

This paper uses 60 years of satellite data and 6 ice penetrating radar transects to highlight changes in the ice structure and ice flow of the Shackleton Ice Shelf region, where results largely focus on the ice shelf, the well-studied Denman Glacier and the lesser analysed Scott Glacier. The results the authors present are important, and for the area outside of Denman Glacier, they are also novel – helping to characterise a poorly understood sector of Antarctica. I commend the authors on their hard work, as it must have taken a long time to find, collect, process and present the large amounts of data collated in this paper. However, I feel some of the hard work (evident in the methodology and figures) is lost within the text, which is quite poorly structured.

The methodology is sound, and I do not propose any major changes to the manuscript, but I think the paper would benefit from more subheadings and a clearer structure.

Below, you will find my main observations, listed as I work through the manuscript:

- 1) The introductory paragraph reiterates a lot about what we already know about the general state of the East and West Antarctic Ice Sheets. It should be more area specific.
- 2) The rest of the introduction jumps around a lot. A more systematic study site description, noting glacier length, bed elevation, ice thickness (from BedMachine) would help to set up context for the paper.
- 3) The ice penetrating radar methods section lacks detail - including important information like radar frequency and the applied ice velocity.
- 4) Remove general references to the “Queen Mary and Knox coasts”, replacing them with the Shackleton Ice System to reflect the focus of your paper (e.g. in the caption for figure 2). You must also refine your abstract and introduction to state which areas of your paper you will focus on. It sounds like you will analyse all glaciers, but you don’t even mention the Northcliffe glacier in the text after the introduction!
- 5) You talk about directions like north, east, south and west (e.g. in section 3.1 and figure 3) but as north isn’t at the top of your figures it’s not immediately intuitive what direction you’re talking about. Can you also add remarks like inland and offshore as well, to quickly clarify directions (where suitable).
- 6) Refer to full glacier names in the text and figure captions (not simply ‘Scott’ – like the last word of paragraph 1 in section 3.1, and in the radar text of section 3.2)
- 7) The results section isn’t very systematic. Not every glacier is described in the same way, for example, there is no information provided about the Apfel Glacier even though you say you will discuss the whole Shackleton Ice Shelf System in the paper. It might be easier to break section 3.2 down further into sub-sections titled ice extent, rifts, strain rate etc. This will help readers interested in a specific component of the glacial system.
- 8) The ice flow section is clear and well written. I found this very helpful.
- 9) The discussion isn’t very well structured either. It begins by down-playing findings and then launching into radar findings, when it would make more sense to briefly outline how you’re going to lay out the discussion, then follow that structure – by either discussing features in turn (as you do in the results) or describing changes by area (like the Denman glacier paragraph does). Many of your results, like ice front positions are not fully discussed, which acts to downplay your important results. Also, you fail to discuss some other important observations, like any distinct seasonal change. Why do you think there are no seasonal changes? Is this common in East Antarctica?
- 10) The discussion section also contains a lot of results based text, which is presented as almost stand-alone text which isn’t used to evidence a discussion.

- 11) The conclusions don't summarise all the results. They should contain more information on your important findings about rift propagation and shear margin changes as these could be explored further in future work (in detailed models for example) – which would use all the data you have so carefully collected and presented. This is much more important to report than your concluding remarks about needing more data, in a very generic sense.
- 12) The Data Availability statement doesn't mention the radargrams. If they aren't freely available to download online, can they be requested from the data collectors? Also mention the BedMachine database used in Figure 1.

Suggested figure changes are below (note that all figures appear blurry, but I presume this is a result of copying and pasting):

#### Figure 1

- Why is the area in panel a so zoomed out? I'd focus in more on the area you examine, maybe just extending as far south as Law Dome so you can really see the detail of the bed topography in your study area.
- In panel b could you make the glacier names stand out in bold as these are key points
- In the caption mention that numbers 1 and 2 refer to rift systems.

#### Figure 2

- Please add glacier names to panel a to make the figure more useful
- Add rift numbers to panel a too, to help the text in section 3.2

#### Figure 3

- Change caption to say "Scott Glacier".
- Add glacier name to figure.

#### Figure 4

- Could you label the rifts differently to those already identified as rifts 1 and 2 elsewhere to avoid confusion? Maybe S1, S2 and S3 here, and D1 and D2 previously?
- Does the arrow point to North? If so, it should say N.
- Write out glacier names in full on panel c, so Scott Glacier etc. The same should be done for Figure 7.
- In the caption put the acquisition dates in brackets

#### Figure 5

- The caption talks about the "Shackleton Roscoe Glacier". I thought it was just the Roscoe Glacier?
- On line 177 you talk about the margin between the Roscoe Glacier and the Shackleton Ice Shelf. Can you mark this margin on the figure?

