

- Figure 7: include impact on Q in the figure legend, so that the figure is more accessible on its own, without having to read the figure caption.

Thank you for raising this point, we changed the legend title in the figure from 'Legend' to 'Legend: impacts on Q' for additional clarity.

