Review:

2022GL098009: Direct measurements of warm Atlantic Intermediate Water close to the grounding line of Nioghalvfjerdsfjorden (79N) Glacier, North-east Greenland.

Overall Statement:

Overall, this is an nice piece of work that uses diverse datasets to present important findings that relate to stability of the 79N Glacier and the Northeast Greenland Ice Stream. The manuscript is generally well written, the results are presented concisely, and the discussion and conclusions expand what is presented to establish their significance in the larger context. Below I have listed a set of comments that I believe will increase the accuracy and precision of the narrative, and will improve the clarity of the text. Most of these changes regard to presentation of the results and are not major. Ultimately, I think that this manuscript will make for a fine contribution to The Cryosphere and will advance the understanding of ice-ocean interactions around Greenland and the ice sheet's future evolution.

Thanks for the review and the positive comments on what we have done to draw together diverse datasets to say something important about the stability of 79N Glacier.

Specific Revisions:

I believe that it is typical to present "North-east" as "Northeast." I suggest changing this. throughout the text. Additionally, I see both northeast and NE throughout this text. I suggest to pick one expression and be consistent throughout.

We will change this as suggested.

I see that 79N, 79 N glacier, 79N glacier, and 79N Glacier are all used to refer to the same thing. Choose one shorthand expression and be consistent in its use throughout the text.

We will change this as suggested.

As Atlantic Intermediate Water is a primary focus of this manuscript, I suggest adding several sentences that discuss its larger origin, flow path (through Fram Strait), and depth range and temperatures on the NE Greenland continental shelf.

We will add a short explanation and some key references to help introduce AIW

Both ice shelf and ice tongue are used to describe the floating portion of 79N Glacier. I know that there is some debate on what to call these features in Greenland based on their lateral constraints and geometries, but I think that it would help the manuscript to use one expression and be consistent in its use throughout the text.

Both exist freely in literature; we agree consistency may help and so have elected to refer to the floating portion as 'ice shelf' throughout

Absolute Salinity units are presented as gkg^{-1}, g kg^{-1}, and g/kg. Choose the correct expression, which is g kg^{-1} (with a space after the numbers, e.g., 34 g kg^{-1}), and correct this throughout the text.

We will change this as suggested.

Temperature units are presented with a space between the number and the unit. This is incorrect. Change this throughout the text to represent the correct notation which is, e.g., 4°C.

Opinions on this vary, including the International Bureau of Weights and Measures who use a space, but many publishers who do not. We don't mind so will adjust to fit the preference of the reviewer.

Distance units are presented with no space between the number and the unit, as well as with a space between the number and the unit. Choose one approach and be consistent throughout. I suggest to place a space between the number and the unit.

Apologies we missed some numbers with no spaces to their units. We will change this as suggested.

I do not think that presenting the different layers of the lake water column as discrete water masses is appropriate. Water masses refer to identifiable, discrete origins for the temperature and salinity range being observed. For instance, we know that Atlantic Intermediate Water derives from the North Atlantic and has a certain temperature and salinity range along the NE Greenland continental shelf and Glacial Meltwater is freshwater derived from melting glaciers. These are water masses. Please update the text to present the water column as having 3 or 4 layers, which are quasi well-mixed with a certain T, S range.

The water column in the CTD casts in the eastern (western) basins is consistent with a 3(2) layer structure with large density gradients in between the layers. But these are not homogenous layers (i.e. not slab-like, as the term 'layer' would imply to us) and the properties of the same 'layer' can plot in different parts of Temperature-Salinity space depending on where in the lake the CTD cast is taken from. So we prefer the term water mass. To address the concern of the reviewer we will clarify that we are only referring to the water in the lake, and will include a summary in discussion that explains the likely origins of the water, along these lines:

The top layer is a fresh layer likely from runoff or above the surface melt of floating ice whose temperature is determined by solar heating. This layer is confined to the top ~20m which also happens to be the depth of the sill that confines the western basin, so it can spread between the different basins unimpeded. The properties are quite similar within all basins although the temperature and salinity of the topmost few metres varies according to freshwater input, lake ice melting and proximity to calving fronts.

The intermediate layer is a brackish watermass whose properties are distinct between the eastern and western basin (which, is consistent with the presence of at least the 21 m sill which keeps the east and west basin waters within this layer separate. Likely this watermass is affected by the iceshelf/icebergs that confine it. Its origins are unclear but wintertime vertical mixing of deeper (saltier) water masses could play a role.

