

Interactive comment on “Estimating the avalanche contribution to the mass balance of debris covered glaciers” by A. Banerjee and R. Shankar

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This is an interesting paper, that makes a useful contribution to estimating the mass balance of Himalayan glaciers. The contribution of avalanching to mass balance is under-researched, so this paper is welcome. It is clearly structured and well argued, and the methods appropriate and clearly explained. Although the model is highly idealized, and neither the constitutive relations nor ice thicknesses are known, the tuning process largely cancels the associated uncertainties and the results are robust.

On the whole the paper needs only minor correction, as detailed below.

12: insert 'of' after 'fraction' 14: 'cover' should be 'covered' 16: insert 'a' after 'of' 18: 'Bannerjee and Shankar, 2013). But...' should be 'Bannerjee and Shankar, 2013), but...'

C11

(i.e. no sentence break) 25: 'subsides' is not a good word here. 'The debris is buried in the snowpack' would be better. 26: delete 'the' before 'it' 29: '...net mass balance. So much so...' should be '...net mass balance, so much so...' (i.e. no new sentence) 31: 'activities' should be 'activity' 45: 'much smaller' should be replaced with 'less negative' 73: 'causes' should be 'cause' 185: 'line' should be 'lines' 194: 'quite' should be 'very' 196: This statement is not correct - and the following discussion does not clarify the issues very well. AAR's of 0.6 on alpine glaciers reflect the area of snowfield required to balance ablation rates on bare ice. On an avalanche-fed, debris covered glacier, the conditions are different. First, avalanches dump large masses of snow in a small area - hence the accumulation area is smaller than would be the case if accumulation occurred by direct snowfall. Secondly, ablation under debris is typically much less than for bare ice, so larger ablation areas are needed to melt the same amount of ice. So, smaller accumulation are + larger ablation area = smaller AAR. These points should be made clear in the discussion.

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C12