

Supplementary Reply on RC1 (Methods, Glacier Area Change, and Oases)

Xuejing Leng et al.

Author comment on "The Spatiotemporal Regime of Glacier Runoff in Oases Indicates the Potential Climatic Risk in Dryland Areas of China" by Xuejing Leng et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-377-AC4>, 2021

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Thanks again for your helpful and valuable comments on our manuscript entitled "The Spatiotemporal Regime of Glacier Runoff in Oases Indicates the Potential Climatic Risk in Dryland Areas of China" (ID: HESS-2021-377). After studying your comments carefully, we have made some corrections which we hope to meet with approval.

- First of all, we rewrite the Methods and annotate parameters correctly. As for some details we have discussed too much, such as the reasons for choosing Shean Estimation and APHRODITE, we use charts and figures to illustrate them in supplementary materials. We also add the methods to calculate the glacier area change. The revised Methods with supplementary materials are attached in the supplementary materials.
- We add the analysis of changes in glacier areas. Glacier outlines were extracted from Landsat TM scenes in the two periods (Region1985-1995 and Region1995-2005) in each basin at the end of ablation seasons (September to November), respectively, in Google Earth Engine™ (hereafter, GEE) based on band ratio segmentation method (Guo et al., 2015; Paul et al., 2009; Racoviteau et al., 2009). We also add an analysis of changes in glacier area in Results.
- We think your suggestion "missing a discussion how water from the glaciers reaches the agricultural areas " should be further discussed. While our article focuses on high-resolution glacier runoff calculating on regional scales but not the hydrological distribution model, the accurate value arrived at the oases (how water reached) is not our goal in this paper. As rivers in DAC are nourished to a high degree by glacier meltwater and also the glacier meltwater is the main artery for the oases in the DAC (Kaser et al., 2010, Wang et al., 2013). Changes in glacier runoff could alter the runoff in the whole river basin. However, the contribution of glacier runoff to oases is fuzzy and hard to quantify (Tino et al., 2013). Most studies also show that glacier runoff is crucial to oases, but there is no quantitative study on how it affects oases (Chen et al., 2019; Fang et al., 2018; Ma et al., 2015; Patrick et al., 2015; Su, 2002; Wang et al., 2012; Yang et al., 2015; Zhang et al., 2021). So, we think that the changing proportion of water withdrawals due to glacier runoff under climate change is sufficient to illustrate the threat of glacier runoff to oases.

Hope the revised sections meet your requirements.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-377/hess-2021-377-AC4-supplement.pdf>