The 4th layer is the modified AIW hence a watermass.

Figure 4 is referenced in the text before Figures 5 - 7. Generally, the figure numbering should reflect the order with which they are referenced in the text. Please either reference Figure 4 in the manuscript before 5 – 7, or renumber the figures.

Fig 4 is called at line 213, Fig 5 at line 232. They are called in order.

I think that an opportunity has been missed to discuss the local input of fresh glacial meltwater

into the lake from submarine melting of the ice faces that calve into the lake, as well as icebergs. This is not central to the main message of the paper, but the data were collected pretty close to the calving fronts so it would be nice to see a brief discussion of this mechanism added to the manuscript.

We will include a short description of the different sources/inputs of freshwater to the lake including submarine melting of the ice faces, fluvial input from the delta and other streams, supraglacial melt flowing off the ice shelf, and melting of lake ice.

Background and rationale:

Li 33: I suggest to be more precise with this statement and change it to:
"from the NE sector of the ice sheet to Fram Strait."

This section (lines 33-59) will be slightly reworded to address multiple comments of Reviewers 1 and 2

Li 34 – 35: Suggest to change to "NEGIS and the ice shelves that extend from its margin"

This section (lines 33-59) will be slightly reworded to address multiple comments of Reviewers 1 and 2

Li 34 – 36: Provide a reference to support this statement.

Li 38. – 39: Does this citation state that ocean temperatures (or thermal driving) will double by 2100 or the rate of ocean warming will double by 2100? Update this sentence to clarify this.

This section (lines 33-59) will be slightly reworded to address multiple comments of Reviewers 1 and 2

Li 44 – 40: Rewrite these sentences to improve their structure and more clearly introduce the study region to the reader. Please consider the following suggestions during rewriting:

- State simply that NEGIS extends from the ice divide to the coast
- State the flow speed range from the onset (slow) to the coast (max rate)
- State approximately where the three outlet glaciers split off from one another and then name them. Reference Figure 1 at this point.
- Introduce more clearly the bed geometry near the coast.
- Introduce the 79 N Glacier ice shelf, mention its flow direction, length, GL depth, fjord depth, and thickness range (which is ~100 – 600 m – fix this and add some references).

This section (lines 33-59) will be slightly reworded to address multiple comments of Reviewers 1 and 2

Li 47 – 48: Suggest to change "is front by an ice shelf" to "extends in an ice shelf"

Li 59: Suggest to change to "79 N Glacier and its ice shelf" or "79 N Glacier ice shelf."

This section (lines 33-59) will be slightly reworded to address multiple comments of Reviewers 1 and 2

Li 60 – 61: Add melt rate estimate from Wilson et al. (2017). See the full reference below under the References section.

OK

Li 63: Reference Figure 1 after the calving front statement.

OK

Li 70: Was AIW found within the ice shelf rift or beneath it? I suppose there was almost certainly some mixture of AIW in the water column within the rift, but for the context of this introduction,

where AIW = heat, it might be better to say beneath the ice shelf rift.

We will reword the description of the Ice-Tethered Mooring (ITM) to clarify that the sintrument was deployed from (and tethered in) the rift but the mooring string sampled the water below the ice shelf, not in the rift itself.

Li 72: Again, I believe all the instruments were beneath the ice shelf base, so the statement "A record from an Ice Tethered Mooring (ITM) situated in this rift" seems misleading to me.

See above

Li 73: It could be worthwhile to mention the substantial heat throughout the water column at the ITM site, primarily due to only weakly diluted AIW.

This feels implicit from the existing wording and is a potential distraction from the focus of the paper in Blaso

Li 74 – 79: I suggest adding "meltwater-enriched" to "outflow" at some point in these sentences to more clearly communicate the sub-ice overturning circulation to non oceanographers.

OK

Li 80 – 81: These sentences would benefit from the aforementioned suggested introduction to AIW.

See response above – we agree

Li 83: Suggest to change to "increasingly, warmer, more saline, and shoaling AIW layer"

OK

Li 85 – 86: I believe that is what this paper was saying, but be sure to mention somewhere in here that this is an increase in the "overall" or "average" ice shelf melt rate.

