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Interactive comment on "Processes governing the mass balance of Chhota Shigri Glacier (Western Himalaya, India) assessed by point-scale surface energy balance measurements" *by* M. F. Azam et al.

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Azam et al (2014) construct an energy balance model that is calibrated with limited but the best available field meteorological and surface mass balance data in a region of the Himalaya that lack such studies. Given that Chhota Shigri Glacier has the best field data this is the ideal location for better understanding the specific climate sensitivity of the glacier. This is an essential step forward in our understanding of the energy balance and climate sensitivity and how they vary significantly in the high mountains of Asia. A key observation is the importance of winter precipitation for this particular glacier. Three challenges that remain: 1) Explaining why October 1 is used as the end of the hydrologic year, since it is not the balance minimum. This would include better defining ablation during the at least the start of the post monsoon season. 2) The validation is based primarily on results from a single elevation, a single stake. This could be expanded using the transient snowline if no other field data exists. 3) Identify the key conditions that have led to either high ELA above 5100 m or low ELA below 4950 m. The trend of recent higher ELA's is worth a brief comment.

2869-26 to 2870-5: Remove unneeded reference section.

2870-20: Why not mention the 1986-1988 period of observation too?

2875-16: Given that the winter season starts in December, and that the post Monsoon season typically features significant ablation why is October 1 the start of the hydrologic year? It is fine to do so, but the rationale should be stated. Note the comments below on this topic too. There is not a simple solution since October 1 is typically not the minimum balance date. Figure 2 highlights this fact as well. Datt et al(2008) observed that winter precipitation is dominant at Dhundi field station of Snow and Avalanche Study Establishment, which lies in Pir Panjal range, and that snowfall did not usually accumulate until November. Prasad and Roy (2005) using a snowmelt model in the Beas River basin observed that October had the minimum snow covered area fraction for the elevation band from 3000-5000 m. Negi et al (2009) note a lack of snowcover in the Beas River basin in October. The Beas is not the same basin, but the same feature can be seen in satellite imagery for the post monsoon season.

2877-18: Worth contrasting this percentage of summer and winter precipitation to Mera and Pokalde Glacier, Nepal.

2889-2: The validation of the model using the limited stake data from one elevation is weak. This is hard to overcome at this point. One solution worth exploring is to use the transient snowline that can be visibly observed. If the model can correctly predict its elevation for specific dates observed by satellite imagery or in the field, than each of these dates represents a validating measure too. If snowpack depth in the area above the snowline is available then the ablation rate can be determined as the transient snowline rises (Mernild et al, 2013).

2892-9: It is noted here the occurrence of mid-September snow storms near the end of the summer monsoon and their ability to reduce melting for a short period. What needs further attention is the fact that in this region snowcover is typically less in October than in September. The ablation may not be high but in satellite imagery it is quite apparent in the fall of 2011, 2012 and 2013 that mid-Sept. snowcover is greater than mid to late October snowcover. That ablation does occur is implied by the authors noting role that such snow events can have on ablation. This also suggests the problem with having October 1 as the end of the hydrologic year, since it is typically not the balance minimum.

2893-12 The authors indicate that ablation typically ends in mid-October, confirming the above for many years. The references noted above all indicate that minimum snow-cover in the region occurs in October, which makes October 1 problematic as the end of the hydrologic year. I do not suggest the authors need to make this change at this point just acknowledge the issue.

2893: There should be reference to the difference in climate during the years with the ELA above 5100 m such as 2003, 2004, 2006, 2007 and 2008 versus those with the ELA below 4950 m such as 1986, 1987, 1988, 2005 and 2010. Maybe 2010 can be compared to the higher ELA of 2013.

Figure 14: Does not add value beyond what can be stated in the text.

Datt, P., Srivastava, P.K., Negi, P.S. and Satyawali, P.K.: Surface energy balance of seasonal snow cover for snow-melt estimation in N-W Himalaya J. Earth Syst. Sci. 117 567–73, 2008.

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Negi, H.S., Kulkarni, A.V. and Semwal, B.S.: Estimation of snow cover distribution in Beas Basin, Indian Himalaya using satellite data and ground measurements. J. Earth System Sci., 119(5), 525-538, 2009.

Prasad, V.H. and Roy, P., Estimation of snowmelt runoff in Beas Basin, India. Geocarto Int., 20(2), 41–47, 2005.

Interactive comment on The Cryosphere Discuss., 8, 2867, 2014.