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Comment on hess-2022-205

Anonymous Referee #1

Referee comment on "Climate sensitivity of the summer runoff of two glacierised Himalayan catchments with contrasting climate" by Sourav Laha et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-205-RC1, 2022

In this paper, the authors quantified the sensitivity of summer runoff to precipitation and temperature changes in two glacierized Himalayan catchments with contrasting climate based on a hydrological model. This study is well prepared, and the results are meaningful. However, there are still some questions needing to be clarified. Here are the details:

- Lines 48-49: This expression should be careful. In my opinion, the simulation is not as same as the observations. The observed data can represent the reality at a point scale but is hard to obtain, especially in the high mountain regions, while the simulation can systematically analyze for a basin-wide scale over a long period.

- Figure 1. The boundaries of the two study basins should be highlighted on the map.

- Lines 65-66: This sentence is inaccurate. As I see, the annual temperature of Chandra

(-55â□□) is lower than Upper Dudhkoshi (-4.7â□□). In addition, the glacierized fraction of Chandra (0.25) is higher than Upper Dudhkoshi (0.20), and the former glacier area is more than two times the latter. These differences are significant and have a large impact on the glaciohydrology. So please revise it.

- Lines 165-166: How to calculate the glacier area change? There is only the glacier mass balance change data in the supplementary Figure S3. In addition, have the model considered the compensation of snow and transforms into ice?

- Supplementary Figure S1: How to deal with the observed data gaps?

- Line 220-225: I think the temperature before the ablation season can also influence the glacier melt and snowmelt since it controls the distribution of rainfall and snowfall in the accumulation season. Especially in the Chandra basin, where most precipitation occurs in the winter. Thus, I suggest that the authors should add a temperature sensitivity experiment before the ablation season.

- Lines 312-317: How to define the glacier runoff in this paper and what is the difference between it and the glacier ice loss? Moreover, the results show that the glacier runoff contribution to the total summer runoff in upper Duhkoshi is higher than that in Chandra basin while the glacier cover in upper Duhkoshi is lower than that in Chandra and the former summer precipitation is much higher than the latter, which seems contradictory. Please show the other contributions of the summer runoff and clarify this contradiction.

- Lines 351-354: How does the glacier hypsometry affect the mass-balance sensitivity, and how is this factor considered in the model?

- Lines 377-379: In my opinion, the results vary from different studies, I think the authors should discuss the reason for the difference among the studies at different basins rather than describe it as "largely in line with".

- Figure 7: The color scheme is too blurry to distinguish.

- Line 389: The precipitation increased while the rainfall on glacier did not change, why? Please clarify it.

- Lines 464-466: The RCP2.6 scenario data has been used in this paper, but has no introduction (e.g. which general circulation model has been selected and the evaluation of the projected data).