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The Cryosphere Discussions

Interactive comment on "Recession, thinning, and slowdown of Greenland's Mittivakkat Gletscher" *by* S. H. Mernild et al.

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Mernild et al (2012) provide a valuable record of the changes in velocity of a small Greenland glacier. The velocity record is unique in its length, but also in the companion surface mass balance record. My comments focus on reducing the emphasis on the surface mass balance record that has already been published in detail and increasing the focus on the surface velocity record. This group of authors are continuing to provide a detailed and valuable record of the response of a small Greenland glacier to climate change. This paper will add to this comprehensive examination.

2009-19 to 2010-6: Most of this can be removed as it is duplicative of Mernild et al (2011). AUTHORS: The text is re-written and parts of the text are erased to avoid overlap.

2010-19: How many stakes total? How many years for most stakes? AUTHORS: The text is re-written. Nineteen stakes were measured each year for the entire period.

4.1: This section should be shortened as the key to this paper is not the details of seasonal mass balance but surface velocity. As a result it is only Figure 3c that is crucial. AUTHORS: This section will not be shortened, since it is important to understand the spatial description of the winter, summer, and net mass balances, if we want to illustrate the spatial velocity distribution in detail. All figures in Figure 3 will be kept to give a better illustration and understanding of the spatial winter, summer, and net balance conditions.

2016-13: More detail is needed here illustrating the variation of velocity spatially and temporally: 1) Illustrate the variation of velocity with elevation, note Figure 4 Palmer et al (2010a) or Palmer et al (2010b) or Berthier and Vincent (2012). Just as the balance gradient for the glacier has been shown to be similar from year to year in shape (Knudsen and Hasholt, 2004), just shifted with respect to x-axis, it would be interesting to see if the pattern is similar with velocity and elevation from year to year. 2) How has the velocity variation progressed with time, did the increase occur steadily or more suddenly. This would be illustrated by providing a temporal view of velocity change at specific stakes or sets of stakes (Berthier and Vincent, 2012). 3) The mean annual surface velocity change map in Figure 5 is nice, but this should be its own figure along with the same map scale showing the percent change in velocity. AUTHORS: The velocity with elevation is what we are illustrating on Figure 5a, just in a spatial way for the Mittivakkat Glacier. Illustrating the velocity along a transect, what the reviewer is asking for, is overlap to what is already illustrated in Figure 5a. We did not decide to illustrate the annual variability in velocity a long a transect, but instead we decided to illustrate the average spatial change in velocity over the observation period for the Mittivakkat Glacier (Figure 5a). Because we have the data, it is more comprehensive to do a spatial plot instead just only transects plots. Plotting transects (elevation and velocity for each year) will be overlap due to what is shown in Figure 5a. We decided

to keep Figure 5 the way it is by not dividing it into two figures, since Figure 5a links up to changes in Figures 5b, 5c, and 5d.

2017-3: Would a figure such as Figure 9 from Berthier and Vincent (2012) be useful in identifying the various roles inn velocity change? AUTHORS: The figure seems to overlap with what we already have shown. This is just another way to illustrate changes in velocity.

2019-22: Compare the changes in velocity seasonal changes to those from Flade Isblink where ablation is less (Palmer et al, 2010) AUTHORS: The reference is added to the manuscript.

Interactive comment on The Cryosphere Discuss., 6, 2005, 2012.