

Ocean Sci. Discuss., referee comment RC1  
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## Comment on os-2022-13

Anonymous Referee #1

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Referee comment on "Hydrography, circulation, and response to atmospheric forcing in the vicinity of the central Getz Ice Shelf, Amundsen Sea, Antarctica" by Vår Dundas et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2022-13-RC1>, 2022

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Dundas et al. combine mooring observations near the central Getz Ice Shelf with a regional model to study the processes that regulate time variability of heat transport toward the ice shelf. They show that atmospheric forcing (winds) and sea ice located over the wider continental shelf and shelf break of the Amundsen Sea regulate temperature and velocity changes at the front of the central Getz Ice Shelf. The manuscript is interesting and the statistical analysis mostly appropriate. However, after reading carefully, the message of the manuscript is not very clear (to me at least). It is not clear how the wind stress regulates the ocean heat flux. Is it the wind over the Amundsen Polynya, at the shelf break, or over the eastern Amundsen Sea? How do velocity and temperature respond differently to winds and why? What about sea ice? In general the connection between winds and ocean heat flux needs to be better explained. For example, if the heat flux is dominated by the velocity, the authors could focus on the velocity. The connection between shelf break and coastal currents is very intriguing, but again it needs to be clearly stated since early in the manuscript. The title might also be changed to reflect the atmospheric forcing on heat flux toward the Getz Ice Shelf (also because you combine obs and modelling, not only moorings...). Below are some minor comments.

### Minor Comments

- Line 56-61: is there any reference describing the undercurrent behaviour in the Getz region? If not, I would avoid including this in the Introduction. You could provide more details later on based on the model you are using.
- Figure 2d: could specify in the legend that solid means obs and dashed means model?
- Line 107: do you mean the multibeam-based bathymetry? As the model is using

IBCSO.

- Line 118-119: Can you say something more about what you mean by “since the sea-ice movement is expected to be small along the coast in winter, we assume little loss of information”? if sea ice motion is small, then the ocean surface stress is small if sea ice present and the wind stress is dampened.
- Line 122: can you specify what you mean by “surface stress”? is it the ocean surface stress (wind and sea ice) or wind stress?
- Line 132-133: if you apply a band pass filter between 8 days and 10 months, the seasonal cycle is not going to be removed.
- Line 153: have you removed the seasonal cycle to all data? Or maybe here you are not removing the seasonal cycle. If not, please specify. Also, it would nice to clarify in the Methods whether you remove the seasonal cycle throughout the analysis or not.
- Line 169-170: I cannot see in Fig. 4b a tendency for different behaviour in 2016 and 2017. Could you maybe highlight in the text specific events of flow away from the ice shelf? Or maybe the number of “northward flow” episodes in 2016 and 2017 to see if there is a difference.
- Figure 5: Why don’t include 4 panels showing winter and summer correlations in different plots? I am also wondering why you make the distinction between summer and winter after removing the seasonal cycle? Can you clarify? Maybe the reason is that you have not removed the seasonal cycle.
- Line 200: the ASP box is mostly north of the polynya. I would change the name of this box and be clear in the text the you are doing correlations with shelf break surface stresses and not with the polynya region.
- Line 207-213: Could you please clarify in the text (or better in the Methods) how you calculate time changes of the correlation?
- Section 3.1 and 3.2.: It would be nice at the end of these two sections to summarize the main results from observations. In this way the reader can better connect observations with the modelling results in the following section.
- Line 260: do you mean Fig. 7e?
- Section 3.3.3: I think that based on the analysis reported by the authors it is difficult to make strong conclusions on advection/waves. I would stress that you see coherent changes between the mooring location and the continental shelf with a few month lag, suggesting advection. Plus you can say few words on waves as potential mechanism, give also the recent results from Steiger et al. (2021), but no definitive conclusions (probably more appropriate for the Discussion).
- Line 287: westward wind anomalies causing westward current anomalies shouldn’t imply a positive correlation?
- Line 312-315: The absence of meltwater at GC<sub>6</sub> does not imply that MCDW cannot melt the ice shelf as the meltwater outflow is presumably located somewhere else. I would say something along those lines here.
- Section 4.2. I like this section that summarizes the connection between surface stress and ocean current. Just it is hard to understand how a negative correlation in winter between surface stress and current can arise. I would try at least to provide some speculation regarding this correlation.
- Line 352-356: Please rephrase this sentence as it is hard to follow. You might need to divide it into two sentences.
- Line 359: do you mean Fig. 6a?
- Line 360: I would not call this “local response” as the wind forcing is located on the other side of the Amundsen Sea.
- Line 368-372: which type of waves are you referring to? Please specify.
- Line 420: I would rephrase “medium time scale”.