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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

Anonymous Referee #2

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The "Himalayan Dilemma"is complex by poorly known effects of climate change upon land and water resources, including potentially significant impacts upon frozen water stores. The extreme Himalayan environment often makes transferring scientific knowledge from elsewhere inappropriate. So Thayyen and Gergan (2009) certainly addresses some research gaps.

In the abstract the authors suggest that the inter-annual runoff variations in a "Himalayan glacier catchment" are directly linked with the precipitation rather than mass balance changes of the glacier". I think it is danger to make such a general conclusion. The catchment response would be clearly different depending upon the % of the glacier in the catchment. Scaling issues in Himalayan catchments are more important due to the highly variable terrain controls on hydrological process. The study area of

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77.8 km2 contains only 9.6% glacier area. It shows that Din Gad is clearly precipitation dominated “Himalayan catchment” rather than a “Himalayan Glacier catchment”. Table 1 clearly shows that Din Gad which has higher degree of precipitation dominated catchment has higher inter-annual variability in runoff than less precipitation dominated glacier catchment (Table 1).

Assessment of snow and rainfall components in the stream flow is missing in this study. This is resulted the lack of the interpretation on contribution of precipitation and glaciers degrade response in the runoff from the head water catchments (Glacier station and Gujrat Hut) where glacier contribution is significant.

The remote location of gauges, lack of automated recording, sediment and solute cause major problems for continuous data collection and accurate estimate of stage discharge rating curves in the Himalayan regions. The authors’ effort on data collection can be greatly acknowledged. However, the 6 year data series is too short to investigate the inter-annual variability in the flow shape and magnitude. It will be nice to mention about the data quality and data validation procedure for an idea on data accuracy and the limitations.

As mentioned in p 453- 11, Fig 6 does not clearly explain the role of glaciers and precipitation in the inter-annual variation in the runoff in the catchments. I am missing the graph of inter-annual variability in precipitation in each catchment.

Authors state in p 454-15 “it is clear from the results presented above the reason behind such a response is reduced runoff contribution from non-glacierised areas of the catchment, rather than any increase in the glacier discharge”. However, this pattern in not very true if we closely look the inter-annual variability of the parameters from 2000 onwards.

Numerous conclusions are made in the paper without sufficient supporting information. The limited data set was not providing the sufficient evidences for the conclusions. The data set was non-representative.

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3, C190–C192, 2009

In conclusion I think a critical revision is necessary on the paper.

Technical corrections:

P 444-18 change “suggest” into “suggests” p 444-20 change “suggest” into “suggests” p 446-21 the small glacier joining Din Gad is missing in Fig 1. P 446-13 the text says the glacier area is 9.6% whereas Table 1 shows glacier is 15.7%. It seems that in Table 1 area corresponds to the catchment area of Glacier Station but not the glacial area. If that is case better to put Station after Glacier to clarify the difference. Could you please elevation of the permanent snow cover in Din Gad in the text? P 453-28 Delete “of” after “runoff” P 457-22 replace “centaury” into “century”. P 459-22 Change “suggests” into “suggest”. Fig 1- Give separate clear symbols for hydrometric and meteorological stations. Fig 5- Give elevations in Fig 5.

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