Review of "Brief Communication: A submarine wall protecting the Amundsen Sea intensifies melting of neighboring ice shelves" by Gürses et al., 2019

Summary

The authors use an ice-ocean model to investigate the effects of a submarine wall on the basal melting of the ice shelves fringing the Amundsen Sea Sector, West Antarctica. While a clear reduction in basal melting shoreward of (and in some cases adjacent to) the wall is detected, an enhanced melting signal is also found along the neighboring Getz Ice Shelf (as well as farther afield at George VI and Amery Ice Shelves), which the authors state may reduce the effectiveness of such a construction. However, despite increased melting across these regions, the large reduction in melting simulated over the Amundsen Sea Sector is believed to contribute to a ~10% decrease in Antarctica's total mass loss. Raising important questions about the usefulness (or otherwise) of geoengineering as a means to mitigate Antarctic ice-mass loss, I therefore believe the findings presented in this manuscript are timely and will be of genuine interest to the readership of The Cryosphere. However, prior to publication, I would encourage the authors to address several important points detailed below.

General comments

Model bathymetry In Section 2, the authors detail the construction of the wall in their model, which acts to block the intrusion of circumpolar deep water (CDW) onto the Amundsen Sea's continental shelf. While I unfamiliar with the technicalities of the FESHOM model, I was very surprised to see the use of RTOPO1 in the model setup for bathymetry, ice shelf geometry and grounding line location. This product has now been superseded by at least 3 updated bathymetric models (e.g. Bedmap2 (Fretwell et al., 2013); IBCSO (Arndt et al., 2013); RTOPO2, Schaffer et al., 2016)), which have significantly improved our understanding of the Amundsen Sea Sector's continental shelf and sub-ice shelf cavity geometry via a range of new in-situ observations and model predictions. A simple subtraction of RTOPO1 from IBCSO (Figure 1 of this review) emphasizes this point, and shows substantial between-model differences in bedrock elevation throughout the domain, including underneath the ice shelves.

It is conceivable that these differences may lead to substantial variations in modelled CDW ingress and basal melting throughout the Amundsen Sea Sector, which may in turn have impacts for the corresponding Antarctic-wide melt budgets presented in Figure 3, and potentially the overall conclusions of the paper. In order for the findings of this paper to be convincing, I therefore strongly encourage the authors to rerun their analyses using one or all of these models, and carefully adjust the figures/text as necessary to incorporate any new or additional results.

Standard of writing/English language While I appreciate that English may not be the native language of the authors, I echo the Editor's initial comments that the main text still includes a large amount of verbose and/or non-standard sentence construction, which at times makes the flow of the manuscript difficult to follow and/or comprehend. This is particularly true of the end of Sections 3 and 4, where the authors concluding statements appear to downplay the importance of intensified neighboring melt - the focus of the title and abstract (see specific comments below), and thus what I initially perceived to be the key message of this research. I have attempted to restructure large parts of the main text to the best of my ability, but prior to publication I would again ask the authors to very carefully read through their manuscript with the assistance of a native English speaker/proofreader, to improve the readability of this otherwise interesting piece of research.

Citations Whilst the style of referencing in this manuscript is generally satisfactory, I think the main text is somewhat marred by an over-reliance of modelling-based studies, and omits

a lot of other key research on (e.g. observationally constrained) Amundsen Sector ice-ocean-atmosphere interactions and/or glacial change. Such citations should be added to the text to provide a more reasoned/well-rounded discussion. Occasionally, citations are also omitted from sentences altogether, which should also be addressed. (See my suggested edits in the specific comments below).

Introduction At the end of the introduction section, I think some words on the flaws and critical 'next steps' of the studies presented by Moore et al. (2018) and Wolovik and Moore (2018) should be added, to qualify the present study and emphasize to the reader why modelling the impacts of building such a wall might be required. The inclusion of a sentence similar to the one on Lines 116-117 could also be added to contextualize the wider role of geoengineering, and hence the need to accurately predict 'adverse side effects'.

