

Responses to Reviewer 1 (G. Clarke)

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.

References added.

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.

To conserve space, we have followed the suggestion of Reviewer 2 and added annotations to the 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

Changed to "e.g."

P5363:L01 "Whether" not "weather"

Corrected.

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

Changed as suggested.

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

Corrected

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.

Accordingly revised to : “such as the down-glacier slope of a subglacial roche moutonnée”.

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 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.

This statement has been removed.

P5368:L01 "In an area of reversed slope"

Corrected.

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

Corrected.

Responses to Reviewer 2

Did the authors thought about giving a name to this lake for future reference in the literature?

We are uncertain what the protocol is for this. We opt not to name the feature at this time.

A location map is really missing. What about an inset in Figure 1?

Added as suggested.

Why did not the authors use the ASTER data (imagery and DEMs) also available over their study site? ASTER DEM are less accurate than the elevation data they used but, once vertically adjusted, may provide some additional insight into the timing of the preand post- drainage surface elevation changes. I checked the archive of ASTER images and found a dozen of cloud free images and some of

them (acquired 2002-07-21, 2012-07-16 & 2012-08-17 among others) seem to lead to very useful DEMs. I know it means some additional work but I think it is worth exploring all the available data.

We did analyze all available ASTER imagery but the DEM's were not of high enough quality in this area to provide useful additional information for our analysis.

A depression of similar depth (~70 m) but over a much larger area (about 5 km²), has recently been detected at the surface of the East Antarctic Ice Sheet, initially by (Smith et al., 2009) and studied in depth with similar remote sensing data as in the present study later (Flament et al., 2014; McMillan et al., 2013). It is probably worth referring to those studies in the present article given the similarity of the maximum surface lowering.

Considering the vast difference in ice sheet environments, it's not clear why the similar lowering should be anything but coincidental. Also, we have also referenced earlier studies Antarctic lake drainage in the paper.

I am very curious to learn how this depression was first detected. On imagery? or on DEM? By chance? I guess others readers will be curious too. Can you provide this in a short sentence for example in the "author contribution" section if you do not think it is relevant for the main text.

Simply, the depression clearly stands out in the high resolution DEM.

Specific comments.

P5363 L18. I think the section "observations" should start about here.

It's subjective where to put the section break since we need to cite some observations to introduce the feature.

P5363 L27. What is the size (km²) of the depression?

Added.

P5363 L29. Size (km²) of the area covered by water. Given that water is found in the depression, your depression volume is a lower bound, right? To mention

Added. Also added "minimum" to the volume change estimate.

P5364 L8. space missing

Corrected

P5364 L12. can use WV1 here (acronym defined already)

Corrected

P5364 L23. "at the location" rather than "in the location" (???)

Corrected

P5364 L26. "of" missing between "margin" and "what" I think.

Corrected

P5365 L19. What about "the surface depression is located at the vertical of a reversed...?"

Reviewer's suggestion is unclear: "at the vertical"?

P5365 L24. Like in the previous comment, maybe good to clarify that the depression described here is at the surface (and not the bedrock one)

Changed to "surface depression"

P5366 L1. A reference (a review by R. Bell?) for this general statement about Antarctic subglacial lakes would be welcome.

Three references for Antarctic lakes provided earlier.

P5366 L23. I suggest adding "of this lake to the ice sheet margin"

Changed as suggested

P5368 L9. "it's" -> "its"

Corrected

P5368 L15. "Finally, the depression refills quickly after the collapse". Seems somewhat in contradiction with "Thus, failure of the lake to refill" (P5367, L21). Reconcile.

Changed to: "the depression infills with snow"

P5368 L25. The SPOT5 data are not described here.

Additional data description beyond that given in the main text (with citation) is not needed for the SPIRIT data, since this is distributed as an upper-level product.

Figure 1. What about adding annotations on the Landsat images to help the reader visualize what is described in the text (not so easy...)

Annotations and arrows have been added

Figure 3D. Could change the vertical axis so that the two curves do not intersect. Could use two different colours for the curves (to better distinguish them) and the same colours for the two corresponding vertical axes. Legend: DEM's --> DEMs.

Changed as suggested.