

Comment on hess-2022-60

Florian Ulrich Jehn (Referee)

Referee comment on "Significant regime shifts in historical water yield in the Upper Brahmaputra River basin" by Hao Li et al., Hydrol. Earth Syst. Sci. Discuss.,
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Li et al. provide a case study to study the influence of climate and cryosphere on the water yield in the Brahmaputra. To do this they collected a long time series for climatic and precipitation data and analyzed it to find the water yield has changed over the time period studied. They find that there are substantial changes and attribute this mainly to the combined effect of climate and cryosphere. I think this study has value (I especially like the introduction) and should be considered for publication. However, I have several issues that I think should be addressed.

General comments:

- First, the study does not provide enough information about its data. For example, after reading the study I am still unsure what exactly is meant when the study talks about climate being a major factor in its analysis. Is it the mean temperature? Is it some indice? Is it something completely different? Same goes for the term cryosphere, which is used quite loosely.
- Second, after reading the methods it is not clear to me how the study is able to differentiate between the influence on climate, cryosphere and vegetation. This section would profit from a more in depth explanation. In addition, why using this method? Why do you think it is especially good for your kind of study?
- Third, the study finds a turning point for the behavior of the river. This seems quite important to me, but is never really discussed. Why did this change happen? What consequences will it have?

Specific comments:

- The study states several times that the increase meltwater has the potential to alleviate the loss of water availability. I also think this is the case, but it should be made clearer that this will only be a temporary relief until the glaciers have melted.
- What are the specific reasons that vegetation was studied? Are there any reasons to assume that the vegetation has changed significantly in the time period?
- Figure S2 belongs in the paper in my opinion, as it seems like this is your main plot, which all following plots refer to.
- Figure 1: Please change this 3D pie chart to bar chart, as those are much easier to read.
- Do the abbreviations that are used to label the subcatchments have any meaning?
- Did you check if your evapotranspiration is roughly correct? You used evapotranspiration data from a global model, which might have not been calibrated well to regions such as extreme as yours.
- Why did you choose LAI as a proxy for vegetation and not some other measure?
- Have you considered also checking for the runoff-ratio? This seems like a variable that should give you some additional information.
- Please change Fig. 3 and Fig 4. to boxplots or swarmplots (depending on your sample size you calculated your mean and standard deviation from). Having just a bar plot with a standard deviation does not really show how your underlying data looks like.
- Are your p-values corrected? If not, this would mean that likely in Figure 5 there are way fewer significant trends.
- The text is quite heavy on abbreviations, which makes it harder to read. Please consider just writing the words out instead of abbreviating them.

Technical corrections:

L19-21: I am not able to parse this sentence.

L45: would delete this mention of "Third Pole" as this exact phrasing has already been used in the paragraph above it.