This study combines glacier terminus position, velocity, surface elevation and bed topography datasets to investigate glacier dynamics across northern Greenland between 1948-2015. The paper nicely presents both long-term trends and regional variability based on terminus types (floating vs grounded) and local fjord geometry. The paper would benefit from a greater and more concise focus on these points. Ultimately, despite some useful insights, there remains several areas for significant improvement. I've also included specific page/line number comments below.

#1 Only including velocity changes between 1995/96 and 2015/16 might alias important velocity changes on shorter timescales that could be linked to discrete terminus perturbation events. As such, the link between terminus position and dynamics might not be fully appreciated. Perhaps finding trends across all years would provide a more complete context and links to the terminus position changepoint analysis? The same could be said for surface elevation changes; why not look at shorter-term trends?

#2 The introduction of terminus types – grounded or floating – is a great distinction and worthy of investigation. However, it should be made explicit up front and not part way through the results. Furthermore, I find it hard to follow the results section for frontal position change. What is the main point you want to make? It seems redundant to go through so many different periods and classifications of change; net from 1948-2015; decadal; changepoint time periods; based on terminus type. I would change to 1) briefly note trends and variability over the entire study period, 2) introduce terminus types (grounded vs floating), and 3) differences in frontal positions between terminus types at decadal (i.e. fig. 4) and/or changepoint time periods (i.e. fig. 5).

#3 The discussion introduces several triggers for enhanced terminus retreat, including "initial thinning at the glacier terminus." While possible, I do not think that these suggestions are well supported within the data analysis and results. The authors note in the methods section that thinning rates were averaged over the entire glacier centerline, so do we have the spatial resolution to test this hypothesis? Does retreat lag thinning in the time series? Is thinning dynamic or SMB driven? Furthermore, if large thinning rates cannot be explained solely by SMB, wouldn't terminus retreat be required to produce the observed thinning rates? The authors present a multitude of descriptive data in the results section, however, I feel there are gaps in logic within the discussion in attempting to explain the observed trends.

#4 Throughout the manuscript the authors invoke climate forcing as a possible trigger of terminus retreat and dynamic glacier adjustments, however, the authors do not include time series of climate and ocean conditions. I certainly appreciate that climate forcing is not the main focus of the study, but perhaps it is worth including some available data in the supplementary information for readers and reviewers to look at. If not, the authors should consider more careful and direct references to pertinent published datasets and studies

#5 Where is the calculation of the force balance, longitudinal stretching and driving stress that is referenced in the discussion? Please make it explicit if we are supposed to deduce these from the velocity time series alone.

#6 Is the discussion of surge-type glaciers relevant to the main conclusions of the paper? It seems to confound the main points: behavior of grounded vs. floating termini and importance of bed topography controls.

#7 Perhaps most important - the manuscript writing should be more clear and concise. The main point within individual sentences or paragraphs is often convoluted and, as a result, the content suffers significantly. I've tried to offer some specific improvements in my line edits, but was unable to address everything. Ultimately, these problems can be addressed with careful and collaborative editing by all authors.

Specific comments by page/line number and figure number:

1/16. No need for parenthesis, just "was"

1/19. "adjustment" not "re-adjustment"

1/21. Delete comma before suggests

1/29. Should be Carr, 2017a

2/5. Delete "surface"

2/10. This paragraph is longwinded – considering stripping down to the main points, i.e., terminus retreat can initiate dynamic adjustments independent of climate and modulated by local outlet geometry and associated resistive stresses. The last two sentences seem most important.

2/12. I suggest using "slow", "long", or "gradual", but best not to use two adjectives.

2/17-19. Is this sentence necessary? If so, perhaps it should have a reference.

2/27. Delete "Most"

2/30. Create a new sentence…"Dynamic changes at Jakobshavn are linked to the gradual collapse of its floating ice tongue."

2/31. Is there anything specific that can be added here to demonstrate the importance of northern Greenland ice dynamics to sea level rise? Important to let the reader know the region is important to study for reasons other than it's underrepresented in previous investigations.

2/33. Delete “far”

3/1. “Consequently, few long-term records of frontal positions exist in the region. As a result, their potential impact on inland ice flow remains unclear.”

3/5. The sentences in this paragraph seem redundant. I would suggest combining sentences 2-5 into something like, “We couple a multi-decadal annual terminus position record between 1948 and 2015 with recently published surface elevation and ice velocity datasets. We use these datasets to evaluate dynamic responses (i.e. acceleration and thinning) to frontal position change and examine disparities in the context of glaciers with floating or grounded termini.”

3/10. Would recommend changing slightly to, “Finally, we assess local topographic setting (ie fjord width and depth) as a control on glacier behavior.”

3/16. Is this true? There are other, albeit smaller floating tongues elsewhere, such as Rink Isbrae and Helheim?

3/13-20. This seems like introduction or nonessential methods material. What is the point of this paragraph? Seems like most important information is the characterization of floating vs grounded termini… then quickly note that there are large and changing tongue systems.

5/2. Are there any gap years?

6/7. To what end? Do you use changepoint analysis between glaciers, over a single record, etc.? What is the point? This paragraph needs a topic sentence that makes this clear up front for the reader to understand the value in this approach.

