

Interactive comment on “Brief Communication: Sudden drainage of a subglacial lake beneath the Greenland Ice Sheet” by I. M. Howat et al.

G. K. C. Clarke (Referee)

clarke@eos.ubc.ca

Received and published: 1 November 2014

This submission reports an important observational result that extends the discovery paper by Palmer et. al. (2013) in which the first Greenland subglacial lakes were identified. I am assuming that the absence of additional observational data near the new lake site prevents the quantitative analysis from being taken further. That being the case, this submission definitely warrants publication as a "Brief Communication".

Specific comments

There is no mention of the previous discovery of draining Antarctic subglacial lakes except for the Clarke (2006) reference. It would be proper to touch very briefly on this and cite the Gray et al. (2005) and Wingham et al. (2006) publications.

C2201

Figure 1 is important to the work but the image interpretations are not self-evident to the untrained eye. I suggest you add a second panel to this figure that retraces the content of each of the six images with labelled schematic diagrams that indicate the lake, the crevassing, the moat, the dome, etc. Colour might be used; this is not "data" but an interpretive guide to accompany the Landsat images.

Technical comments

P5362:L16 Do you mean "i.e." or "e.g."? Moulins may not be the only type of englacial pathway that could connect supraglacial and subglacial drainage systems; "e.g." would therefore be a safer choice

P5363:L01 "Whether" not "weather"

P5363:L02 In my opinion basally-derived meltwater and surface-derived meltwater that is stored subglacially both qualify as "basal meltwater". I suggest changing "basal meltwater" to "basally-derived meltwater" or something along these lines.

P5363:L24 Drop the "a" from "and a stereoscopic ... models"

P5365:L20 The following sentence requires clarification: "A downward step in the bed, such as at the crest of subglacial roche moutonee, would provide conditions needed for a zero, or reversed, hydraulic gradient."

When I think of roche moutonee I think of them as aligned with flow and I mentally trace their profile in the direction of flow (i.e., upstream to downstream). From this perspective the "downward step in the bed" occurs downstream from the crest of the roche moutonee. The reverse slope needs to be on the upstream face of the bedform and this is only a downward step if one is thinking of the feature from downstream to upstream. Thus the image, as described, does not work universally.

P5367:L26 "confirming that such water bodies can exist outside the far north" seems like an odd claim. Presumably you are referring to the Palmer et al. (2013) discovery of two subglacial lakes in northwest Greenland. I don't recall them making the case that

C2202

lakes might not exist elsewhere, e.g., because of special conditions exclusive to that region. They just aimed to explain why the lakes might have formed where they did.

P5368:L01 "In an area of reversed slope"

P5368:L08 "Undulating surface topography ... are common" (fix the subject/verb agreement)

Interactive comment on *The Cryosphere Discuss.*, 8, 5361, 2014.

C2203