OK

Li 89 – 90: I do not recall if Mayer et al. (2018) set out to estimate a thinning rate over the whole ice shelf. If so, state that explicitly with the thinning rate range. If not, state explicitly that this thinning rate of up to 12 m a^{-1} is local only to Midgardsormen. The reader will be confused otherwise, as the Rignot and Jacobs (2002) approach suggests an increase in melting of 5 m a^{-1}, which can be equated to thinning if we ignore large changes in ice dynamics. This is less than half of 12 m a^{-1}, which is a significant difference.

We will reword to make clear the scope of the Mayer thinning estimate, which relates to a local thinning estimate at the Midgardsormen locality

Li 98: Suggest to change "then this should have profound" to a more precise statement such as, "then changes in its thermohaline properties should have profound."

OK

Li 100: Suggest to change "flux, extent, properties and interaction of AIW with the floating ice and grounding line" to "delivery of AIW to the sub-ice shelf cavity and the degree of thermodynamic interactions with the ice shelf base" to improve sentence readability.

OK

Li 102 – 104: Poorly written run-on sentence. Rewrite to improve readability.

OK

Li 106: Add the distance of Blasø from the grounding line, and reference Figure 1.

Blaso does not have a single distance from the grounding line (the two entrances are 10 km apart) which is why we use >50km

Li 107: Correct to Interferometric synthetic Aperture Radar (InSAR).

OK

Study Area:

Li 111: Is this sentence correct? Milne epishelf lake in Canada is one that comes up often in the literature that is between an ice shelf and a lodged ice mass in a fjord with fjord walls on its sides.

That is, it is not strictly bounded by an ice free land area and an ice mass. Please take a look through the literature to make sure that this statement is correct.

We have worked on epishelf lakes for many years and this is a definition that fits both Blaso and Milne epishelf lake. We will include a slightly expanded description and context of epishelf lakes to address these comments and for the comments of reviewer #2.

Li 111 – 112: Aren't all epishelf lakes freshwater on above the ice draft and seawater below? Isn't freshwater typically considered necessary for a body of water to be considered a lake? I suggest to correct these two sentences then combine them into one cohesive sentence that accurately defines an epishelf lake.

We will include a slightly expanded description and context of epishelf lakes to address these comments and for the comments of reviewer #2.

Li 114: Why must the ice be in hydrostatic equilibrium for its underside to determine the transition to seawater? Wouldn't the underside depth determine the onset of seawater regardless of the degree of flotation?

We will include a slightly expanded description and context of epishelf lakes to address these comments and for the comments of reviewer #2. It is correct that HE is not necessary and we will correct (see reviewer #2)

Li 115 – 119: Can you expand this thought a little further to explain concisely how epishelf lakes have been used to infer past glaciological change?

We will include a slightly expanded description and context of epishelf lakes to address these comments and for the comments of reviewer #2.

Li 122 – 123: Would the southern lake margins also receive freshwater from submarine melt of the ice faces and summertime runoff?

See earlier comment that we will include a short description of the different sources/inputs of freshwater to the lake including submarine melting of the ice faces, fluvial input from the delta and other streams, supraglacial melt flowing off the ice shelf, and melting of lake ice.

Methods:

Please add subsection headings to improve the organization of this section.

OK

Li 138 – 140: The structure of this sentence makes it unnecessarily difficult to read. Suggest to rewrite the sentence with active voice to more clearly and concisely communicate the idea.

OK

Li 145: Please provide a reason for the depth differences. Perhaps they are within the instrument uncertainties at these depth ranges? If so, state this uncertainty range explicitly.

This is a measurement and spatial location issue common in any geophysical survey where line transects are being done. A crossover analysis to determine average difference in layer depth e.g. in ice-penetrating radar lines is a common statement to make. In this case it is likely due to tides, slight differences in GPS locational accuracy on sloping surfaces, and a small amount of instrument measurement error.

Li 148 – 149: Please convert the C, T, and P uncertainties to Conservative Temperature and Absolute Salinity uncertainties, as these are the properties that the hydrographic data should be presented in.

The CTD measures conductivity from which one can then calculate practical salinity

(units psu). This conversion depends on the temperature of the sample, amongst other things. Conversion to Absolute salinity will, in addition, take into account differences in the salt composition by location. Thus the sensitivity of a conductivity sensor cannot be related to an absolute salinity uncertainty in a simple way. As a result we have kept the manufacturer's specifications in the text but will explain how they are **approximately** ***proportional to values in g/kg. Similarly for Conservative temperature, thus:***

Manufacturer-cited accuracy was ±0.01 mS/cm, ±0.01 °C, and ±0.05% for pressure. (Roughly this corresponds to an accuracy of 0.02 g/kg, and an accuracy of 0.01 °C for Conservative Temperature).

