

Review of the revised manuscript “Future permafrost degradation under climate change in a headwater catchment of Central Siberia: quantitative assessment with a mechanistic modelling approach” by Xavier et al. submitted to The Cryosphere

In the revised version the authors have addressed the comments raised by both reviewers. The readability was greatly improved and clarifications were added to the text. While I think the manuscript is in a much better shape now, I believe some comments are not addressed adequately and require a little bit more work.

1. L58: this sentence is still confusing. Do you mean something like “and thereby covers 55% of the total global permafrost area”? Please clarify
2. L95: the abbreviation CMIP6 shows up in the main text here for the first time, but you only define it for the first time in L213, please adjust.
3. Fig. 10: Rev #2 had a good suggestion to better illustrate the water content with varying active layer depths. This is a valid comment, especially considering the differences in ALT between NAS and SAS. I agree with the authors that it is not meaningful to use maximum ALT as a reference depth, but an additional plot (maybe in the Supplementary Material) showing a time series of the liquid and ice content within the thaw depth (depth until $T < 0^{\circ}\text{C}$, changes throughout the season) would be interesting. This could be done for the present conditions, a year in the middle of the century and by the end of the simulation (or in the equilibrium simulations). This would be important to interpret the availability of liquid water throughout the season to better align it with the growing season.
4. Fig. 10: The figure caption is not very informative as it is. Maybe change it to something like "Annual mean of total water content [m^3 of water / m^3 of soil] partitioned into liquid (blue) and ice (grey) content..."
5. L455-458: The explanation of the processes driving moisture distribution is still insufficient in my opinion. They are not explained in the subsequent text. Rather, a direction of water movement is given but without explaining what is causing it. This still needs work.
6. L503-506: The discussion on the water flux changes is insufficient given the description of the results. With a more careful description of this in the result section, the discussion can be improved accordingly.

Supplement:

L185: What is the reference for the geothermal heat flux boundary condition?

L237: The text is copied from the response letter. Please remove “This comparison will be added to the supplementary material.”

Generally, I find the referencing to the Supplementary Material hard to follow. With some restructuring, the references to the individual text parts can be improved (e.g., not starting with Supplementary Material B in L130 and more clearly stating which part of it refers to what is being said in the main text).