6/10. This sentence is redundant and could be more concise. Just cite Bunce and Carr in the first sentence after clarifying.

6/18. Within what range?

6/17-22. This explanation is confusing to the reader. What is the reason for a threshold penalty? What is a threshold penalty? If this method is following Carr 2017, then simply reference their method, give a brief overview with an emphasis on portraying what the main point is and why it’s valuable. The main point seems to be articulated in the last sentence of the paragraph, perhaps this could be a topic sentence?

8/9. It is unclear why Euclidean distance is necessary – to draw centerlines? What if fjord walls are not parallel?

8/11. I would think averaging elevation change over the entire centerline (to the ice divide as the manuscript suggests) would significantly skew your results. Would it also be better to mask elevation changes seaward of the grounding line on floating tongues?

9/4. This sentence is unclear – you're calculating catchment areas from the flow field right? Could you instead reorient the sentence as, "We calculated each drainage area using catchments constrained by gradients in the DEM"...?

9/7. Perhaps "Net retreat"?

9/7. Do these statements pertain to frontal positions (ice tongue fronts and grounded termini), or just grounding lines? Please clarify.

9/14. Is "mean rate of terminus change" more accurate?

9/17. Could you be more direct and just say, "Long-term retreat rates varied across northern Greenland?"

12/2-6. The distinction of terminus type needs to be made earlier to give the reader context to interpret records of terminus front change.

12/12. Already stated previously. Need better topic sentence; why do grounded termini matter? State main result up front and then support with observations.

12/23. Already stated previously. Need better topic sentence; why do floating termini matter? State main result up front and then support with observations.

17/16. Higher with respect to what? Need to clarify.

18/1, Perhaps change to, "different pattern of elevation change compared to the rest of the region: Storstrommen and L. Bistrup Brae."

19/1. Perhaps it is best to also explicitly separate this section into grounded vs. floating termini?

19/4. Please clarify what is meant by "split"

19/2 and 22/1. What are the main points of these paragraphs? Please upgrade the topic sentences to better reflect the main point – inland sloping beds are correlated with higher retreat rates at glaciers with grounded termini, but fjord width is not a main determinant. What is a corresponding main point you are trying to get across in describing bed data at glaciers with floating tongues?

22/30. Delete acceleration and retreat in southeast Greenland, or support with references and include other regions where this occurred (e.g. SW Greenland, Howat et al., etc.).

22/31. Please provide more complete and recent references (e.g. Felikson et al., 2017). Also please more explicitly link these changes to climate factors, if that is in fact what you mean to

do.

23/2. Do you show this relationship in the text? If so cite a figure. Also please reword the sentence. “Indeed, surface thinning preceded rapid terminus retreat at many northern Greenland glaciers (Fig. x).” I would be wary of adding sentences referencing old studies in other parts of Greenland and focus more on the region of interest. What is the main point you are trying to make? Is it that climate may be the initial trigger for terminus change? Then make it explicit and cut the fat.

23/2. Confusing sentence, please reword. Not initial condition, do you mean forcing?

23/9. Delete “the”

23/8. I’m confused, is it climate and ocean forcing at the terminus; or thinning from negative mass balance that causes retreat? I realize they are related (i.e. climate driven), but I think you can be more direct.

23/12. This seems like material that could be combined with the previous paragraph. In fact, I would consider making this section a single paragraph that is more direct and punchier. Lots of material is repeated and the topic lacks focus.

23/15. Can also add: Catania G. A., Stearns, L. A., Sutherland, D. A., Fried, M. J., Bartholomaus, T. C., Morlighem, M., et al. (2018). Geometric controls on tidewater glacier retreat in central western Greenland. Journal of Geophysical Research: Earth Surface, 123, 1–14, https://doi.org/10.1029/2017JF004499

23/25. What are the significant differences?

23/26. The last sentence of this paragraph is essentially the same as the first. Consider revising.

23/31. What causes the initial near-terminus thinning? Is this supported in the results section? Does retreat lag thinning? If so, reference the appropriate figure. Otherwise, I feel this is unfounded.

23/33. Ice does not flow inland; perhaps you mean the dynamic response propagates inland, or up-glacier?

23/33. Change to, “As such, we suggest thinning initiated enhanced retreat…”

24/19. Awkward sentence, consider rewording.

24/19-20. Where do you show calculation of the force balance, longitudinal stretching and driving stress? Also, you may not have the temporal resolution in the velocity dataset to resolve short-lived dynamic adjustments from individual calving events.

24/27. Delete the comma in this sentence.

28/10. It doesn't really seem that any glaciers are responding linearly to climate forcing. It looks like Ryder has a very nice, episodic advance/retreat cycle.

28/10. It is hard to compare these records to climate forcing without also seeing time series of climate forcing (i.e. air or ocean temperatures).

29/9. But didn't the results section showed fjord width had little control over retreat rates?

Figure 6 and 7. It's hard to read and interpret yellow colored velocity data. I suggest changing to blue or another easily accessible color.

Figure 9 and 10. The bathymetry colorbars are not needed for each panel. Consider including one at the top or bottom of the figure.

Figure 11. Please annotate the ice flow direction and make explicit the location of ice tongues and lateral rifting. It's hard to make out these features without descriptions in the figure.