

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

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X. Fettweis, thanks for your referee comments related to our paper in Discussion for TC.

This short paper presents a 15yr Mass Balance (MB) records of the Mittivakkat Glacier by highlighting the record 2009–2010 mass loss. The paper is well written and the TC journal is right for this kind of paper. However, after Tedesco et al. (2011), the interest of this paper is poorer.

MERNILD: I looked into the Tedesco et al. (2011) paper, to see what the focus area for their study was. They mentioned climate records for Western and Southern Greenland for 2010, not for Eastern Greenland, and they looked into the Greenland Ice Sheet

C100

albedo and accumulation conditions for 2010. Therefore, the interest of this paper might still be high, since we are focusing on different issues – we on climate issues, also for 2010, but instead related to a local glacier in East Greenland, and whether it is out of balance according to present climate. The paper by M Tedesco, X Fettweis, M R van den Broeke, R S W van de Wal, C J P P Smeets, W J van de Berg, M C Serreze and J E Box (2011), The role of albedo and accumulation in the 2010 melting record in Greenland, Environ. Res. Lett., 6, 014005, is added as a reference to the manuscript.

1. Some 2D figures showing the elevation bands listed in Table 1 and where the SMB measurements at the surface of the glacier are made is needed here as pointed out by Prof. M. Pelto.

MERNILD: As stated in the comments to Prof. M. Pelto, all the figures about the glacier form, elevation bands, measuring points etc. he asked for, have been published in Knudsen and Hasholt (2004, 2008). Therefore, to avoid publishing exactly the same figures again, we have through the text, where it is necessary, added references to these papers.

2. The authors link the MB measurements to temperature/precipitation measurements made in Tasiilaq. A simple multiple regression explaining the MB variability with the Tasiilaq measurements could be interesting: $\Delta MB \sim a \times \Delta Temp_{summer} + b \times \Delta Temp_{winter} + c \times \Delta ACC_{winter} + d \dots$ (1) where Temp and Acc are the temperature and respectively the snow accumulation recorded at Tasiilaq.

MERNILD: The link between climate conditions at Station Tasiilaq and Mittivakkat Glacier mass balance data has already been covered/published in a previous paper by Mernild et al. (2008), actually in a more detailed seasonal way, but also on annual scale. A link between the end-of-winter Mittivakkat Glacier balance and Station Tasiilaq cumulative winter precipitation ($r^2=0.68$, $p<0.01$, where p is the level of significance), end-of-summer mass balance and cumulative summer positive degree days ($r^2=0.55$, $p<0.01$), and observed and calculated (calculated based on the links described) glacier

C101

net mass balance ($r^2=0.71$, $p<0.01$), have already been described/illustrated in the paper mentioned above. Lines, related to the Mernild et al. (2008) reference, have been added to the manuscript, illustrating the significant link between the climate and the glacier mass balance.

Mernild, S. H., D. L. Kane, B. U. Hansen, B. H. Jakobsen, B. Hasholt and N. T. Knudsen 2008. Climate, glacier mass balance and runoff (1993–2005) for the Mittivakkat Glacier catchment, Ammassalik Island, SE Greenland, and in a long term perspective (1898–1993). *Hydrology Research*, 39(4): 239–256.

3. The recorded ELA of each year should be plotted or given in a table for helping to interpret Table 1. In addition, the SMB measurements between each elevation bands could be listed in a table for each year. This will allow to compare the 2009/2010 anomalies with the other years and to show the zero AAR occurring some years.

MERNILD: For clarification to understand Table 1, a Table 2 has been added to the manuscript, illustrating observed annual ELA elevation at the Mittivakkat Glacier, and the variability in ELA from 1995 through 2010, indicating a variation in ELA between 400–500 and >930 m a.s.l., averaging 700–800 m a.s.l. for the period 1995-2010. 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.

4. A time series showing the mass gain from accumulation and mass loss from melt could help to better interpret the net MB time series (see Fig 3).

MERNILD: I agree that a time series showing cumulative winter balance and cumulative summer balance for the period 1995-2010 would have been helpful. But, unfortunately we have gaps in the winter balance records. That is why; we decided to focus only on the Mittivakkat Glacier net balance in this study. In 2003, 2004, 2007, 2009, and 2010 we didn't go to the Mittivakkat Glacier to observe end-of-winter balance. Due to the missing annual winter balance observations, we were in this paper forced only to focus

C102

on the net balance conditions.

5. Title like 2009-2010 record mass loss from the 15yr observed Mittivakkat Glacier, South-East Greenland is more adequate, I think.

MERNILD: The title has been changed.

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

C103