

Interactive comment on “Surge dynamics in the Nathorstbreen glacier system, Svalbard” by M. Sund et al.

Anonymous Referee #2

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This manuscript presents a rich set of observations characterizing the surge of a major glacier system in Svalbard. Such observations are rare and valuable. Here they reveal a style and progression of surging of a tidewater polythermal glacier that differs significantly from tidewater polythermal glaciers where the whole lower part of the glacier activates simultaneously.

Somewhat lost in the fog of details is whether the whole set of behaviors observed in this new case really differ in any significant way from Sortebrae (where the surge started in the middle of the glacier, presumably in thawed-bed regions) or even from the non-tidewater Trapridge Glacier, where the surge progressed downglacier into regions with frozen bed. The authors should make a better effort to construct a succinct and cogent statement about how the current surge differs from these two previously-studied

C2371

cases.

I found the nearly simultaneous surging of different branches of the NGS to be a particularly fascinating aspect of this new report.

The "Results" section is very hard to read. It is like a laundry list of numerical values. Such information should be summarized in graphics (tables and figures) and not repeated in the text! The reader cannot keep track of the argument and what are the significant points if he/she is buried by all these specifics.

It is well recognized from studies of other surging glaciers that a surge often propagates along the glacier due to feedbacks in the system that expand the area undergoing surge. In Section 5.2 the authors suggest that a key ingredient in such propagation is increased melt caused by frictional dissipation of sliding. The authors should strengthen this argument with a quantitative estimate for the melt rates due to friction. Such melt rates are normally trivial compared to rates of surface melt. (Which is why they are so important in the Antarctic.) It seems more likely that the feedback involves release of englacially stored water to the bed, or transfer of stresses from the slippery bed regions to surrounding regions of the glacier.

Section 5.3 talks about surface bulges. For a beautiful example of a bulge at the boundary between thawed and frozen beds, the authors should look at Clarke's pictures from Trapridge Glacier (see, for example, Fig. 12.7 in Cuffey and Paterson).

The figures are very informative. I suggest that more of the details described in the text be moved to some new figures. It would make it much easier for the reader to digest and remember the results.

Interactive comment on The Cryosphere Discuss., 7, 4937, 2013.

C2372