Section 3 (Lines 63-64) Following Section 2 (Lines 56-57), are your modelled 1947-2007 ocean temperatures also restricted to summertime means? Or do they reflect annual averages? I think this might be worth explicitly stating here. Similarly, if indeed they do reflect annual averages, then have you also considered the importance of seasonal changes in CDW ingress onto the continental shelf, as has been noted in the recent literature? (e.g. Thoma et al., 2008; Steig et al., 2012; Dutrieux et al., 2014; Webber et al., 2017). Such changes may lead to large variations in bottom temperatures over seasonal timescales (and hence basal melt rates), which may not be representative of the *in-situ* temperatures shown in Figure 1 of the manuscript. If this is the case, then what steps have been taken to validate the temperatures estimated by your model during non-summer seasons?

Specific scientific comments

Ln 74 – "*The warm water mass penetrates through the Getz Ice Shelf into the walled region*". Following my concerns on the use of RTOPO1 above, is this phenomenon present when the model is run with more updated cavity geometry information (e.g. IBCSO/RTOPO2)? Equally, what impact does this have on the simulated spatial distribution and magnitude of melting of Abbot Ice Shelf? In Figure 1 of this review, it is apparent that significant (> +/- 250 m) differences exist underneath these ice shelves, so I would encourage the authors to give this careful consideration.

Lns 85 to 87 – These sentences appear highly speculative and in physical terms, I don't understand how this could be the case. The positioning of the ACC over the Bellingshausen Sectors' continental shelf break has been implicated as the predominant driver of unmodified CDW flooding across this region (e.g. Holland et al., 2010; Bingham et al., 2012; Schmidtko et al., 2014; Wouters et al., 2015; Paolo et al., 2015; Christie et al., 2016; Zhang et al., 2016; Hogg et al., 2017), which is presumably the overriding driver of melt variability at GVIIS. As such, I don't understand how mCDW, which would presumably be constantly freshening during its transport underneath and eastward of the Abbot Ice Shelf, could either reach GVIIS or play a more important role than the influence of the ACC here. I would encourage the authors to carefully consider this point and either clarify why they think this to be the case, and/or amend the text/interpretations as necessary.

The same comment applies to why they think reductions in melt rate in the Amundsen Sector may influence melting at Amery Ice Shelf. Presumably any propagation in the coastal current would become entrained within the Ross Gyre, and not extend to the other side of the continent (cf. Nakayama et al., 2014; Dotto et al., 2018)? Assuming it did, however, then presumably any diverted CDW would again be freshened during its advection towards these regions? As above, I'd like to see a more convincing discussion of why the authors believe this to be the case added here.

I am also interested to see how these findings may change when the model is forced with more updated bathymetry as discussed above. While Figure 1 in this review only shows the Amundsen Sea Sector and its surrounds, significant differences in bathymetry also exist around the continent.

Technical comments

Title – For those unfamiliar with the geography of Antarctica, I would reword the title to "*A submarine wall protecting the Amundsen Sea, West Antarctica, intensifies melting of neighboring ice shelves*" or similar.

Ln 8 – Add "*Sector of West Antarctica*" after '*Amundsen Sea'*. Also reword the end of the sentence to "…*acceleration of ice discharge from upstream grounded ice*" for technical accuracy.

Ln 9 – '*et al*' is a Latin abbreviation for '*et alia*', and so a period should follow the '*al*' (i.e. '*et al.*'). I have noticed this small error throughout the manuscript, so the authors should address this universally throughout the document. Also, add the word '*ocean*' between '*warm water*'.

Ln 10 – Suggest rephrasing the end of this sentence to "…*into the sub-surface cavities of these ice shelves could reduce this risk*". The word '*sea*' preceding '*ice-ocean*' model is not needed, and should be removed.

Ln 11 – Change '*warm water*' to '*this water*'. Rephrase next sentence to begin "*However, these water masses get redirected … which reduces the net effectiveness* …".

Ln 14 – Should read "… *the warming of Earth's climate is sea level rise*". Add a reference to the IPCC (e.g. Vaughan et al., 2013) to the end of the next sentence.

Ln 15 – Suggest rewording to "*Currently, the main … mean sea levels are the thermal expansion of the world's oceans, the mass losses emanating from the Greenland Ice Sheet, and the world-wide recession of mountain glaciers and ice caps…*".