Li 146 – 156: Were the CTD post-processed at all? If not, I suggest to post-process the data to improve their quality, as this is standard procedure in oceanography. This webpage explains nicely how to post-process the profiles: https://docs.rbr-global.com/rsktools/files/latest/57311819/57311821/1/1593023510371/PostProcessing.pdf.

The data were processed in the ways already noted in the text. We note the MATLAB code linked by the reviewer but we are not convinced that this would add anything significant to the quality of the dataset: for example, our CTD is relatively compact and we did not think it necessary to post-process for a few cm offset between T and S sensors, and the data do not have noise that might suggest a low-pass filter would be appropriate (e.g. we have no salinity spikes at sites of strong gradients), and we sampled on a flat calm lake so loops are not present.

Li 159: Please convert this uncertainty to a vertical range based on the observations.

OK

Li 162: Cite Figure 1 b at the end of this sentence.

OK

Li 174: Is this the annual DEM for 79 N for 2017 or is it a single DEM spanning multiple years? Please add this information to the text.

Hydrostatic analysis used the Arctic DEM (which is constructed from data acquired over multiple years prior to 2018, and is provided at a ground resolution of 2 meters, for full details see Porter et al., 2018) for the ice surface and BedMachine v3 (which is constructed from multiple ice thickness datasets collected between 1993-2016 and is provided at a ground resolution of 150 m, for full details see Morlighem et al., 2017) for the sub-shelf bathymetry and subglacial topography

Li 181: See above comment on correcting InSAR acronym definition.

OK

Li 184 – 185: I see the reference to the full InSAR processing method, but it would be nice to know in the text if tidal elevation data necessary for the vertical correction applied? If they are, did you extrapolate your measurements back in time with a harmonic analysis or use the Dansmarkhan tide gauge? Did you use the CATS2008 tide model?

We do not correct for tidal elevation on purpose, because the intention is to identify areas affected by tides and those who are not.

Results:

Please add subsection headings to improve the organization of this section.

OK

Li 205 – 206: Be consistent with units. Either choose cm or m for tidal range. Figure 2 presents amplitude as cm, so perhaps that is the best route forward.

Fair comment – we will be consistent

Li 208 – 211: I do not understand the point of this text. Is it just saying that the CTD profiles were retrieved within some range of the seafloor? I think that most of this is dead text that can be cut out so that this paragraph can be combined with the next to more concisely state the results.

This is pointing out that the CTDs necessarily sample quite different (maximum) depths due to the locations they were taken. We do not think it is dead text and is a necessary part of explaining the context behind the CTD profiles in Fig 3.

Li 212: Replace "haloclines and accompanying thermoclines" with "pycnoclines where temperature and salinity increased rapidly with depth."

We will use pycnocline and add a statement that the density changes are likely driven dominantly by Salinity, thus: "with pycnoclines associated with changes in salinity given how dominant salinity is in governing density at these cold temperatures"

Li 225 – 226: Is this sentence referring to the upper limit of the pycnocline or its thickness? This is not clearly communicated with this sentence.

It is a difference in the measured depth of the boundary – we will clarify.

Li 227 – 229: This is a very interesting finding that in its current form is kind of a distraction from the narrative. Please add a temperature and salinity range where these fish have been observed to live in to fix this. Also, this is minor, but were the fish dying or dead? If they were interpreted as dying, what was the reasoning for this interpretation. Please write more precisely.

We internally debated whether to include this but we think that they add an important implication that marine water must be reaching the western basin from under the ice shelf. We saw both dying (gaping, flapping, and unnaturally floating on their sides 'high' in the water) and dead fish. We know of no source for the T-S range but as with all cod, they are normally found in fully marine conditions and have not been reported in lakes. The Froese and Pauly reference is to FishBase which we understand to be the leading marine fish database. We will add some wording to clarify.

Li 233 – 235: Poorly written run-on sentence that contains multiple thoughts. Please rewrite as two sentences.

OK

Li 243: Correct to "free floating (Fig. 5d)."

We will add the space

Li 263: Suggest to change to "ice penetrating radar data," because there are many different frequencies of radar used to measure ice and some do not penetrate through the whole ice column.

