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Interactive comment on "Multi-decadal marine and land-terminating glacier recession in the Ammassalik region, Southeast Greenland" *by* S. H. Mernild et al.

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Mernild et al., (2012) provide a valuable and detailed comparison of the changes in the glaciers of the Ammassalik region of Greenland. The value is in the level of detail and the fact that they contrast three types of glaciers that have different climate sensitivies ice caps, outlet glaciers and the ice sheet land terminating sections. It is unusual to have a study focused on all three in a region. This will be a valuable contribution. More attention is needed to an accurate discussion of the dynamic changes of outlet glaciers that has led to the acceleration and retreat. Some mention of the AAR of GIC's should be made and what this indicates about their ability to survive.

533-11: This is a not a main point of the paper, but deserves to be accurately described. That is the causes of the GIS outlet glacier acceleration and retreat of the last decade. Attention must be given to the importance of changes in force balance at the calving front due to thinning, reduced resistive force and acceleration, and the lack of evidence for meltwater lubrication. Johannesson et al (2011) relies on a statistical correlation between the ice-front position and the surface air temperature to determine that meltwater lubrication is partly responsible, this is not a sound conclusion in view of the following studies. Thomas et al (2009) note outlet glaciers have "periods of glacier acceleration and rapid thinning initiated by flotation and break-up of lightly grounded glacier snouts or break-up of floating ice tongues. Near-simultaneous thinning of these widely separated glaciers suggests that warming of deeper ocean waters might be a common cause. Nearby glaciers without deep beds are thinning far more slowly, suggesting that basal lubrication as a result of increased surface melting has only a marginal impact on Greenland outlet-glacier acceleration". Howat et al, (2008) observed that, "while substantial seasonality in front position and speed are apparent, nearly all the observed glaciers show net retreat, thinning and acceleration, with speedup corresponding to retreat. The ratio of retreat to the along-flow stress-coupling length is proportional to the relative increase in speed, consistent with typical ice flow and sliding laws. This affirms that speedup results from loss of resistive stress at the front during retreat, which leads to along-flow stress transfer." Nick et al, (2009) found that most outlet glaciers sped up and/or sustained enhanced speeds during the winter. This led to the conclusion that seasonal melt did not appear to contribute substantially to the long-term speed-ups observed on outlet glaciers. Joughin et. al, (2010) find that, "where speed-up and retreat coincide, the speed-up is largely the result of the loss of resistive stress as the terminus recedes." Howat et al, (2010) observed that, "only Rink Isbræ exhibits a seasonal speed variation that correlates with variations in front position, with the others undergoing mid-summer deceleration that indicates the effects of subglacial meltwater discharge and drainage system evolution that led to deceleration." I do not see that meltwater lubrication in light of all the recent studies that examine dynamics directly, can be referred to as a significant cause of the acceleration. It is more likely that surface melt enhanced thinning would reduce resistive forces, than a seasonal short term meltwater pulse would be critical to the base of these glaciers that already have considerable water at their base. The lack of a large seasonal signal is the main failure of this idea.

534-23: Suggested rewording: On approximately a decadal scale we examine net frontal position and area fluctuations for the Ammassalik region using multispectral Landsat imagery: of 21 marine-terminating glaciers from 1972-2011, and of the land-terminating margin of the GrIS and 35 GIC from 1986-2011.

537-14: Rewording: On an individual glacier scale, Midgaard, Helheim, Tasis Sassik Fjord, Heims, and Fenris had as listed the five highest net recession rate (total recession) of 0.365km yr^{-1} (14.3 km) etc.

540-6-10: Same issue as with 533-11.

544-13: What about the AAR comparison with Mittivakkat in 2007, that year Mittivakkat had an AAR of 0, which is true of four years from 2000-2010. How many other GIC had an AAR of zero in the 2007 image used. Given the lack of a consistent accumulation zone, how can the Mittivakkat survive at all, extrapolation is not the best means of determining survival (Pelto, 2010).

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