Ln 17 – Suggest rewording to "… *and the ice mass losses originating from the Antarctic Ice Sheet… although Antarctica's*…". (Note here the capitalization of the pronoun 'Antarctic Ice Sheet'). At the end of this sentence, a reference to Shepherd et al. (2018) should also be added.

Ln 20 – Suggest rewording this sentence to read "*In Antarctica, remotely sensed, modelled and palaeoclimatological-proxy data indicate that the highest potential for sea level rise will come from the West Antarctic Ice Sheet (Joughin and Alley, 2011), particularly from the Amundsen Sea Sector, where the progressive thinning of its ice shelves over the past ~25 years has greatly enhanced rates of ice mass loss emanating from this sector*" or similar. At the end of this sentence, cite e.g. Pritchard et al. (2012); Mouginot et al. (2014); Rignot at al. (2014); Paolo et al., 2015; Shepherd et al. (2018).

Ln 22 – Suggest rewording next sentence to something like: "*Here, warm, high salinity circumpolar deep water (hereafter CDW) has been observed to flow onto the continental shelf and flood the cavities underneath the Amundsen Sea Sector's ice shelves, driving high rates of basal melting*". Add citations (e.g. Jenkins et al., 2010; Pritchard et al., 2012; Rignot et al., 2013; Jacobs et al., 2013; Depoorter et al., 2013) here.

Lns 25-26 – Merge these two sentences for brevity. Could read something similar to: "*Various processes… ice shelf cavities, including, most predominantly, wind-driven changes in Ekman transport, whereby variations in offshore wind stresses lift CDW onto the continental shelf*". An abundance of new literature has been published on this phenomenon in recent years,

which could/should be cited here in addition to work by Kim et al (2017). These include, but are not limited to: Thoma et al. (2008); Steig et al. (2012); Jacobs et al. (2013); Dutrieux et al. (2014); Walker et al. (2017); Christie et al. (2018); Greene et al. (2018) and Paolo et al. (2018).

Ln 27 – Suggest rewrite to: "*During its transport onto the continental shelf, this water mass is … by mixing with local, fresher on-shelf water masses*". A citation is also needed here (suggest Webber et al. (2017)).

Lns 25-29 – Somewhere in this section I think a short sentence should be added detailing the important role submarine troughs play in amplifying the transmission of CDW to the grounding line (following e.g. Nitsche et al. (2007); Bingham et al. (2012); Dutrieux et al. (2014)). The addition of this sentence would critically also give context to the discussion presented in Section 3 (Line 62).

Ln 26 – Suggest reworking the rest of this paragraph to the following or similar for conciseness: "*In the Amundsen Sea Sector, decadal-scale changes in the draft and intensity of CDW incursion onto the continental shelf – and ultimately the basal melting of the ice masses fringing this sector of Antarctica - have also been directly linked to changes in global-scale atmospheric circulation, including the influence of ENSO-induced atmospheric wave trains propagating towards this region from the central tropical Pacific Ocean (Steig et al., 2012; Dutrieux et al., 2014; Jenkins et al., 2018; Nakayama et al., 2018; Paolo et al., 2018)*".

Ln 32 – Suggest the amalgamation of this and the following sentence for conciseness. Could read something like: "*Since the West Antarctic Ice Sheet resides on retrograde sloping topography (Mercer, 1978), it is inherently susceptible to a Marine Ice Sheet Instability, whereby the reduced buttressing effect of thinning ice shelves triggers the retreat of upstream ice, leading to larger ice thicknesses at the grounding line (Hughes, 1973; Weertman, 1974; Schoof, 2007)*". [Note also here the addition of several classic papers I was surprised to not see in the text. Also, as the term 'grounding line' hasn't been introduced, I would consider also defining this in a short, follow-up sentence].

Ln 35 – Hyphen required between '*grounding line*'. For clarity, next sentence could also be amended to read: "*This sustained retreat accelerates the transport of inland ice towards the ocean past the grounding line, where it directly contributes to sea level rise*".

Ln 38 – Full stop required after the abbreviation '*al*' as discussed above. Also, suggest changing '*this ice sheet collapse mechanism*' to '*marine ice sheet instability*' since this has just been defined above.

Ln 39 – Suggest changing '*warm water with*' to '*CDW via the erection of*'.