#### Figure 6

- Add year of data collection to each panel

#### Figure 7

- Radar name text is on the wrong side. Move all radar names to the left side of the transects in panel a as you are looking at the transects from the sea, not from inland.
- The radar bed pick key needs a metric (m a.s.l.?)
- Re-title the radar transect names on the right hand column to match those on the map.
- I'd argue that the power colour bar down each radargram is unnecessary.

#### Figure 8

- Label glaciers again here (and in Figures 9 and 11). You're used to looking at this area so it's clear to you what's what, but most readers won't be.

Additional, minor comments:

Title: Maybe Glaciological history is a better term than setting, which doesn't really mean much.

Line 28: Be more specific. From what speed to what speed?

Line 30: How do you know acceleration in ice flow and calving are linked?

Line 33: Presumably sediment filled trough rather than just bedrock.

Line 48: This paragraph jumps around. Stick with basin introductions first then move onto the floating components. A more detailed site overview is needed too – to include glacier lengths, thicknesses etc (see points above).

Line 56: What does the lack of an embayment mean in terms of 'major dynamic change'? I fail to see the relevance.

Line 57: Refer to figure 1

Line 62: You've just said the data is sparse, so how reliable is this information? Can you note any error margins?

Line 71: I presume you mean average basal melt rates rather than total melt rates.

Line 73. Introduce all acronyms. The information about the Sabrina Coast doesn't seem to have much relevance to your work but I could be reading this incorrectly.

Line 74: But how likely is this given what you say in the next sentence? Probably best not to jump to possibilities here.

Line 79: I think you mean grounded.

Line 87: You don't mention the multi-decadal timeframe you talk about in the abstract.

Line 92: Just talk about the Shackleton system rather than the whole coastal area.

Line 83: Can you briefly state why you chose every 6 months, presumably you have data from February and July/August then? Is that just because of daylight? March to September might allow you to capture more of the seasonal changes? Note that I'm not asking you to change your data analysis period! Just note exactly which months you studied and why you made that call.

Line 94: The datasets need referenced, or you at least need to provide reference to a data availability section of the paper.

Line 110: Reference required for Gamma software

Line 113: How short? Can you give a range?

Line 114: The cold temperatures is an assumption. Delete this.

Line 115: Can you note how many image pairs you used to show off the rigour of your work?

Line 125 (and the rest of the paragraph): More detail required. What frequency did the radar operate at? How was the data topographically corrected? What velocity did you use? Did you apply a firm correction?

Line 135: Do you mean no obvious change in the annual rate of advance?

Line 137: Which front are you talking about?

Line 139: The lack of seasonal change is interesting is it not? So something you should talk about in your discussion?

Line 145: How do you know it's the calving that's causing the retreat and not faster ice flow or melting?

Line 171: How do you define the grounding line?

Line 179: What happened prior to this? Is there a reason why you don't explore data prior to 2015 here?

Line 183: Why don't you talk about any features on the Apfel Glacier?

Line 186: Reference not needed as it's your observations that show this.

Line 188: Why is this remarkable? A statement like that needs to be backed up by other references that say this situation is really unusual. I'd use the word notably, or something similar instead.

Line 191: You should say the radar provides a snapshot of information.

Line 195: Split is the wrong term. The ice doesn't fracture apart.

Line 199: What's consistently noisy? Radar returns? The bed?

Line 232: Use precise dates here rather than 'beginning'.

Line 239: What time span do you analyse here?

Line 241: I think you mean to refer to figure 11.

Line 247: What do you mean by that? Longer-term change in what? Glacial output?

Line 274: This reads like a literature review. How does it relate to your findings? You never talk about melange.

Line 275: Of what ice melange? At your study site?

Line 278 (the paragraph): Contains lots of results again, but you need to discuss what the results mean for your study site and out knowledge of antarctica and processes as a whole.

Line 294: What do you mean by 'connection'?

Line 305: How do your results underpin this hypothesis?

Line 320: It's unclear exactly what data you need more of. Do you need better bed topography data in the region? Or do you want better ocean temperature data? How will a knowledge of local geology help? This statement is rather generic and therefore unhelpful.