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The Cryosphere Discussions

Interactive comment on "Changes in the marine-terminating glaciers of central east Greenland and potential connections to ocean circulation, 2000–2010" *by* K. M. Walsh et al.

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As I am interested in the coupling between glacier surging and climate, and particularly surge activity in Greenland, I read this discussion paper with great interest. Overall, I find the paper important as there are few studies on glacier variations along the East Greenland coastline, but I do have some comments on the parts that involve surge-type glaciers. I believe that we should be careful when analysing frontal variations of surge-type glaciers in relation to environmental changes (Yde and Paasche, 2010), just as we have to be careful when analysing frontal variations of marine-terminating glaciers (Post et al., 2011). Basically, most glaciers between Kangerlussuaq Fjord and

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Scoresby Sund are considered to be either surging or potentially surge-type glaciers (see Fig. 1 in Jiskoot et al. 2003), whereas glaciers from Sermilik Fjord to Kangerlussuaq Fjord are characterised as non-surging tidewater glaciers. These differences in glacier dynamics are likely to influence frontal change rates in different ways in these areas, as recognised by the authors in their division of the data set into three sub-regions (chapter 3.4). However, Sortebræ is highlighted as an example of a glacier with regional representative behaviour (2873, 3-4) for surging glaciers (2875, 12-19), but I am not sure that Sortebræ is that representative. Sortebræ has recently experienced an active surge event (1992-95) with a 10 km frontal advance (Murray et al., 2002), so its relatively high recession rate in the following decade is likely to be affected by this event. Also, Sortebræ is likely to have a short surge cycle (39-49 yrs) relative to other surge-type glaciers belonging to the East Greenland surge cluster as it is, to my knowledge, the only glacier in the region for which two surge events have been observed; other East Greenland surge-type glaciers may have significantly longer surge cycles of hundred or even several hundreds of years (Woodward et al., 2002).

The discussion of surging glaciers (chapter 4.1) summarises general knowledge on surging glaciers rather than discussing/estimating the actual contribution of glacier surging to regional glacier change as indicated (2876, 16-17). The dynamics are complex and likely to vary from surge-type glacier to surge-type glacier, making it a challenging task to differentiate surge-related recession from changes caused by tidewater, climate and other effects. A comparison between non-surging ice cap outlet glaciers south of Kangerlussuaq Fjord, i.e. excluding glaciers fed by the Greenland ice sheet such as Helheim, Midgård and Kangerlussuaq glaciers, and surge-type glaciers north of Kangerlussuaq Fjord may provide a tentative basis for discussion. How would it influence the mean/median recession rates, if one or more glaciers had surged 10 km between 2000 and 2010 instead of experiencing quiescent-phase recession?

A few minor comments:

2871, 15: I will not consider Gåsegletscher as a marine-terminating glacier because

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an alluvial fan separates the glacier from the fjord along most of its terminus, and where the glacier is in contact with the fjord the glacier terminus is very debris-covered, indicating that calving is not important. Thus, I suggest that Gåsegletscher is excluded from the data set.

2876, 25 - 2877, 1: 'rates of hundreds of meters per day' is an exaggeration. 'Rates up to tens of meters per day' would be more appropriate.

2877, 16: This sentence is incorrect. For example, Jiskoot and Juhlin (2009) give another example of an active surge event between 2000 and 2010 in this area.

A table showing coordinates, physical characteristics and results (frontal change, thinning, and surface speed) for each individual glacier would be helpful to the readers in order to gain an overview of the differences between glaciers in the data set.

References:

Jiskoot, H. et al.: Surge potential and drainage-basin characteristics in East Greenland. Ann. Glaciol., 36, 142-148, 2003.

Jiskoot, H., and Juhlin, D.T.: Surge of a small East Greenland glacier, 2001-2007, suggests Svalbard-type surge mechanism. J. Glaciol., 55, 567-570, 2009.

Murray, T. et al.: Ice dynamics during a surge of Sortebræ, East Greenland. Ann. Glaciol., 34, 323-329, 2002.

Post, A. et al.: A complex relationship between calving glaciers and climate. EOS Trans., 92, 305-306, 2011.

Woodward, J. et al.: Observations of surge periodicity in East Greenland using molybdenum records from marine sediment cores. In Dowdeswell, J.A., and Ó Cofaigh, C. (eds.): Glacier-influenced sedimentation on high-latitude continental margins. Geol. Soc. London, Special Publ., 203, 367-373, 2002.

Yde, J.C., and Paasche, Ø.: Reconstructing climate change: Not all glaciers suitable.

EOS Trans., 91, 189-190, 2010.

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