Ln 40 – '*Thwaites Glacier'* is a pronoun, hence the word *'the'* directly preceding it should be omitted. Also suggest reword of the end of this sentence to *"…Thwaites Glacier – one of the largest contributors of ice discharge into the Amundsen Sea (Rignot et al., 2011; Mouginot et al., 2014; Turner et al., 2017; Shepherd et al., 2018)*" for clarity. [Note the addition of several key recent citations here].

Ln 41 – This sentence is highly repetitive of the preceding sentence explaining the work of Moore et al. (2018), but can easily be fixed by changing to something like: "*In addition to the erection of subsurface walls (cf. Moore et al., 2018), they imposed artificial pinning points to enhance the buttressing effect of ice shelves on grounded ice. Both measures were found to successfully reduce ice mass losses emanating from this sector of Antarctica*".

Ln 42 – As noted in my general comments, some words on what these studies didn't examine/consider (i.e. the potentially adverse effects elsewhere), in order to qualify the research presented in this paper, should be added here.

Ln 45 – Should read "*Amundsen Sea Sector's ice shelves*". Next sentence should also read "*…horizontal resolution (minimum 5km) around Antarctica and its … and has 100 vertical levels (z-coordinate).*" for clarity.

Ln 49 – Should references be listed in chronological order? Also suggest rewording following sentence to "*While coarse resolution ocean models have been found to underestimate the ocean-induced melting of Antarctica's ice shelves, our basal melting rates are in reasonable agreement with recent observational estimates*". [The authors should also add appropriate citations to the observational estimates they refer to, as well as a cross reference to their Figure 2b here].

Ln 52 – Suggest using the word '*of*' in place of *'from*' for grammatical accuracy. See also my comments above regarding my concerns over the use of RTOPO1.

Ln 54 – Suggest change to "*This forcing period is run twice*".

Lns 58-60 – I think these two sentences could be reworked to become much easier to read/comprehend. Suggest reword to: "*We investigate differences in ice shelf basal melting with (WALL) and without (CTRL) the erection of a wall surrounding the Amundsen Sea (Figure 2a)*" [see also my comments on the manuscript's figures below]. Then: "*This feature follows the approximate location of the continental shelf break (~1000 m), and blocks CDW inflow from the deep ocean onto the Amundsen Sea Sector's continental shelf"*.

Ln 62 – Suggest amalgamating the first two sentences for clarity and conciseness. "*Consistent with oceanographic observations [Authors should add reference to the appropriate citations and/or manuscript figure here], our CTRL experiment simulates accurately the ingress and delivery of mCDW through submarine troughs towards the ice shelves fringing the Amundsen Sea Sector*". [Note also that the place name 'Amundsen Sea Embayment' is used here for the first time. This has not been introduced prior to this line, so I would suggest using either 'Amundsen Sea Sector' or 'Amundsen Sea Embayment' universally throughout the manuscript for consistency].

Ln 63 – Suggest '*acquired'* in pace of '*taken'*. I would also consider rephrasing this sentence for clarity to "… *acquired in austral* summer *(cf. Section 2), also strongly agree with the spatial distribution of our simulated temperatures, giving confidence in our abilities to accurately predict basal melting in the present study*" or similar.

Ln 65 – This sentence is highly verbose, and could be shortened considerably. Suggest something like: "*Contrary to our CTRL experiment, our erected wall blocks the ocean below 350 m depth and suppresses the direct inflow of CDW to the interior of the Amundsen Sea*".

Ln 67 – Change *'(Figure 2)'* to *'(Figure 2 a)'* for clarity of reading/reference to figures [see also my comments on the manuscript's figures below]. I also suggest restructuring the following sentence to "*Enhanced sea ice formation is also simulated, enabled by a resulting colder water column and the consequent release of brine into the underlying ocean across this region"*.

Ln 68 – I found the context of this sentence almost impossible to comprehend without reading the next paragraph, so I'd suggest rewording to the following, and also inserting a cross reference to Figure 2. Sentence could read something like: "*However, despite the brine-induced salinification of the water column here, this phenomenon is insufficient to maintain the pronounced melt rates observed in the presence of unobstructed mCDW inflow (cf. Figure 2),*

as discussed below". [NB.: brine is by definition salty, hence the inclusion of the word 'salty' is superfluous].

