

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

Anonymous Referee #1

Received and published: 17 October 2013

General This paper presents an impressive data set documenting surge behavior on NGS. Unfortunately, the paper is not well written. I have made numerous comments where things could be fixed because they are grammatically incorrect or where a different choice of words would improve readability. In addition to these, there were numerous other places where some wordsmithing would be helpful. Since the paper details a complex sequence of events, the poor writing really makes it hard to follow. In addition, some kind of sketch map showing the sequence of events might really help. Right now, it is really tedious to go through it all.

In the discussion, it seems something is found in common with multiple surge mechanisms, which in the past have been treated as distinct. While this may be the case, a careful, logically consistent argument is lacking on top of the overall poor writing.

C2086

Each and every figure should be called out in sequential order (for example, after figure 1, the next figure referenced is figure 5). The out of order references to figures should be dropped, or the figure numbering redone. The figures in general could use some work. Several have small text that is hard to read.

Stages 1 through 3 appear to have been introduced in an earlier paper. They are discussed throughout the paper, but then only defined in section 5.2. Why not bring these stages up and define them in the introduction, so readers know the characteristics of each stage from the outset.

In summary, the data seem technically sound and worthy of publication. But the authors first need to put in considerable effort to improving the text and tightening the arguments.

Specific Pg1,L19 remove “s” from “glaciers” Pg1,L22 – After >5. . . tidewater during winter. Not enough context here for it to be clear what “into tidewater” means (i.e., did it transition from a land-terminating to tidewater). Please clarify. Pg 1, several instances of c. for circa, but circa applies to time not distance (use approximately or ~ except L28 where it is ok). Pg1,L23-24. I am still at the abstract, so maybe I have missed something, but I think it is more appropriate to remove “indicating a re-action following from the already” and replace with “coinciding with” (i.e., the crevasses form when the flow is extending, not afterwards). Pg1L26, Might be good to add “glacier” before area.

Pg 2L7 “perceptions of” instead of “on” P2L12 consider change to “10-1000 times quiescent phase velocity”. The way it is worded it could be interpreted that the surges is part of the quiescent phase. P2L13 “,” after surges. P2L16 Consider “During the quiescent-stage buildup, the glacier’s. . .” P2L20 Consider “efficient” in place of “fast” P2L22 Replace “glaciers displaying” with “glaciers display an” P2L24 Change to “. . .also have led to. . .” P2L26 Would read better to remove “which are controlled by a thermal mechanism”. If left, then which should be changed to that. Also, start sentence with “Some surges in polythermal. . .” as I don’t think a hydraulic mechanism

C2087

can be ruled out for all polythermal glaciers. Pg3L7 remove “the” before NGS Pg3L11 try “perspectives of” rather than “perceptions on” Pg3L15 add “the” before “temporal” Pg3L17 “crevasses” -> “crevassed” Pg3L21 find an alternative for “c.” as described above. There is one on the next line too. For efficiency, I will stop calling them out, but please search and replace globally. Pg3L22 “glacier flows” or “glaciers flow”, I think the latter is meant here. Pg3L23 “they enter” not “they enters” P3L31 “in these” instead of “of these” P4L3 “has” -> “have” P4L9 add “locations of” before “maximum water depths” P5L5 remove “on the order of”, after rounding the wavelengths are all 5.6cm. P5L23 “was” not “were” (ie. ASTER is singular; alternatively could add images after ASTER and keep were). P5L29 Remove sentence with “Furthermore” and add “, which is generally directed north-south for polar satellites” Pg7L16 “output . . . is . . .” (not are) Pg7L23 “individual glacierS” PgL25 Processing . . . was . . . Pg8L2/3 Portions . . . are exposed P8L4 “this points to” -> “indicates” Pg8L17 delete “of” before “just” Page8L24 remove “s” from “aircrafts” Pg8L26 “2009, appearing in about one third of the entire NGS . . .” unclear, only 1/3 of terminus advanced? P9L2 “was extending 8 km further” -> “extended 8 km farther” P9L13 “represent(drop s)” Pg10L5 “,” before “which” Pg10L7 “has” -> “had” Pg11L17 Sentence beginning with “Neither . . .” needs rewording. Pg11L21 “,” before “which” Pg11L19 Suggest “experienced a drawdown of” -> “thinned by” (i.e., more active voice). Similarly try “while the lowermost reaches thickened the most (~25m)” P11L21 “,” before “which” P11L27 add “the” before “end” and before “begging” in the next line P12L9 “in situ” explain how drawdown was observed – trimlines, GPS, . . .? P12L20 “October” a new section is being started, so specify year to avoid ambiguity. P13L1, “,” before “which” P13L2 add “an” before “additional” P13L5 “frontal velocities” ??? if so be clear P15L7 “no significant amounts” of turbid water or ice mélange ??? P15L7 Insert “On” before 18 and add “a” after 2011 P15L16 There should be a brief introductory paragraph between Section 5 and subsection 5.1. P15L19 “Upper regions” unclear do you mean upper part of the catchment or upper part of the ice column. Be specific. P15L26 Be clearer and more specific about where the frozen to the bed section was. P15L27 Replace “also coincides” with