OK

Li 285: Please convert these data ranges to months so that the reader can more easily compare the lags presented in this manuscript to those in Wilson and Straneo (2015) and Schaffer et al. (2020).

OK

Discussion:

Li 273: Please change "melt-mixing line" to "meltwater mixing line (Gade, 1979)." I've added the citation to the reference section below.

Ok

Li 273: Since this is the first mention of glacial modification of AIW through melt input, I suggest

to clarify this as “glacial melt modified AIW” or “glacially modified AIW” and to clarify that this is colder and fresher (less thermal driving) than pure AIW.

OK

Li 274: Again, the ITM was deployed through a rift, but all the sensors resided beneath the ice shelf base, so I think “deployed in the rift” is slightly misleading.

See earlier response.

Li 276: The expression “50 km inboard of the calving front” is somewhat awkward. Consider using a different word such as “upstream, upglacier, westward” or something similar.

OK

Li 283: The reference to the Schaffer et al. (2020) paper is awkwardly placed. I suggest to place it after “grounding line.”

OK

Li 296 – 299: Poorly written 59 word run-on sentence containing at least two ideas. Please rewrite this sentence and break it into two shorter sentences.

Will split in 2.

Li 300: I suggest to use “pycnocline” instead of “halocline”, because both temperature and salinity characteristics are referred to here.

We will use pycnocline and add a statement that the density changes are likely driven dominantly by Salinity, thus: “with pycnoclines associated with changes in salinity given how dominant salinity is in governing density at these cold temperatures”

Li 302 – 303: Why does the 145 m pycnocline have to be a proxy for the ice shelf draft “in hydrostatic equilibrium?” Why can’t it simply reflect the ice shelf base depth?

Covered by earlier response on epishelf lakes.

Li 300 – 305: There is another fresh water mass that is not considered here that will fill the lake. That is glacial meltwater from submarine melting. Please update this paragraph to reflect this.

Covered by earlier response on freshwater sources.

Li 306 – 309: I do not think that this is the proper mechanism to explain the 5 m difference in pycnocline depth considering the insane vertical stratification across this feature. Internal wave amplitudes decrease with stratification and their speeds increase, so I would expect them to be much smaller and quite fast. I would expect that it is more likely that the seawater layer simply goes up and down with the tide, then there is quite a strong pressure driven flow into and out of the lake where water parcels flow down isopycnals. Please expand the discussion to reflect this comment or include a rebuttal, with a scaling argument in the text, that defends the internal wave interpretation.

We note that the internal wave explanation was picked up by this reviewer and by the third set of comments. We agree with the reviewer that we do not have enough information to fully understand the 5m difference in pycnocline depth observed between CTD5 and CTD8. Since this difference does not affect any of our results - we have modified the text to avoid attribution and we will include the potential explanations of errors introduced by tides and instruments, internal waves, and add the mechanism noted in the third set of comments and will summarise that we do not have an unequivocal explanation for the difference in depth of the boundary between the two sites. This does not affect our overall conclusions.

Li 322: Is the tidal exchange unencumbered? Earlier in the text it was hypothesized that the somewhat reduced tidal amplitudes results from the partially grounded margin of 79N Glacier inhibiting tides. Please clarify this.

We will remove ‘unencumbered’

Li 337: Please change to "dying marine fish" so that the reader knows at this point, not later, that Arctic Cod are strictly marine. Also, see prior comment above that points out that it would be helpful to state the thermohaline range that these fish live in.

See earlier response.

Li 3338: The statement that there is "no seawater present in the deepest parts of the western basin" is incorrect, because brackish water contains seawater. Please correct this portion of the text to be more precise.

We will change to 'there is no fully marine water'

Li 344: Ok, so this is way outside of my area of study, but wouldn't fish that live in denser seawater and therefore balance their buoyancy to the denser water, sink if placed into less dense brackish water?

Also outside our primary expertise. But from biological texts it seems that osmotic lysis is the simplest explanation, whereby the change in osmotic potential of the cells of a saltwater fish that finds itself in a hypotonic solution would be for the cells to absorb freshwater, bloat and rupture. Whatever the mechanism it is clear that we found marine fish floating in distress in fresh surface waters. We will clarify that we were not referring to swim bladder buoyancy adjustments but to cell osmosis.

