The paper by Sommer et al. presents an interesting analysis of lake drainage on the Shackleton Ice Shelf, alongside ice shelf damage and the evolution of tidal cycles. The authors draw several conclusions about the predominant regions of lake formation and drainage, based on the degree of damage and activity of this variable. The methods used in this paper are well described and defined in previous studies, particularly for drainage detection and damage assessment, and thus represent an interesting methodological application.

In general, this paper is clear and well-structured. The authors also clearly and extensively present the limitations of the methodology used. However, there are several aspects that need further elaboration to clarify the conclusions, particularly regarding the methodology and the results derived from it. Indeed, the current version of the paper could be more convincing, especially in highlighting the links between drainage, damage, and tidal cycles (see general comments below).

These comments should be addressed before the publication of this study.

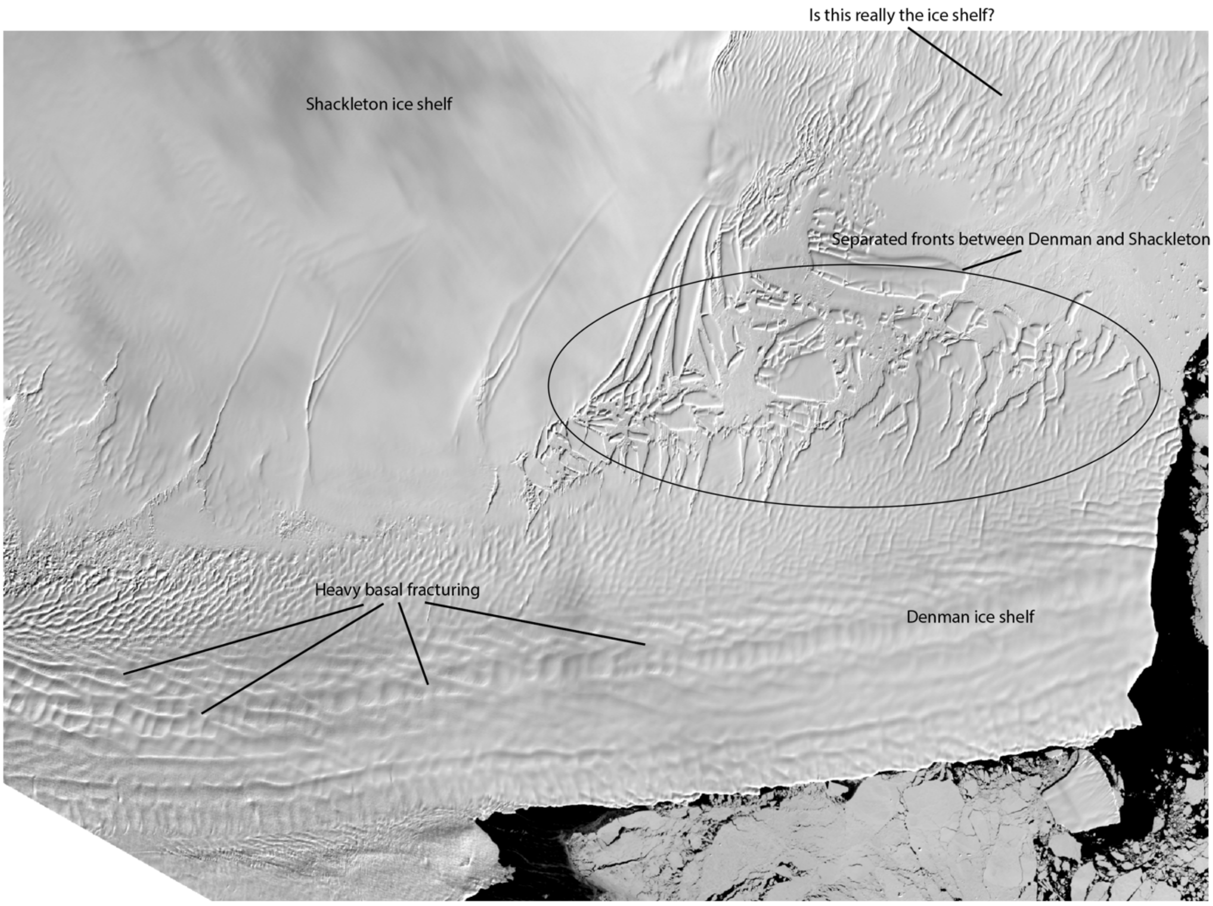
General Comments:

An important point to clarify is the definition of damage. Initially, damage is defined in modeling as a variable of the enhancement factor, which modulates the ice's fluidity. This modeling variable is defined between 0 and 1 and can be adjusted to best fit the observed ice flow. Here, the authors completely recalculate this damage variable from satellite observations, independently of a model or flow velocities. It is not entirely clear how these products could be directly used in a flow model. Some studies have suggested that the crevasses derived by NerD do not match the damage modeled in an ice flow model (Gerli et al., 2024). Therefore, to avoid confusion between the terminology used by modelers and that of this paper, I suggest using the term "satellite-derived damage" or something similar throughout the manuscript.

