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The Cryosphere Discussions

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

Anonymous Referee #1

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This paper deals with just what is advertised in the title: thinning and slowdown of a local glacier in Greenland over the past few decades. The authors also give values for volume change and quantify the annual velocity cycle at a local on the glacier. The slowdown is explained in terms of thinning, and basal sliding is shown to be a smaller player in potential causes for slowdown. The manuscript is easy to read and understand.

I do not have many comments (see below), but some of them are very important. Most crucial may be that the results may not be all that spectacular or a big advance in our understanding. The thinning and negative mass balance of MG have been published by the first author on previous occasions and may be limiting the newsworthiness of this work. And the explanation of why there is a slowdown of MG is no surprise to

most readers. The velocity variations could be something to put the full emphasis on, with special focus on parallels between Greenland and alpine glaciers. This would require quite some work, but could be that advance in our understanding of Greenland's peripheral glaciers that is mentioned as a driver behind this work.

Specific comments:

Fig 2: Why is the validation not shown for all stakes? Were there no more transects of radio-echo sounding collected? What is the error at other stakes?

Line 6 & 16 page 4392: Please give root mean square difference as well. If this is mean difference then it is only helpful in detecting an offset.

Figure 3 is very hard to read, printed out on A4 paper. Increase font size (also in other figures). Please use the same color scales in the right panels of Fig 3 for easier comparison. Also, indicate the statistical significance of these trends and consider removing areas where the trend is insignificant. Also, repeat the period covered by these measurements in the text and mention that stakes were used.

Is Fig 5 mentioned in the text before Fig 4?

Give uncertainty in Fig 5b and make the horizontal axis (stakes?) the same as in Fig 5a.

Line 18&19 page 4396: You can't claim 2-decimal accuracy based on the uncertainties.

Fig 6 is also hard to read, especially the contour line labels - like in Fig 3. Also here, indicate (in b) where trends are statistically significant.

Section 4.3 and Fig 7: Sliding only adds to velocity; thus where Vsia is larger than Vobs, all of the difference can be attributed to calculation errors. These errors seem very large in the right hand side of the figure and do not give much confidence in the result.

The findings in section 4.3 are not all too remarkable. The large slowdown is interest-

ing, but I don't think that any reader would consider another cause of this than thinning. Especially the slowdown because of changing hydrology seems far-fetched.

Section 4.4 more or less sums up what is known from previous studies and provides no new insights. Besides, I find it hard to fit this section in with the rest of the manuscript.

Looking into the uplift events would be interesting, and could make you come to conclusions such as "MG behaves just (un)like alpine glaciers", which can help statements that understanding MG is crucial for understanding Greenland's peripheral glaciers.

Interactive comment on The Cryosphere Discuss., 6, 4387, 2012.