The Cryosphere Discuss.,
doi:10.5194/tc-2016-151-RC2, 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.

T.ÂăA. Scambos (Referee)

teds@nsidc.org

Received and published: 26 July 2016

This is an interesting but rather rambling study on the connection between the presence of fast ice and the timing of glacier calving, and its potential impact on glacier flow. The study uses MODIS image data and the record of sea ice concentration from SSM/I (mostly) to demonstrate that during the brief periods of sea-ice-free conditions in Porpoise Bay, significant calving occurs, implicating the fast ice as a stabilizing component. The study then continues to search backward in time for evidence of this relationship, to the earliest satellite data, and then forward in time to an event in early 2016.

It could be published as it is. . . it is not incoherent. But it does not offer a clear contribution beyond the initial worthwhile documentation that fast-ice break-up leads to rapid iceberg release; or, to say it conversely, the presence of fast ice inhibits calving and drift. The discussion of velocity change seems rather vague, since any speed-up is not able to be directly tied to fast ice break-out and increased calving. The link to surface melting is so tenuous as to be useless. Moreover, the writing style is not brisk and efficient. There is a lot of excess text.

The central discovery of the study appears to be a major glacier calving event in late summer of 2007, during a period of extended sea ice retreat in Porpoise Bay. Images before, during and after the break-out of the sea ice show the disaggregation of the floating ice tongues in the region. Having found this, the authors extent the search, first backward in time through the sea ice record, and then back still further using the record of early Landsat and declassified Argon / Corona data.

There is another data set available, already processed, of MODIS data. See http://nsidc.org/data/iceshelves_images/index_modis.html This is a processed geolocated record of ∼monthly to weekly images going back to 2000. This shows other periods of low sea ice and partial fast ice break-up. Unfortunately, there is a one-year gap around 2001-2002 that could help narrow down the 2002 calving. If you request some additional images, we can add them for this time range.

This manuscript is very long, and could be much better focused. It is not necessary to show every data set that can say something about the 2007 event – the purpose is to document the event and the link with fast ice break-out, and then examine the extent to which glacier flow might change as a result. In particular, it is lengthy to read, first, the discovery of the 2007 event, then the inference of the 2002 and and 1986 events, and then the possibility that there was no calving between 1963 and 1973 (and that case is not well-made) and then that there was a recent event.

The paper should present what you've learned overall, not the step-by-step process by

which you learned it.

I don't want to spend more time with the study. Nor do I want to berate the writers. So let me simply outline the paper they should write, if they wish to. Figure order is re-arranged. Any figure not listed is not needed.

Introduce the region (Figure 1b) Indicate the location of later figures here. Present the evidence for major break-ups in March 2016 and February 2007: (fig 13);(merge Figure 3-dates?- into Fig 4);(then, Fig2 extended through 2016). Fig6 might be retained, but it does not really help - regional sea ice is not low, yet there is a calving in austral autumn 2006.

Present the sea ice record from SSM/I+SMMR+EMSR for the areas in Fig 1b (using Figure 7) The major bay-wide calving and retreat is clearly timed by the loss of sea ice.

Earlier events large events at the Holmes Glacier front can also be linked, somewhat tentatively to extreme sea ice lows. MODIS data at NSIDC could help greatly here. An examination of this image series could document that the small iceberg pattern does / does not remain fixed (spreading or twisting of the arrangement of the bergs, but no 'individual' motion) during periods of continuous fast ice. Create a new figure from the MODIS data, summarizing what it shows about the small berg pattern evolution over time (this has a bit of Fig 14, but might be more extensive). Don't have to show every event in the 2000-2016 record – just the facts you extract from it.

With this record, i.e. ASAR, sea ice concentration, and MODIS, you have observations that can help you interpret the old record. Create a figure of the 1997, Nov 1973, Jan 1973, and Oct 1963 images, together. Given the field of small bergs trapped in fast ice in this series, make inferences about past calvings of Holmes, and of Frost (Figure 12). I would downplay the calvings of the other small glaciers, it is too confusing to follow it all.

From here, discuss synoptic patterns using reanalysis data that cause (or are associ-

ated with) sea ice retreat from this region of Antarctica. I don't think surface melting helps much, and in any case RACMO is not likely to capture katabatic heating events very well, which could be key in the immediate vicinity of the grounding line. I don't see how Fig 15, 16, 17 or 18 really helps.

This will be a new paper, that you would re-submit for review. It would be half as long. It would conclude things about calving and presence of fast ice, mostly focused on the the 2016, 2007, and 2002 events, but with a few statements about earlier events back to 1963. It would conclude things about berg motion within temporally continuous fast ice, and synoptic climate patterns that favor fast ice break-out and calving in this area.

Please also note the supplement to this comment:
http://www.the-cryosphere-discuss.net/tc-2016-151/tc-2016-151-RC2-supplement.pdf

---

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