Regarding the calculation of damage, why didn't the authors use the same optical images as for lake detection? It seems that NerD also works with this type of image. The paper lacks details on the time coverage of Sentinel-1 vs. Sentinel-2 images. Do the dates align perfectly? What is the time delay? There are also unclear areas regarding damage calculation: only one map is presented—is it a mosaic? Over what period was it calculated? Why don't the authors present a time series of damage alongside the time series of lake drainage? This would better specify the exact timing of events, particularly concerning tidal cycles: for instance, does damage increase with tides? Does this increase precede drainage events?

A second point concerns the features detectable via the NerD algorithm. Looking at Figure 1A, it seems the algorithm effectively detects dislocation zones with wide surface crevasses, as observed near Denman's grounding line or north of Denman Ice Shelf. However, examination of a Landsat image (see below) reveals that almost the entire Denman Ice Shelf is heavily fractured by basal crevasses, unlike the Shackleton Ice Shelf. Yet, damage maps show very similar low damage values, suggesting an underestimation of basal fracturing. Given this limitation, I think the interpretation of results should be revisited, and this should be mentioned in the discussion, specifically in the sense that ice shelf can still be damaged from below, if it is not detected by your method.

Additionally, a significant portion of the Denman Ice Shelf's front appears to be detached from Shackleton, more so than shown in Figures 1 and 2. Thus, some of the damage signal may no longer belong to the ice shelf and could merely represent calving icebergs. Analyzing lake evolution in this sector is therefore limited. The Shackleton Ice Shelf's frontal boundaries are also ambiguous (see image below), with a border region between sea ice and mixed ice that could bias the damage analysis. How are you dealing with these regions?



L200-215: How does the coarser resolution affect your interpretation? Drainage is a highly localized phenomenon. When downsampling, you might "leak" damage values located far from drainage events, especially with a factor of 10. Why was a factor of 10 used? Were smaller downsampling values tested unsuccessfully? If so, this could indicate that the correlation between damage and lake drainage events is not as strong as suggested, and tuning the data by downsampling may not be the correct approach?

Furthermore, most figures shown in this paper are very general and synthetic, for the sake of the "brief communication" format. This significantly limits the analysis of results. For example, it is important to include a zoomed-in or more detailed figure focusing on a lake drainage event that clearly shows the relationship with damage/crevassed regions (or a new panel of Fig 2). Similarly, it would be important to include a Sentinel-1 image with the retrieved damage (at least in an appendix) and the visually observed fracturing. I am unsure of the best solution: either move the paper to the regular format of *The Cryosphere* or add one or two figures to the appendix.

Concerning the tidal analysis, the authors argue that drainage events always occur during the ascending phase of tides. Looking at Figure 3, I would argue this is a bit of a stretch. Indeed, 6/11 drainage events in 2019 (more than half) started during the lowest (or even descending) phase of the tidal cycle (drainages M, L, F, H, J, E). The same applies to 2020, which saw only one drainage event. This does not undermine the paper's conclusions, as it remains plausible that changes in stress on the ice shelf with tidal cycle, and thus damage, favour these drainage events. For example, could the authors argue that the descending phase of the tidal cycle might be even more prone to crevasse opening due to flexure, whereas the ascending phase might favor crevasse closure?

Specific Comments:

- **L46:** Does lake advection with ice flow affect your mosaic calculation in any way?
- **L65:** Can you justify the choice of 80% loss of area?
- **L67-70:** Can you justify the threshold choices? Why 54,000 m^2? Why a median lake depth greater than 0.65 m?
- **L84:** Why don't you consider rifting? Rifts could also be an important source of lake drainage.
- **L115:** Same as before, better justify the threshold used to classify damage.
- **L127:** If the activeness value mainly reflects shearing, why not directly use shear strain rates? What is the added value of activeness?
- **L137:** What do you mean by "more pronounced"?
- **L150-155:** Can you clarify how you can have low damage but high activeness?
- **L195:** Do we really need more data and satellites? With Sentinel-2 providing data every 5 days, Sentinel-1 every 6–12 days, and Landsat-8-9 every 15 days, what is your temporal sampling of drainage events when combining these data? What is the finest temporal scale you could achieve?

Figures:

- **Fig1:** Meltwater extent appears highly correlated with Denman's shear margins. Has any analysis been conducted in this regard?
- **Fig2:** What do you mean by pixel quality? Be more specific. This figure also needs a close-up on an actual drainage event, showing the related fracturing observed in the raw data (see earlier comment).
- **Fig3:** Include damage evolution with the tidal cycle (see earlier comment).