

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-329

Anonymous Referee #2

Referee comment on "A tree-ring perspective on the past and future mass balance of a glacier in Tien Shan (Central Asia): an example from the accumulation area of Tuyuksu Glacier, Kyrgyzstan" by Youping Chen et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-329-RC2>, 2022

The authors presented interesting results for their study glacier. However, from my taste, novelty of the paper is far from acceptable in this journal. Seems the authors showed lots of trust on correlation analysis. They used correlation coefficient to evaluate their models, to explore the relevance between two variables, and to compare with other studies. I would say, correlation coefficient is useful for examining the change pace of two variables but can't tell the bias. Moreover, the authors used only simple linear models to reconstruct and predict the glacier mass balance, which I think is of highly uncertain. First, the training of linear models is heavily related to the collected data. There area inevitable uncertainty in the data collection, especially when only data from one glacier was collected in this study. Second, validation of the linear models is poor in this study, especially for the prediction models. Although the authors claimed that they validated the reconstruction model by a leave-one-out method, there were few details on how this was conducted in the paper. Last, the linear models typically ignored other contributing factors beyond the considered ones. Glacier mass balance is typically controlled by many factors, such as ice flowing, radiation, albedo, and even terrain, not simply by precipitation and temperature. Prediction of future glacier mass balance based on solely precipitation or temperature is highly uncertain.

By the way, I'm not familiar tree-ring. So I have a question for the authors, how did they have the tree-ring data for 1600s. Are there exactly trees so old in Central Asia? Regardingly, I would suggest the authors to provide more data (such as pictures) for the tree-ring collection. The simple statement of 'Data set available on request to corresponding authors' is unacceptable recently in HESS.

Some small comments:

1. Seems the collection sites of tree-ring are far from the glacier. Do the authors have any comment on the representativeness of the tree-ring data?
2. What is sample depth in Figure 2?
3. Gridded data was derived from CRUs at a resolution of 0.5 degree, which is larger than the glacier size. Do the authors have any comment of this uncertainty?
4. Figure 3 different gradients should be different altitudes.
5. Leave more space between sub-panels in figure 4
6. What is growing season? From... to...
7. Figure 8 is unclear or even unnecessary, I think . Are they discussing the spatial representativeness of the glacier or the precipitation data?