

Review on Revision #1 of (formerly) “The diurnal evolution of oceanic boundary layer beneath early-frozen landfast ice in Prydz Bay, East Antarctica”

now changed to:

“The annual evolution of ice-ocean interaction beneath landfast ice in Prydz Bay, East Antarctica” Hu et al. (2022/2023)

January 24, 2023

[Please note: Not all changes in the manuscript were marked up in red, which made it unnecessarily hard to track all applied changes during review]

The resubmitted manuscript shows some noticeable changes & inherent improvements compared to the original submission. The authors addressed many (but not all) issues that were raised by both reviewers, while in particular focusing on four core weak-points of the initial submission (time series length, MS structure, methodical section, large-scale context).

Despite all positive changes and additions, the manuscript still requires some rather comprehensive revisions. As in round one, I posted all my general and some specific comments and concerns below. Unfortunately, those again include many of my previous comments related to Figures, as most of them were not or only partially addressed in the revision of the initial manuscript (contrary to what was indicated in the author’s response letter by “*We revised and redraw the figure.*”). I consider most of these comments to fall into the category of good scientific practice, but admittedly some might be more of personal preference. Still, I recommend that the authors see fit in a future revision.

General comments

- 1) As noted above, several parts of the manuscript were rearranged and changed quite noticeably. However, I feel that some of the new parts (such as Ch.4.2 or the addition of three different bulk approaches for the oceanic heat flux) are not so well connected to the rest of the manuscript. In other words – I am missing a clear and stringent “story line” on how each part of the study relates to one another. Maybe the authors can try to improve on this aspect.
- 2) Methods & results are again not consequently described in present tense throughout the manuscript. In addition, some numbers are still given with too many digits (e.g., heat fluxes). Please revise grammar / style.

Specific comments (incl. technical notes)

Abstract

General: Too many brackets – please keep it concise & simple to increase readability. Plus, please check grammar/wording in order to avoid phrasing or sentences with little information.

Ch.1: Introduction

P.3, L.66: “in the ice-ocean model parametrization” – what exactly do you mean here? One specific parametrization or should it be a more general statement?

P.3, L.70-73: Please revise – all sentences in past tense & beginning with “the”

Ch.2: Data and Methods

P.3, L.83-94: Can give respective references to the individual instruments?

P.4, L109-110: “ASI” not explained; check grammar when explaining the different temporal and spatial resolutions

P.4, L.112-113: Reference missing for the ocean reanalysis

P.4, L.114: Please be more specific about the type of interpolation and grid format.

Ch.3: Results

P.6, L172: “didn’t change obviously” – please revise grammar

P4, L.100: You reference a detailed discussion about Ice-Ocean interface detection in „Zhao Jiechen, Yang Qinghua, Cheng Bin, et al. Snow and land-fast sea ice thickness derived from thermistor chain buoy in the Prydz Bay, Antarctic. Haiyang Xuebao, 39(11), 115-127, <https://doi.org/10.3969/j.issn.0253-4193.2017.11.011>, 2017.” However, this paper is only available in Chinese as far as I can see. Is there also a translated version available somewhere? Otherwise, are there alternatives?

P.8, L.208/209: What do you mean with “a classic example of air – ice – ocean interactions”?

P.10, Fig.4: In addition to comments below – is this figure really necessary, given that the rose diagrams in Fig.5 already give the information on current velocities and directions? Fig.4 (panels a-c) doesn’t really yield a lot of additional information (and fluctuations are quite hard to differentiate), and a note in the text on the smaller range of W-component values could well be sufficient in my opinion.

P.12, L.270-272: Why this sudden shift to two digits?

Ch.4: Discussions

P.17, L.352: “Several polynyas” → Do they have names / were these already part of earlier pan-Antarctic polynya inventories? In that regard, would you expect a noticeable influence of those polynyas (e.g., by salt release through new ice production) on the oceanic measurements at Zhongshan station?

P.17, L.355-360: Is that part referring to Fig.13? If that is the case, this reference is missing. Also, this Figure is poorly introduced (what it is showing, why, etc.). Can you add a few more words on that?

P18, L368: “an obvious thick” – do you mean “thickening”?

Other aspects

Data availability: You indicated that you plan to make the data available – that’s great and I would certainly see that as a strong benefit, both in terms of reproducibility of your results as well as in terms of a data sustainability.

Figures & tables

Several figures were noticeably modified or even exchanged completely, so additional and some of the previous comments (which still apply unfortunately!) on all figures below:

Fig.1:

- The photo in panel (b) is not planar as indicated on the map in panel (a), which leads to several hic-ups regarding the length-scale. Also, it seems that the distances/marked locations of the ACTD, ADV etc. are way closer together than the 30m indicated in panel (c), judging from the Ski-Doo on the right side of the photo. Please reaffirm.
- Indicate a reference for the Worldview-2 satellite image in (a)

Fig.2:

- Panel (b): Vertical gradient (note the spelling mistake) → add “of temperature” or use “Vertical temperature gradient”
- It is not mentioned in the caption that this is a contour plot based on a limited number of measurements (four times daily); none of the axis explained
- Please also note the year on the time axis
- Colormap not suited for readers with color vision deficiencies; better examples & background for instance here <https://zenodo.org/record/5501399> or here https://tos.org/oceanography/assets/docs/29-3_thyng.pdf

Fig.3 (formerly 3-5):

- Pay attention to grammar & spelling in the caption
- Please also note the year on the time axis

Fig.4 (formerly 6):

- As in previous three figures: The reason for a differentiation between now 2 minutes and 1 hour average values is not mentioned in the text. Either note that this is purely for visualization purposes, or justify in the text why you decided to illustrate it like that.
- Please also note the year on the time axis
- Caption/panels (a) to (b): add "-component" and/or explain abbreviations

Fig.5 (formerly 7):

- I would recommend to choose another symbol for "Current speed" than "s". "V" is probably more common and intuitive.
- Caption: Too short; please be a bit more descriptive on what the sub-panels depict, on the location of measurements and the displayed quantity & unit.

Fig.6 (formerly 9):

- Indicate the reference layer / position in the caption
- It's sensible heat flux, not "specific"
- Please also note the year on the time axis

Fig.7 (formerly 10):

- Hourly and monthly mean values?
- Please indicate what the error bars stand for. I assume +/- 1 standard deviation?
- Please also note the year on the time axis
- Be a bit more descriptive in the caption – it's a bit short on information.

Table 2 (formerly 1):

- Add what +/- indicates (likely standard deviation?)

Fig.8 (formerly 11):

- Please also note the year on the time axis
- What is the temporal resolution of the displayed data?

Fig. 9:

- Please properly sort the legend in panel (b) and clearly indicate heat fluxes and current components
- Also (b): It's hard to depict any differences in the lower percentage-range. Can you try to improve this?

Fig.10:

- Caption: add unit of tidal-level bins

Fig.11:

- Unit of sea ice concentration missing (colorbar)
- Caption: reference missing; resolution of product not given
- (Small) overview map of Antarctica would help to geographically locate this area

Fig.12:

- Percentage of what? A reference area / mask (if yes, what is the spatial extent of that area?)? That is neither mentioned in the text nor indicated here (caption, sub-panel or previous Figure).
- What is the grey line with rose shading?? Again, not in caption!

Fig.13:

- Colormap not suited for readers with color vision deficiencies; better examples & background for instance here: <https://zenodo.org/record/5501399>
- What is "Density ocean mixed layer thickness"? I.e., what does "density" refer to (check grammar)?
- What are the white shadings? Interpolation gaps or some other data features outside the colormap range?
- Caption: reference missing; resolution of product not given