

Interactive comment on “Testing hypotheses of the cause of peripheral thinning of the Greenland Ice Sheet: is land-terminating ice thinning at anomalously high rates?” by A. Sole et al.

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This is an exceptionally important paper as it emphasized that dynamic thinning is the key mechanism for rapid thinning of marine terminating outlet glaciers in Greenland using a different data set. Dynamic thinning has already been the evident solution due to the lack of seasonal velocity change and the initiation of observed velocity increases occurring at the calving front and propagating upglacier. However, there has even in the glaciologic community an misunderstanding about the extent of the role of the enhanced meltwater induced acceleration and a significant use of this to explain outlet glacier acceleration. Zwally (2002) did not intend to explain the bulk of the the GIS out-

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let glacire acceleration with enhanced meltwater production and delivery to the base of the glacier, lubricating the glacier base. Many others have extrapolated this mechanism to an inappropriate degree. Changes in glacier thickness is an independent data set for identifying regions with the greatest thinning and correlating these with ablation observations, and velocity observations. The results reinforce that the main changes in thickness have occurred in marine terminating outlet glaciers. This fits with the fact that marine terminating outlet glacier are also the location of the noted accelerations. The key is the reduction in effective bed pressure that can lead to increased calving, which leads to glacier acceleration, glacier thinning and potentially then even more reduction in effective bed pressure. Equally important is that this process is occurring not just on a few marine terminating outlet glaciers of Greenland, or even just on the ones that had sudden increases in velocity or retreat, note Rinks Isbrae.

The main suggestion I have for this paper, if possible, is to examine the identified magnitude of thinning of the marine terminating outlet glaciers, in the context of how much effective bed pressure change this would induce. Understanding that doing this in detail is the task of another paper, but just a hint of this would be useful. Possibly in section 4.1.

A further suggestion is that in Figures 4-6 the color coding is confusing as land and marine are not uniformly of the same color in the same diagram.

Since the thinning observations focus primarily on the ablation zone, section 4.2 is not as critical and I hope it does not distract from the important lower elevations data.

I believe a table would be useful to more concisely delineate the observed thinning rates for each glacier between the two time periods and at one or two specific elevations.

Figure 7 is particularly important and deserves more attention.

Is Figure 8 warranted?

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