C2088

“also is consistent” P15L29 replace “;” with “,” and consider tightening up the wording of this sentence. P16L4 “The ELA of Zawadzki breen was found to be higher than the 350 m a.s.l. indicated by Hagen . . .” suggest rewording to something like “Our estimate of the Zawadzki breen ELA is higher than the 350 m a.s.l. indicated by Hagen . . .” to make clear you are comparing your estimate. P16L7 “the” before “cirque” the rest of the sentence could use some work to make the part about lee sides follow from the cirque. P16L11 change “is” to “are” or make regions singular. P16L13 be more specific about what pattern i.e., “same pattern of accumulation” P16L14 “not” -> “non” then insert “,” before “the surface . . .” P16L19 “Comparisons” ??? of what, be more specific P16L22 “the lowering onset in the upper” this makes no sense (some words are missing). P16L24 “has” -> “had” P16L24 change to “ice flux was” (be consistent with tense) P16L31 “This resultS” P17L2 “and generating” try replacing with “that generates” P17L3 “impacts on” try replacing with “influences” P17L5 Paragraph break here doesn’t make much sense. The next line is about stage 1, then the second sentence starts with stage 2. If you want a new paragraph here, start with stage 2. P17L6 replace “at this” with “during Stage 1” P17L7 Don’t use “;” to separate stages, especially when describing with multiple sentences and across paragraphs. Make transition with something like “During Stage 2, an initial . . .” P17L8 remove “temporary” this is an evolving process, temporary is implied. Would read better if “and hence temporary increased ice . . .” was replaced with “, increasing ice . . .” P17L9 replace “short term” with “rapid” if meaning the change happens quickly (as opposed to the ice thickens, but remains thick for only a short time). P17L13 would be simpler to replace “may result in opening of” with just “may open” P17L14 get rid of “;” P17L19 It seems like some kind of sentence is required after the one on Variegated Glacier to tie this fact to the present case (i.e., were there multiple velocity increases on NGS?). Right now this sentence reads like a random fact. Pg18L12 “occur” not “occurs” P18L29 “is not representing” -> “does not represent” P18/19L1 “The characteristics only reflect a time-section of the entire surge.” What characteristics??? Be more specific. P19L5 “on how” -> “that” P19L5-15. This paragraph starts stating past observations indicate tributary surges

C2089

can cause surges in the trunk. They then argue that this can only occur in stage 1 and 2. Apparently in support of this, the text then jumps to a discussion of how the trunk behavior has not caused surges in the tributary, which is the opposite of the original point about tributaries, causing trunk surges. This logical inconsistency needs to be fixed. P19L30 "We emphasize the geometrical development of NGS leading to this event". Without being more specific, this sentence really doesn't make any kind of relevant point. Pg20L3 "and also" -> "that" Pg20L4 "In Hornsund (Fig. 1) as well, the weather even. . ." » "At Hornsund(Fig.1), the weather event also. . ." Pg20L10=11 "On Monacobreen, Svalbard more than doubled velocities were observed during winter 1991/92" -> "Elsewhere in Svalbard, Monacobreen observed velocities more than doubling during winter 1991/2" Pg20L15 "in consistence" -> "consistent" Pg20L16 "sudden advance of NGS starting in October" At the start of the section, it was stated that the sudden advance started in the winter (this seems more like Fall). Pg20L17 "row"-> "progression" Pg20L18 "lead" -> "led" P20L20 "promoted expediting"-> "expedited"

P20L23 "points to" -> "indicates" or "suggests" P20L26 "occurring at the same time as" -> "coincident with" P20L28 add "," before "which" Pg22L19 "row" -> "progression"

Figures. Figure 1. A larger, higher resolution version would be helpful. Figure 2 color bar says dz/dt , but that would imply thousands of meters (i.e., (90-36)years x 40 m/yr). I strongly advise merging Figures 2 and 4, it would be easier to compare them. Also would be nice to include outlines of other glaciers in the system.

Figure 6 – Use larger font for dates (currently barely legible) and color bar.

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