

Interactive comment on “Strong ELA increase causes fast mass loss of glaciers in central Spitsbergen” by J. Małecki

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Dear Prof. Holmlund,

Thank you for your accurate comments on the manuscript and apologies for my late reply.

The most important point of the review was the unclearness of the ELA issue. The conclusion about strong ELA increase in Dickson Land is based on the assumption that negative elevation changes of local glaciers result from increased melting. Contributions of the dynamic component and firn changes are negligible, because glaciers are nearly stagnant and almost no firn is present on their surface. Therefore, geodetic zero elevation change lines should closely match the 'real ELA'.

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In my previous paper (Małecki 2013b in the reference list) I reported the 1960-1990 zero-change line at ca. 600 m a.s.l. in central Dickson Land. The TCD paper calculates the 1990-2011 zero-change line at 1000 m a.s.l., which is above the highest zones of most of local glaciers. That indicates strong shift of the 'real ELA'. This conclusion is supported by my direct 2010-2015 mass balance measurements on Svenbreen (yet unpublished). The average 2010-2015 ELA on Svenbreen was also above the glacier and its mean 2010-2015 surface mass balance was very similar to the 1990-2011 geodetic balance reported in the supplement table of the TCD paper.

You also point to a mismatch between the 38% area decrease of local glaciers and only 8.4% length loss. Please note, that I do not give any % values of average length losses, I rather give length loss rates in m/year, including the Table 1. In fact, the total length loss of glaciers in Dickson Land was by far greater than 8.4% mentioned in your review. 62 out of ca. 150 ice bodies of the region were measured for length changes. The mean length of this subset decreased from 3971 m to 3049 m (by 23%, data available in the supplement). Total area of the subset decreased by 35%, so both values are somewhat comparable. Lateral retreat also causes significant area losses, because valley sides of many glaciers are not very steep.

I will try to address all your additional comments in the revised version of the manuscript. Thank you for your time.

With my best regards,

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Interactive comment on The Cryosphere Discuss., 9, 6153, 2015.

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