Ln 70 – The construction of this sentence is again rather difficult to comprehend, and can be simplified by saying something like: *"…, which lies shoreward of the easterly Antarctic Coastal Current residing over the continental shelf break at this location*". [Note: A citation should also be added here].

Ln 71 – Suggest changing the word '*through'* with '*via'*.

Ln 72 – Suggesting rephrasing part of this sentence to "*the Abbot Ice Shelf's sub-ice shelf cavity (south of Thurston Island) contributes to this cooling (Figures 2a and b)*". [Note also the added cross reference to Figures 2a and b].

Ln 72 (sentence beginning "*The deflected* …") – Suggest changing the beginning of this sentence to "*Seaward of this wall, mCDW …*", and amalgamating this and the next sentence together. (At present, they are highly repetitive, and could easily be reformulated into one concise statement).

Ln 76 – Add reference to your Figures 2b and c. In the next sentence, add a comma after '*However*'.

Ln 77 – For ease of reading/cross reference to your Figure 2, I would suggest changing the contents of the parentheses to "(*central and western Getz Ice Shelf; Figure 2c)*".

Ln 78 – Add a comma after the word '*therefore'*, remove the comma after '*mass'*, and add the word '*have'* prior to '*impacted'*. Also suggest changing the word '*fringing'* to '*neighboring'* in line with the manuscript's title.

Ln 80 – "*longitudinal dependence*". I'm not sure this is the correct term, given that longitude itself does not directly contribute to the basal melting of ice. '*Longitudinal distribution*' would perhaps be more suitable. Also, at the end of this sentence, I suggest the authors add "… *Antarctica, with and without the erection of the submarine wall*" for clarity.

81 – Embayment or Sector? See my comment re: Ln 62. Also suggest merging the end of this and the next sentence to: "*In the Amundsen Sea Sector [Embayment?], ice mass losses around Pine Island Glacier drop by 85%. This phenomenon contrasts with the increased ice mass loss observed at Getz Ice Shelf as discussed above (see also Figure 2c), where melting increased by ~50%.".*

Ln 83 (sentence beginning "*In the western Bellingshausen Sea*") – This sentence is highly repetitive of the content discussed in Lines 70-74, so could easily be removed or integrated with Lines 70-74.

Ln 85 – Suggest rewording this sentence to "*In addition to the decreased melting simulated underneath Abbot Ice Shelf, basal melting at George VI Ice Shelf increased by up to 10%.".* [Note also that the GVIIS resides on the western flank of the Antarctic Peninsula, not west of the Peninsula].

Ln 87 – Add a comma after '*East Antarctic Ice Sheet'*.

Ln 90 – Following my general comment above, the concluding remarks of this sentence are hard to comprehend, and appear to underplay the key message of the title and abstract. Do you mean to say that while localized melting is enhanced across some neighboring ice shelves, these signals are minimal compared with the simulated continent-wide reductions in melt elsewhere? If this the answer to my question is yes, which I suspect to be the case, then

I'd recommend amending the title, abstract and conclusions to provide a more focused argument in favor of this point. In any case, some rephrasing of this sentence is needed to make your conclusions explicitly clear.

Ln 94 – Suggest beginning with "*In this study, a submarine wall erected along the continental shelf of the Amundsen Sea is found to suppress the inflow of circumpolar deep water onto the continental shelf. This freshens water masses residing shoreward of the wall, resulting in significantly reduced basal melting rates of the ice-shelves located there. However, inflowing CDW seaward of this wall is found to be redirected westward towards Getz Ice Shelf, where it enhances basal melting by up to 50%...*".

Lns 98-101: Like the concluding remarks of Section 3, it is difficult to understand with absolute certainty what the key take home message is from these sentences. Is it the fact that the melting enhances in neighboring regions as a result of constructing a wall, or that these enhanced melting signals are minimal when compared to the Antarctica's overall mass budget? The authors should rephrase this section to make this explicitly clear. Also, given the opening sentences of the conclusion, there is a lot of redundancy/repetition on how CDW is diverted to Getz and causes enhanced losses in this section, which should be removed.

