

Interactive comment on “Brief Communication: Thinning of debris-covered and debris-free glaciers in a warming climate” by A. Banerjee

Anonymous Referee #2

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This paper uses a simplified flowline model to assess the impact of debris cover on debris-covered and debris free glaciers. The underlying concepts the paper aims to test are relevant and important. However, I think that the way in which debris included creates a circular argument. Areas with ‘debris’ cannot thin below a threshold, but this threshold covers a large portion of the ablation area in the model glacier. The author then uses this result to show that the debris covered area has not thinned, whereas the ice free glacier, which does not have this limit, does not thin. To me, this does not tell us about debris cover, but uses an arbitrary threshold to stop thinning at a certain point on one glaciers, but not on another. This debris parameterisation is fundamental to the paper. If my understanding is correct, then it is fundamentally flawed and circular and does not give us any information about the impact of debris on glacier melt rates. Page 1 Line2: Where as thin debris cover is expected to accelerate melt, due to its low

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albedo. Line 5: in >on Line 6: The sentence starting 'Subsequently. ...' Is hard to follow. Express more clearly. Line 7: I find this sentence hard to understand (starting 'Time evolution. ...') Line 13: Outline the impacts of thin debris cover on ice loss. Line 15: .. length change, and formation of.. Line 18: This task is made more difficult by our limited understanding of. . . Page 2 Line 2: Why then should. . . Line 5: get compensated> be compensated for. Line 8: Very briefly outline what these are. Line 11: pointed out> highlighted. Pointed out is colloquial. Line 12 debris-covered glaciers, but. Should be a comma not full stop. Line 27: steady state THE ice thickness profile. Page 3 Line 1: If I have understood correctly, the debris cover is applied by simply saturating ablation at -2 ma^{-1} over part of the terminus. This therefore seems like a very circular argument, as the value for this section cannot become less than -2 ma^{-1} . It therefore cannot thin and this is then used in an argument to say that debris cover means that the glacier does not thin. The only thing that can change is the upper section, which does thin. To be, this is circular parametrisation and not an appropriate way to evaluate the impact of debris cover. Perhaps I have misunderstood this, but it needs to be explained more clearly. Also, why a value of -2 ma^{-1} ? Line 17: I don't follow this argument.

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