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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Quantifying streamflow and active groundwater storage in response to climate warming in an alpine catchment, upper Lhasa River" *by* Lu Lin et al.

Anonymous Referee #1

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This paper presents the temperature, precipitation and stream variation in the Yangbajain catchment. Interestingly, the estimate the base flow and connect the baseflow variation with the climate change. This is important for the local water resources management and well as for the global groundwater-climate change research. But it should be accepted after a minor revision. My major comments are: 1. The accuracy of base flow and groundwater storage estimation. As I pointed out in the specific comment, the authors should provide more evidences to show the estimated groundwater storage are correct. 2. The explanation on the glacier loss should be deleted. Please see the specific comment (Line 408-413). 3. The schematic model (Figure 3). (1) The glacier thickness should increase with the altitude; (2) 'Unconsolidated material'

changes 'Unconsolidated soil layer'; (3) Take care of the width of the arrows. Specific comments: Line 115&117 What is the method difference between Lyon et al. (2009) and Kirchner et al. (2009)? And what is the latest advance of the recession analysis? Please clarify. Line 163, 164&168. Please describe the number clearly on the period as well as the hydrologic station. Line 169-171 How do you get the number of 63% from Fig. 2. And I do not think you can get this number easily only with the data of temperature, precipitation amount and runoff. Line 286-288 The higher grade relational grade is found at the annual scale, how can you say the air temperature also acts a primary role for the base flow? Line 339-344 I suggest to shift these sentences above the lines 335-339. Before discussing the trend of the groundwater storage, you should firstly explain the obtained results of groundwater storage are reasonable. I also ask the authors to give more explanation on their obtained groundwater storage, because it does seems consistent between the Grace data and your data. Could the authors give more evidences of the monitored groundwater level? Line 356-370 I understand the authors try to draw the conclusion 'the increased streamflow is mainly fed by the accelerated glacier retreat rather than frozen ground degradation' through the comparison between four catchments. This is something kind of 'circumstantial evidence'. Could you explain why the frozen ground degradation does not increase the streamflow? Line 408-413. This is quite arbitrary. Although the estimation of glacier loss is reasonable, the loss can be explained in many ways. For example, it could be delivered through the different pathways of shallow aquifer; and it could be exchanged with the aquifers outside the studied region. Sure, it may also infiltrate into the deep fault. But all of these hypotheses need evidences. If you take the one of deep circulation, you should describe clearly the hydrogeologic features of the fault. Is it conductive or not? What is the depth of it? What is the groundwater flow direction inside it? Could you provide the hydrogeologic section map here? If the authors could not provide the discussion above, I suggest the authors to delete this paragraph and leave the glacier loss as an open discussion question here.

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