Lns 101-105 – This section comprises mainly of MISI theory, which was covered in the introduction, and so is not required here. I'd recommend removing this entire section, and instead give brief mention to MISI in the following section (see comment below). On a side note, while I suggest this part of the discussion be excised from the text, I also completely disagree that Thwaites and Pine Island Glaciers have the potential to be more stable than the Marie Byrd Land Sector, owing to the deeply bedded, retrograde bed slopes and subglacial basins they reside on (e.g. Bedmap2, RTOPO1, RTOPO2, IBCSO, ALMAP etc.). Also, I presume this sentence contains a typo in that '*eastern Marie Byrd Land Sector*' should actually read '*western Marie Byrd Land Sector*' (i.e. the region flowing into Getz Ice Shelf)?

Lns 106-115 – The construction of this paragraph is very hard to follow and should be edited to offer a more fluid and concise discussion. I suggest the following rewrite, in this particular order:

1) A very brief summary of what building a wall means in terms of basal melting in the Amundsen Sea Sector (including Getz);
2) How the findings of this research compare to the ideas presented by Moore et al. (2018), and what the implications of building the shorter wall he discusses would likely be on this region, and then;
3) What the implications of both walls would therefore be in terms of MISI, and Antarctica's future contributions to sea level rise.

Ln 116 – In light this paper's findings, I recommend editing the end of this sentence to read *"…, but the results of this study suggest that such proposals could have adverse side effects*". Then begin the next sentence with something like: "*To evaluate the effects of using submarine walls to protect Antarctica's ice shelves in greater detail, the use of fully coupled ice-sheet-shelf-ocean models should be utilized in future analyses. These models should be of sufficiently high resolution to simulate accurately changes in sub-ice shelf cavity geometry (including grounding-line migration and ice-shelf thinning), as well as the influx of mCDW to these locations"*.

Ln 121 – Suggest removing this sentence, as all it serves to do is cast doubt on the validity of the findings presented in this paper!

Ln 126 – Should read *"… for his comments, which greatly improved this manuscript*".

Ln 129 – Should read "*contributed to the interpretation of the results and proofreading of the manuscript*".

Ln 137 – The full stop after '*Germany'* is not needed here.

Ln 186 – '*Cryopsh*.' Should be changed to '*Cryosphere'*.

Lns 187-235 – Remove.

Figure 1: comments on Figure – I would suggest rescaling this image (particularly all lon/lat labels and color bar size) to more closely align with the scaling of Figures 2 and 3, as its current scaling looks rather odd in comparison. To assist the reader, it would also be highly beneficial to add the ice shelf limits as thin lines onto this plot, similar to those presented in Figure 2. Being picky, I also dislike the sizing and positioning of the glacier and ice shelf labels, which could easily be resized/positioned to be more aesthetically pleasing. If possible, I'd also suggest rotating the figure 90 degrees to align with the orientation of the polar stereographic plots shown in Figures 2 and 3.

Figure 1: comments on caption – For overall clarity and conciseness, I would suggest rewriting parts of the caption as follows: "*Figure 1 – Modelled and observed seafloor ocean potential temperatures in the Amundsen Sea Sector of West Antarctica. Inset shows study location. The plot shows … acquired in 1994 and 2010, respectively*".

Figure 2: comments on figure –

- Each sub-plot should be labelled (e.g. a, b, c) to assist the readability of the text. These changes should then be incorporated into the main text and figure caption as necessary.
- I would also add ice shelf outlines to the left panel as their current omission looks odd.
- I would like to see ice shelf limits also added to the inset map for wider geographical context.
- Why is the wall shown in some plots but not others? Suggest adding it to all plots. For consistency, I also suggest using the same color of dashed line in all plot.
- Why does the spatial extent of the wall change between figures? Please show the exact location of the wall as defined in your model in all plots.
- While the arrangement of the figure is generally satisfactory as is, could the right-hand panels be made bigger (at the slight expense of the left-hand panel's size) by arranging all figures side-by-side in a 1 row x 3 columns fashion? At present, it is quite difficult to see the interesting spatial details contained in the melt maps, which may be remedied by making these figures larger.
- Relatedly, I find the ice front positions in the right-hand panels almost impossible to see against the blue color scale, which would be improved by enlarging the plots. Also, I'd suggest making them thicker and/or a different color (e.g. black) to make them easier to visualize.
- The label for Abbot IS goes off the plot and looks ugly. Suggest writing over 2 lines to neaten this up.

