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The Cryosphere Discussions

Interactive comment on "Role of glaciers in watershed hydrology: Himalayan catchment perspective" *by* R. J. Thayyen and J. T. Gergan

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Thayyen and Gergan (2009) examine an important topic, the response of glacier fed Himalayan Catchment's to climate conditions. Their focus is solely on an area of the Himalaya that receives its highest accumulation and ablation in the same season, due to the summer monsoon. Unfortunately this paper raises more questions than it answers. The analysis lacks the depth necessary to distinguish robust and important conclusions. Numerous conclusions are drawn that are not warranted by the relatively thin data set. This research project could provide important results if the analysis is narrowed, limited to the breadth of the data, and is interpreted with greater detail. I encourage the authors who have limited data on the winter season to not draw conclusions about this season. I further encourage the authors to provide more detailed

data from the glaciers and the methods used. Further to more rigorously separate the contributions of precipitation, non-glacier snowmelt and glacier ablation on discharge. Only this would allow differential diagnosis between the role of ppt. and glacier melt in the hydrologic records.

The following are some examples where the reader is either left with important question as to the methods, where key data is missing or where statements exceed the bounds of the reported data.

446-20: The average accumulation rate of 0.43 my-1 is cited. Given the volume loss this is not the annual balance, but what does it represent and how was it determined?

448-13: What was the purpose of the May snowline observations and how did this observation relate to annual glacier contribution or to annual discharge if at all. Since the summer monsoon is the suggested to be the main accumulation source for the glaciers, why is their no snowline reported for this period?

448-15: How was the summer balance estimated?

450-20: Stated that; Monsoon rain main component main component of melt versus glacier melt, this maybe true but where is the data to back this up.

452-5: How was the melt determined? How was the net accumulation determined? What elevation bands of the glacier are referred in each.

452-15: What is the winter precipitation rate or swe increase with elevation? This is crucial. What is the mean summer and winter snowline?

453-22: Buffering capacity of glaciers during period periods of low runoff in glacier fed rivers is a typical aspect of glaciated alpine basins.

454-4: The heavy precipitation and runoff of 2001 does not clearly show the influence of ppt. dominates both during the winter and summer monsoon. It shows that in a wet year ppt. can dominate. Further where is the precipitation data or runoff data for the

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winter that would allow any such conclusion?

454-22: Conclusion that the highest runoff in a glacier fed stream is always a result of ppt. has not been documented given the paucity of the data presented. This is true when it comes to the highest short period flows certainly. But without precipitation data and snowline data and ablation data, how can we distinguish?

455-18: Low runoff in glaciated alpine basins with high negative mass balance as noted for 1999 is typical of alpine glaciers not atypical. The higher discharge of 1994 and 1998 during wetter years is exactly what would be expected in most glaciated alpine basins. The higher runoff is associated with wetter years, which tend to have more positive mass balance. What is different in these basins and what would make them atypical is that high accumulation and high ablation occur simultaneously during the summer monsoon. If the summer accumulation and ablation can be quantified, we would expect the impact of high precipitation years to be exaggerated on a Himalayan glacier. If this level of information can be gleaned from the mass balance data than this research would be unique and valuable.

Figure 5: This diagram without elevations for the basins in questions and supported by the snowline observations etc., is not useful.

Figure 6: Except for 1988 and 1999 the runoff at the three elevations is well correlated. This is not examined in text.

Figure 7: Where does the data come from that is illustrated here.

Figure 11: Should contain some precipitation data to illustrate connection with runoff decline.

Interactive comment on The Cryosphere Discuss., 3, 443, 2009.