

Interactive comment on “

Snow cover dynamics and hydrological regime of the Hunza River basin, Karakoram Range, Northern Pakistan” by A. A. Tahir et al.

Anonymous Referee #2

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The paper presents an observation based comparison between snow cover, precipitation, temperature and runoff in the Hunza basin in Pakistan. They show that discharge from the snow covered and glacierised basin is closely related to temperature and to a much lesser degree to precipitation. The study present a straightforward analysis and it is generally well written. It is of interest to the readers of HESS and it is an important piece of work in a field and geographic area where limited scientific work is available. However there are number of shortcomings that need to be addressed before the paper

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can be accepted.

1. The authors state the Hunza is not impacted by global warming because a large part of the basins, which also produces most runoff is at high elevation where temperatures remain negative. I challenge this statement because there is always an equilibrium between the melting point and the extent of the snow cover in a catchment. If the temperature rises with a constant precipitation snow cover will always recede. It depends on the topography of the catchment how fast the snow cover will be reduced. Your data shows that the temperatures in the basin do not show strong positive trends ($0.0003 \times 12 = 0.0036$ degree / year compared to the global average of 0.021 degree / year over the last decade) and this is the reason why no large trends in runoff are observed. The reasons for this relatively constant temperature are multi-fold and should be compared to nearby stations before any conclusions can be drawn.

2. In the abstract it is stated that snow cover is expanding in contrast to receding glaciers worldwide. Glaciers and seasonal snow are two very different things that respond very differently and the authors seems to suggest that climate change is not happening in the Hunza based on this statement. Evidence on the glacier extent and downwasting or thickening rates should be included to support this conclusion. Glacial melt is an important contributor stream flow, but the topic is completely ignored in the paper.

3. Although winter precipitation is significant in the Hunza I am not convinced it exceeds the monsoon peak. It would be good to show some proof of this statement.

4. Runoff in these basins is obviously a function of temperature and precipitation. The authors state that their precipitation measurements are completely unreliable and the fact that average stream flow exceeds average precipitation by at least a factor 2 seems to indicate something strange is indeed occurring. The authors mention a severe undercatch of precipitation at high altitude and a strong increase in precipitation at elevations higher than 5000 meter based on work of Hewitt and others. This seems

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plausible but extremely large. A possible other explanation could be increased glacial melt. It would be good to do a literature review on glaciers in the Hunza.

5. The authors mention an NDSI threshold of 0.82, while this is normally 0.40.

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