

Interactive comment on “Arctic Ocean outflow and glacier–ocean interaction modify water over the Wandel Sea shelf, northeast Greenland” by Igor A. Dmitrenko et al.

Anonymous Referee #1

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Review of Dmitrenko et al. "Arctic Ocean outflow and glacier-ocean interaction modify water over the Wandel Sea shelf, northeast Greenland"

Summary: the paper investigates water masses and water column structures based on CTD profiles collected in 2015, and aims at identifying relevant processes and interactions between the different local and advected water masses. The study region is very remote, and largely unexplored, and the spring sampling campaign resulted in a quite unique dataset. While the main conclusions of this paper appear plausible, I find that text and figures need to be improved to convincingly present the main points. In the current form, the text is not easy to follow and could be significantly improved, in

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particular the introduction and parts of the results and discussion. Some of the figures are very busy, and require a tedious amount of time to identify the relevant details as mentioned in the text. Overall, I find that the paper presents very interesting data and summarizes four plausible main findings at the end of the paper, but requires some major improvements in text and figures to convincingly guide the reader through the paper. Below please find some general comments as well as more specific recommendations.

Introduction: I suggest that the introduction should better introduce the study region and better highlight the significance of the presented scientific aspects. I imagine that most readers are not familiar with the Wandel Sea, and more details may be needed to provide the background necessary to understand the region's relevance as is discussed in the text. Parameters such as area/width of the shelf, depth, bathymetry. . . How does this shelf compare with other Arctic shelves or is the Wandel Sea rather a glacial inlet or so rather than a shelf? From the maps provided in the paper, I don't get a sufficient idea of the relevance of this region beyond the local scale. However, since the aim is clearly to connect the region with upstream and downstream conditions as well, a more comprehensive introduction might help. A stronger formulation of scientific objectives is needed, rather than to "...investigate the vertical CTD profiles. . ." (lines 66-67).

Results: the results are difficult to follow. In particular the clustering is somewhat confusing and not obvious why this is done. Perhaps a better organization into subchapters might help, with section titles that help the orientation. The introductory sentence for the clustering is given in lines 197-199, but may be better before the clusters are introduced. Are all 5 clusters needed for the paper or could the paper do with less for a better overview? There are 5 clusters and 3 regions defined and I wonder if this is necessary. From the map I cannot distinguish between an outer shelf and a mid-shelf region (regions 1 and 2), but perhaps I am just confused by the terminology that is more commonly used for larger shelves. What is the connection between the two regions that are summarized in cluster 1? Perhaps Figure 7 might be better placed at the

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beginning of the cluster presentation rather than at the end.

Ocean glacier interaction subchapter: Would an estimate of glacial melt due to glacier-warm water interaction be not as interesting as calculating salinity differences considering the high interest in Ocean-glacier interaction?

L389: Upwelling over the continental slope: Seems random. What kind of upwelling, was upwelling documented before, and where is the Wandel Sea continental slope with respect to your study region?

Figures: Map: A map showing topography and stations on a regional scale might help to put the region into a better context. Figure 1 is good to have for the large-scale circulation, Figure 2 shows where glacier and polynyas are located, Fig.3 shows the ice conditions during the survey, but the reader has no idea what the greater region looks like, i.e. where is the continental slope that is mentioned in the text. Shelf-slope interaction is one focus of the paper, but not clear to me where this takes place.

Fig4: In my opinion this figure is too busy. There are too many lines in there with colors that are not immediately distinguishable. I would strongly suggest to try to make this more user-friendly. Perhaps only show mean profiles rather than the whole bundle, or remove those profiles that are not absolutely necessary. Understanding this figure requires multiple readings of the captions which distracts from the text. Same problem with some of the other figures.

Fig5: Somehow the different dashed lines are confusing and by the time I read through the caption to identify what the different lines indicate I forgot what the figure is supposed to tell us. Could this be made more user-friendly? Also, the box refers to Fig6, not Fig 5.

Fig7: How are the clusters related to regions? That part seems confusing. Is there a continental slope that can be displayed in this figure to show where potential interaction with ambient waters could take place?

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Fig8: I would suggest to reduce the information displayed to a minimum. A paper that requires a detailed study of each figure caption in order to understand the figures quickly becomes unattractive for the readers. Perhaps show either the mean or just the 21 April profile. Details or differences between the two are not discussed in the text anyway. . .

Minor comments: L89-92: Locations are not shown in a map, therefore it is not clear where these stations are and why they are used

L91: “meridian” is not needed

L136-138: were those the “normal” ice conditions?

L141: as a result of ice melt and glacier runoff. Can you provide more details at least qualitatively which of the two is more important?

L167: dotted line is very difficult to see

L171: this sentence kind of downgrades your analysis, perhaps mention why it is still worthwhile to do here. . .

L175: . . . were subdivided into clusters. . . Why? I think an explanation is needed here on why the data are subdivided and what one is hoping to learn from this

L283: “water dynamics”. . . I would just say “currents are too weak”

L289: insignificant sub glacier freshwater discharge. Is it really insignificant? It sounds more important when you talk about it earlier. . .

L298: heat conduction into the glacier: are there more details regarding this subject, or papers that deal with this? Seems a bit random there. . .

L337: 4.2 interaction with ambient water from the continental slope. . . interaction of what? Incomplete title. . .

L404: is pers. communication from a co-author the correct referencing?

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