The Cryosphere Discuss.,
doi:10.5194/tc-2016-151-RC1, 2016

The Cryosphere Discussions

Interactive comment on "Simultaneous disintegration of outlet glaciers in Porpoise Bay (Wilkes Land), East Antarctica, and the long-term speed-up of Holmes Glacier" *by* B. W. J. Miles et al.

A. Pope (Referee)

apope00@gmail.com

Received and published: 23 July 2016

In "Simultaneous disintegration of outlet glaciers in Porpoise Bay (Wilkes Land), East Antarctica, and the long-term speed-up of Holmes Glacier," Miles et al. present a study which investigates a few East Antarctic tidewater outlets. They document calving activity with a range of remotely sensed imagery and relate calving behavior to sea ice dynamics. Using sea ice concentration as a proxy, they infer recent glacier speedup of 50%. This is an interesting paper, expanding a known glacial (in)stability mechanism from the Arctic to East Antarctica. With some revisions, I certainly recommend it for

publication in The Cryosphere. -Allen Pope

Broad Comments: **The paper leads to some really interesting points, but some of these are let down by incomplete discussions. The paper would be improved and more useful if the discussion of (1) what could have led to increased glacier velocity and (2) what drove anomalously high melt / ponding were expanded.

**Similarly, the conclusions are acceptable but do not place the results in a broader context, including the implications of the new knowledge described in the paper.

**This paper includes a lot of figures which help demonstrate and illustrate the arguments in the paper. This is really helpful! However, the figures are often complex imagery – more annotation would help the reader quickly understand what they are supposed to glean from a particular figure. In addition, many figures' brightness and contrast need to be reviewed for "readability" on screen and in print.

Specific Comments: L13: Indicate specific kinds of remote sensing data that were used.

L25: Include a space between "March" and "2016"

Abstract: The discussion includes mentions of warming, increased melting, etc. – including a sentence which nods to climate and larger implications may strengthen the abstract.

L93: The description of the method is VERY vague. What sort of automated mapping method? The goal should be reproducible science, so a fully described method should be included in the paper. At the very least, a citation which describes the method in depth should be included.

L126: 18 grid cells equals what area?

L131: Define ASI acronym

∼L133: You discuss multiple breakouts – why is only 2007 studied at higher resolutions,

and are you sure the data sources are completely intercomparable?

L138: I thought that the figure described a particular region where sea ice concentration was studied. When/why are you getting closer to termini?

L141: At 27 km spatial resolution, how many points are you really sampling?

L155-L157: A bit of a meandering sentence, it almost implies monotonic behavior, which is not the case.

L159 & L167: It seems like Frost might not actually fit? More like a hybrid with Sandfjord?

L200: Using anomalies rather than absolute concentrations or areas means that sea ice could be lower, but it doesn't actually provide proof that there is a breakup.

L208: Are you really confident enough to use "cannot", as opposed to the slightly more flexible "likely did not"?

L211: Instead of "large," how about "very large" or "largest"?

Section 4.4: The first few paragraphs in this section seems more awkward and convoluted than previous sections. The sentence structure and tense seems overly complicated. It would benefit from a style edit so that it flows easier and therefore is more easily comprehended.

L219: "has been" to "was"

∼L251-264: The language in this paragraph seems a bit belabored and the arguments (regarding sea ice) seem a bit circular. Streamline the writing to simplify and clarify. (On a side note: "thus" is repeated closely together, which is also awkward.)

L291: Consider including inferred velocities for these time periods, too?

L302: Insert space before open parenthesis

L308: Okay, it may be the first time it is observed. So what?

L313: "suggest", not "suggests"

L316: Days/weeks is really the realm of weather not climate – clarify the difference between the two and really what the important processes are.

∼L322: Temperature might not be driving melt, but something in the model clearly is driving melt. Look at other parameters to identify this. For example, is it wind that could be causing it? That would be logical, and really helpful to identify the driver of such an important process.

L332: It may be the first time this has been published explicitly – but it is also not surprising. There are a few papers that observe supraglacial lakes on East Antarctic outlets. So why is it important that this has been observed for the first time?

∼L347: Is it possible that the higher melt year saturated/refroze in the snowpack, which then allowed a lower melt year to be able to form melt ponds? I know that is the case on ice shelves, but I'm not sure if that is true in a sea ice context?

∼L362: The sentences around here go in a couple circles about the processes and drivers that you think are most important for the reader to understand. I think it might help to clarify that, in this system, bathymetry and geometry seem to drive the location of calving events which sea ice drives the timing.

L376: This is restating earlier conclusions. Maybe only need to say in one place?

L380-389: This is really interesting and important glaciologically! The paper would be stronger if this were fleshed out and done so with more rigor. It can very much be a discussion of what is reasonable (not an in-depth analysis), but more should be included. For example, what might changed in accumulation do? Is it possible basal changes played a role? What else could be driving increased velocity?

∼L399: Yes, sea ice is related to climate – but Antarctic sea ice is very much dependent on more than temperature (which can be seen in regional expansion of Antarctic sea ice). More nuance needs to be brought to this sentence.

L409: You specifically mention “warming” – but it would seem to be more appropriate to discussions in atmospheric or oceanic circulation?

L411: Okay – but where else might these processes be important? Expand this conclusion to be broader to have larger implications.

Table 2: No Landsat 8 OLI imagery used? This might be interesting for the recent breakup and data are available from 2013.

Figure 1: **Include a small inset of the entire continent. **“Moscow University” should be “Moscow University Ice Shelf” **Scale bar in upper figure

Figure 2: **x-axis labels are a little too small **Caption should note the different vertical scales

Figure 3: **Blue is a bit hard to see **Show outline of this area in Figure 1? Don’t worry about it if too crowded. **Brighten figure so easier to view

Figure 4: **Consider tracing front in a 2nd color in each image to clarify the changes that you want to highlight between images? It is hard to see (as you admit) with the melt, etc. **You reference the total area calved. Maybe include a hatched area in the last image between the two terminus lines?

Figure 6: Increase brightness and contrast to make more easily viewable.

Figure 7: Anomalies are interesting but is an absolute scale better to demonstrate what you want show?

Figure 8: Include 2nd outline in lower image?

Figure 9: **Maybe darken a little so it prints better? **Include 2nd outline in lower image?

Figure 10: Increase contrast so more viewable. The edge of the 9 km advance isn’t very visible when printed.

Figure 11: Increase contrast in lower image.

Figure 12: Same comment as in text – include inferred velocities for these time periods, too?

Figure 13: Add line for 7 Feb? Hatched area to indicate calved area?

Figure 14: **Include annotation in each image and particularly at circle to help the reader **Increase contrast to make more viewable.

Figure 16: Maybe just report January ’14 melt total relative to 2007? I don’t think that the timeseries is particularly helpful here.

Figure 17 & 18: Combine these into one figure?

Figure 18: **Be consistent with date format **Double check permissions and copyright for using a Google Earth image in this publication.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-151, 2016.