

Response Letter HESS 03/25

Review Round 2

Editor Comments

Public justification (visible to the public if the article is accepted and published):

In the previous round, one reviewer suggested comparing model performances to benchmarks. Given the overall goal of this study, I found this a very good and relevant suggestion. Looking at the revisions, I am now afraid you tried to reformulate the text a bit rather than follow this advice fully.

Please see our benchmark commentary (Seibert et al., 2018, HP) for a more extended argumentation for the need to use upper and lower benchmarks. Please consider providing some kind of alternative model/computations to allow the comparison of model performances.

We thank the editor for highlighting this point and we apologise for the misleading impression. We therefore introduced a SWAT standard model that was used to provide a SWAT (without glaciers) upper and lower benchmark solution. The upper benchmark was optimized in the similar way as the SOO Q SWAT-GL model (just without glacier parameters). For the lower benchmark model, we took the median KGE for Q of 1000 Latin Hypercube Samples.

Minor issue:

Please avoid multi-letter variable names. These are mathematically incorrect. In an equation, KGE, for instance, means K times G times E.

Thank you very much for the hint and we corrected it accordingly.

Reviewer 1 (Cyril Thébault - Minor Revision)

Dear Authors,

Thank you for your thoughtful consideration of the review comments. I have reviewed your response and am generally satisfied with it. The paper is very rich, with very interesting and varied results, particularly for high mountain hydrology. However, this richness requires a perfect logic and organization of the manuscript to make it easier to understand. I think the paper could be further improved with a few modifications in the construction and flow of the article. I have a few additional broad comments listed below, along with some detailed suggestions in the annotated PDF.

We would like to thank the reviewer once again for the very detailed and helpful feedback, which has significantly improved the manuscript and we were hopefully capable of addressing all points properly. The biggest changes are the consideration of the reanalysis plots in the appendix and the introduction of 2 SWAT standard (without glaciers) models that serve as upper and lower benchmark and are now included in the analysis.

1. I believe the manuscript would benefit from further refinement. This includes clarifying/reorganizing certain points (as indicated in the annotations) and conducting a comprehensive review for spelling and grammar errors.

Thank you very much for the suggestions and we agree that especially the methodology section needed a better structure which we hopefully provided now. Also a new table with an overview of the different models of SWAT and SWAT-GL is provided that should help readers accordingly.

2. I recommend adding a brief discussion section that addresses the potential impact of some of the study's key limitations. While the scope of the work is appropriately focused, I believe it is important to explicitly outline how these limitations could influence the findings.

We thank the reviewer for the suggestion, however, we had to admit that given the current discussion section that focuses on all the individual subchapters from before, it was not completely clear which points were intended but tried to add new elements to the section.

3. A Data Availability section should be added and I strongly recommend incorporating a Code Availability section to enhance the reproducibility of the study.

Kind regards,

We thank the reviewer for the suggestions and fully agree and added a code and data availability section.

Cyril Thébault

Language revisions from PDF

We incorporated all suggestions as proposed.

Comments on Reanalysis from PDF

We fully agree and indeed we partly cross-checked the potential of ERA-5 Land, however, especially for precipitation the data showed deficiencies, which was the major reason to stick to the methodology provided in the cited literature of the benchmark glacier project. As recommended, we added a new figure with some seasonal, annual and daily comparison between the WS (weather station) data of the Wolverine and Gulkana glaciers and the ERA-5 Land basin values (all pixels that are touched by the basin outline. Indeed it is shown that significant biases exist and that the signs/directions of the biases are even flipped across the catchments.

Reviewer 2 (Anonymous - Major Revision)

The authors have addressed all my comments. I have no further comments, except for a minor one. Please check the first paragraph of Section 3: an overview of subsection 3.5 is missing, unlike the other subsections.

We thank the reviewer for the evaluation and that we managed to address all comments satisfyingly. The description for subsection 3.5 was added accordingly.