

## ***Interactive comment on “Record mass loss from Greenland’s best-observed local glacier” by S. H. Mernild et al.***

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Received and published: 3 March 2011

M. Pelto, thanks for the comments related to our paper in discussion for TC.

Title: Add Mittivakkat Glacier to the title.

MERNILD: Is done.

464-8: Expand the discussion or include a table of the various terminus changes for the intervals noted in Figure 1.

MERNILD: We have decided to calculate and add the average annual terminus retreat which is around 16 m yr<sup>-1</sup> (1931-2010), and not to calculate/add the average retreat between the line intervals (shown in Figure 1), since the behavior (retreat) of the glacier

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terminus in this mountain area is highly influenced by the topography: valley and the peak topography, the shadow effect from the mountains. Furthermore, the retreat of the terminus is influenced due to variability's in climate, and delayed due to dynamic processes within the ice. Therefore, a signal from the changing climate, will necessarily not be seen right away at the glacier margin. Based on these processes delaying the terminus retreat from changes in climate, we only added the average terminus retreat value to the manuscript, which was 16 m yr<sup>-1</sup> (1931-2010).

464-20: Include a figure illustrating the balance gradient of the glacier. This is the single key figure that is helpful in analyzing mass balance, particularly with respect to a glacier's future response to climate change.

MERNILD: Figures illustrating annual net balances with altitude for the Mittivakkat Glacier, have already been published, and therefore to avoid scientific overlap, these figures will not be shown here again. References to the papers have been added to the manuscript in stead of: - Knudsen, N. T., and B. Hasholt (2004): Mass balance observations at Mittivakkat Glacier, southeast Greenland 1995–2002. *Nordic Hydrol.*, 35: 381–390. - Knudsen, N. T., and B. Hasholt (2008): Mass balance observations at Mittivakkat Glacier, Ammassalik Island, Southeast Greenland 1995-2006. *Geografisk Tidsskrift*, 108(1):111-120.

464-21: A satellite image with glacier contour lines and basic measurement profiles noted should be included since this is the first detailed mass balance report on this glacier.

MERNILD: A map illustrating the glacier with contour lines, and where the glacier stake observations were done, is illustrated in Knudsen and Hasholt (2004, 2008). Also, here, to avoid scientific overlap, these figures will not be displayed again.

465-6,8,9: For clarity refer to mass balances losses with a negative sign before the value, as -0.34 m etc.

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MERNILD: Since a 'loss' by definition is a negative thing, it will be a pleonasm saying: 'a loss of -0.34 m'. Therefore, we will not include a negative sign in front of the values, as asked for by the reviewer.

465-11: What was terminus ablation in other high years such as 2005 and 2007, did 2010 substantially exceed all?

MERNILD: Terminus ablation values for 2005 and 2007 are added to the text.

465-24: What was the winter balance in the typical accumulation zone above 600 m in 2010? At present we are given very little information on accumulation zone. Given the low AAR it is expected that ablation will be of greater focus.

MERNILD: In 2010, the AAR was zero, indicating that ELA was located above the glacier some where. We simply don't have any data for the 2010 winter balance, because we didn't went to the glacier in end-of-May 2010. In some years fieldwork is done both in end-of-may, and end-of-August, but in 2010 we only went to Mittivakkat in August to do annual net balance. In 2003, 2004, 2007, 2009, and 2010 we didn't go there to do end-of-winter balance. Due to the missing values in the winter balance time series, we were in this paper only concentrated/focused on the net balance.

465-25: When was the terminus exposed in 2010. Are there any other transient snow-line elevations noted during the course of the melt season. It would be interesting to know the length of exposure to melting of the various elevation bands.

MERNILD: As I just stated above we have no direct observation/information about the glacier conditions during the 2010 winter period, the spring melt period, and the early/mid-summer period.

467-3: Is the annual ELA observed in the field or via satellite images?

MERNILD: The ELA is calculated based on measurements from the stake method. We have added a line to the manuscript, to make it clearer.

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467-15: Since 4 out of the last 10 years have led to the loss of essentially the entire accumulation zone, and other very low AAR suggest the lack of a persistent accumulation zone. Without an accumulation zone a glacier cannot survive Pelto (TC: 2010).

MERNILD: I agree. The low AAR, and AAR values equal to zero, will probably in the long run do, that the glacier not will survive. Therefore, it will be interesting to observe mass balances (winter, summer, and net) for the Mittivakkat Glacier in the future – in the next decade –, to see if the trend illustrated for the period 1995-2010 will continue.

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Interactive comment on The Cryosphere Discuss., 5, 461, 2011.

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