Li 350 – 352: Ok, I do not disagree that 79N Glacier appears to be thinning significantly, but how do several CTD profiles from a single year that reveal seawater in the lake show this? They cannot resolve change because they are from a single point in time – they just show that there is seawater at depth in the lake. The migrating margin I believe shows this, but this is not explained sufficiently here, and I don't think these data are really shown in this manuscript. Please expand this discussion to more sufficiently defend the reasoning that Lake Blasø can tell us about the thinning 79N Glacier. I believe that this will require at least an additional paragraph, perhaps two.

We will clarify that the conclusion we make here is in the context of some of the other work such as that by Mayer et al, where we can combine their conclusions with our observations to suggest that the incursion of marine waters *may* be relatively recent.

<u>Conclusions:</u>

Li 359 – 360: It is important to clarify that the AIW at the ITM site that is being referenced has already been glacially modified. At least this is what I thought was communicated earlier in the text. Either way, it would be helpful to clearly communicate the temperature and salinity difference between the AIW observed in Lake Blasø and the warmest and most saline AIW observed at the ice shelf front. The Schaffer et al. (2020) or Lindeman et al. (2020) reference should provide the necessary information.

See earlier response. We will quantity the different in T-S ranges of AIW between ITM and Blaso

Li 373 – 377: This statement ignores the logistical difficulties of establishing a continuously-monitoring mooring in the western basin of Lake Blasø, which will be significant. Calving icebergs from the tidewater fronts will likely have a draft close to the maximum depth of the fjord and will have a high likelihood of running into the mooring. If this statement is to be left in the text, then there should be a disclaimer about the inherent risk in establishing a mooring in the western basin.

We will remove 'continuous' – the innovative suggestion we are trying to make is that this is logistically a much easier place to deploy a (campaign) mooring than drilling through an ice shelf.

Li 881: Suggest to change to "glacial meltwater from basal melting of the ice shelf."

Line 381 – OK.

<u>Figures:</u>

Figure 1: Consider adding a reference map that places NEGIS in context of Greenland as a whole, and adding glacier demarcations to the inset figure. I believe these data can be downloaded here http://imbie.org/imbie-3/drainage-basins/. Add a northward-pointing arrow or longitude and latitude lines to panel A. It would be nice to have several more ticks on the color bar to more easily identify lake depths in relation to the color scale.

We will improve Fig 1 for visualization of the bathymetry and will add a map of ice shelf thickness and a long profile of the fjord (See also Reviewer #2)

Figure 2: Perhaps it would be clearer to present these data as deviations about a 0 cm elevation. That would make the data easier to compare and would represent tidal fluctuations more accurately.

We will follow the suggestion of Reviewer #2 to align the observations more clearly.

Figure 3: Please label x axes as Conservative Temperature (Θ) and Absolute Salinity (S_A)

OK

Figure 4: Please label axes as Conservative Temperature (Θ) and Absolute Salinity (S_A). Also, The caption says that the blue data are from the Eastern Basin, but the legend labels them as the Western basin. Please correct this.

OK – we will correct the legend which has east and west transposed.

Figure 5: This is a very informative figure, but in its present form it takes up 2.5 pages and requires some improvement. I suggest the following changes:

- I suggest to either split into three figures or remake what is currently Figure 5 so that it all fits on one page.
- Additionally, the vertical scales on d – f) are different. It would improve the interpretation of this figure if these panels all had the same vertical scale or the panels heights varied with respect to the vertical scale.
- The inclusion of a filled space beneath the ice shelf that is either modified AIW or fjord water is misleading. The authors do not data to prove this. Please either label this part of the figure as AIW (interpreted) or something similar. In reality the sub-ice shelf water column will have up to 4 different water masses mixed into it, with AIW probably being the dominant water mass.
- I suggest to interpolate between multiple CTD profiles to fill in the Lake Blaso water column structure.
- Finally, I suggest to replace the multiple legends with a single legend and nest the maps of the lake locations in the empty space to improve the figure.

We will consolidate this figure to occupy less space and to pick up the errors picked up by this reviewer and Reviewer #2.

References:

Wilson, N., Straneo, F., & Heimbach, P. (2017). Satellite-derived submarine melt rates and mass balance (2011–2015) for Greenland's largest remaining ice tongues. *The Cryosphere*, *11*(6), 2773-2782.

Gade, H. G. (1979). Melting of ice in sea water: A primitive model with application to the Antarctic ice shelf and icebergs. *Journal of Physical Oceanography*, *9*(1), 189-198.