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TCD

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Interactive Comment

Interactive comment on "A comparison of different methods of evaluating glacier response characteristics: application to glacier AX010, Nepal Himalaya" *by* S. Adhikari et al.

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Adhikari et. al., (2009) provide a detailed examination of the response time of the unromantically named Glacier AX010. This glacier is a perfect choice for a response time study due to its simple geometry, lack of an icefall, and lack of debris cover. The papers last paragraph poses the relevance of the question of dealing with the response time of small alpine glaciers in the face of potential short term survival. I do not question the relevance; it is in fact more important given the circumstances. Being able to understand and quantify the response of glaciers is essential for determining and planning for future water resource changes. If the glaciers were quasi static this would not have the same import. The paper applies a wide range of different existing means of determining response time; thus,providing a valuable comparison of the existing methods of calculating glacier response time and I look forward to its publication. The suggestions below are offered to enhance an already strong paper.

768-25: A bit more information on mass balance would be useful, possibly using a mass balance map or typical mass balance gradient for the glacier. A picture of the glacier would be useful, there are many available, but here would be nice as well.

769-10: What is the ice thickness range, we know the maximum thickness, what is typical at the ELA and in the accumulation zone?

771-8: Does the Tr of 8-13 agree with the lag noted by Adhikari and Huybrechts (2009)?

774-8: Tv is calculated using f=0.5 and f=0.3, the volume response time declines for the smaller value of f. This is a bit puzzling. A glacier that has f=1.0 is losing or gaining mass everywhere at the same rate, this would seem to generate a faster volume response, than where the volume loss is concentrated at the terminus. Why is this not true on AX010? Whereas, a smaller value of f would concentrate change at the terminus, speeding up Tl response versus a large value of f.

775-24 Note that Tv of 29 years is a maximum value due to using the maximum ice thickness.

778: The term br is the focus of a lengthy and appropriate discussion. The term itself does not lend itself to accurate determination as it is not a measurable or real value that can be tested against an observed value. This difficulty in accurate determination and the resultant uncertainty in Tv should be more clearly noted. Is there a better way than br to get at this?

782: Based on equation 7, why does it make sense that C can be determined from C=-2/slope X 150%? What happens to the value of C determination if the glacier accumulation zone is not 4 times the ablation zone width? C is significantly different for AX010 determined using the two methods noted. This suggests that the C as calculated is not a robust term. Which of the models relies more on C? I believe it is the inverse method suggesting this method is not as reliable. Further comment on the reasonability of using C would be appreciated.

783-5: The importance of the height mass balance feedback is evident in the observations by Pelto (2009 in TCD), "Forecasting temperate alpine glacier survival from accumulation zone observations". In this study we found that further adjustments have been accelerating the response time. Is this what you have found? Is this what you would expect to find for AX010, or what conditions would shape whether including this feedback would be positive or negative for response time?

Figure 5: It could be pointed out that the scenario of a loss of -0.5 m per year leads to sufficient volume loss that the existence of the glacier is in question.

Figure 6: ELA change is linear and given the simple geometry and relatively even slope this is not surprising.

Interactive comment on The Cryosphere Discuss., 3, 765, 2009.