Figure 2: comments on caption – Unlike Figures 1 and 3, the caption of this plot is missing a short opening summary of what the figure shows, which should be added for consistency. Ln 246 – Using my labelling convection, I'd suggest editing this sentence to read "*Figure 2a shows simulated ocean potential temperature anomalies (WALL-CTRL) on the seafloor of the Amundsen Sea and its adjacent ice shelf cavities. The location of the wall is denoted by a dashed line….*". Ln 250 – A colon should follow the word 'used' (i.e. "*The following abbreviations are used:* …"). Ln 252 – Suggest shortening the last sentence to "*Inset shows*

study location and other regions referred to the text". Change all instances of e.g. '*left subplot shows*' to new, explicitly labelled equivalents here and in the main text.

Figure 3: comments on figure –

- Why is color scale inverted in this plot relative to Figure 2? This is extremely confusing for the reader, and should be amended. To add to this confusion, the labels associated with the color bar appear to be incorrect, whereby, according to the current caption, red should actually denote "*shrink*".
- Suggest changing '*shrink'* and '*gain'* to '*decreased'* and '*increased'* melt, respectively.
- Like the right-hand plots in Figure 2, ice shelf outlines should be added to this figure.
- It's very hard to see the spatial detail of melting around Antarctica in the current figure, which is a shame, so I'd also strongly suggest increasing the scale of the center map if possible, or including the addition of inset subplots zoomed over key areas (e.g. GVIIS and Amery Ice Shelf) if not.
- Similarly, given the subtle changes in melting simulated underneath Amery Ice Shelf, it would be helpful to provide a zoom-in inset of the CRTL vs. WALL signals shown in the figure for this region.

Figure 2: comments on caption –Ln 255 – '*Outer ring*' is confusing, so I'd suggest rewording to: "*Longitude-specific changes in modelled basal melting with (WALL) and without (CTRL) the presence of the submarine wall are shown as dashed red and solid blue lines surrounding the center map, respectively*". Ln 257 – "*in the center map*" is superfluous, and should be removed (it is obvious where the black dashed line is).

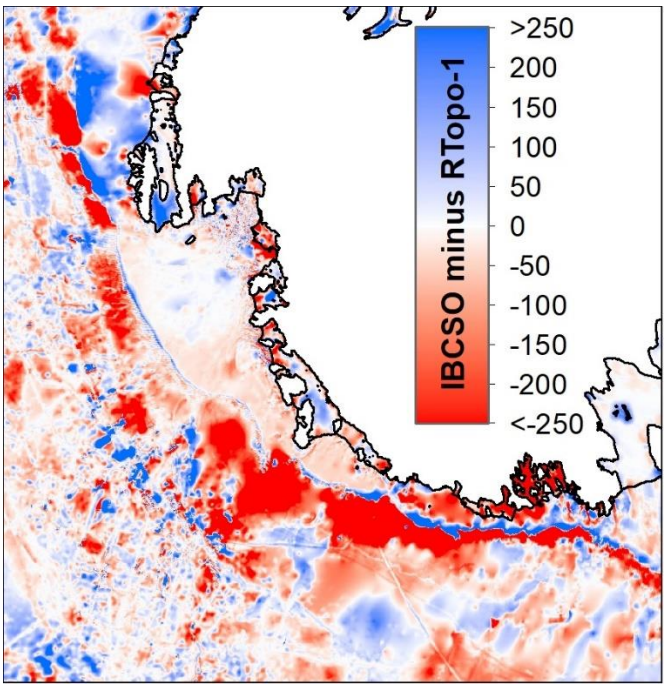

Figure 1 – Difference between IBCSO and RTOPO1 seafloor bathymetry (red, IBCSO is deeper; blue, shallower). How do these differences (and/or those of e.g. RTOPO2) affect your modelled changes in CDW incursion/basal melting within a) the Amundsen Sea Sector and b) the rest of Antarctica following the erection of the wall?

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