

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-125

Anonymous Referee #2

Referee comment on "Annual evolution of the ice–ocean interaction beneath landfast ice in Prydz Bay, East Antarctica" by Haihan Hu et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2022-125-RC2>, 2022

Landfast ice is one of the important components of Antarctic sea ice. Its growth and decay processes are closely coupled with local climate and affects local ecosystems. Due to the effect of tides, the ocean heat flux under the landfast ice is very important for the growth and decay of sea ice, and has the multi-scale characteristics of temporal changes. Therefore, it is of great significance to simultaneously carry out the observations of the landfast ice mass balance and the underneath ocean process. However, there are still no (to my knowledge) relevant observation and research been carried out in the Prydz Bay, East Antarctica.

In this study, an observation system of landfast ice and underneath ocean processes close to the shore off Zhongshan Station, Prydz Bay, East Antarctica, has been preliminarily established. Based on the observed data, the ocean heat flux under the ice has been parameterized, and the adjustment of tidal processes on the ocean heat flux has been analyzed, as well as the impact of the latter on the rate of sea ice growth and decay. It is a research achievement worth publishing. However, there are still some problems in the analysis and expression of the paper at present. Thus I recommend that the paper could be considered for publication after major revision.

General comments:

- The author only gives the observation data of less than 10 days, so the representativeness of the data and whether the corresponding analysis result is robust are most worthy of discussion. If possible, the author is strongly recommended to provide longer observation data series to support the research conclusion
- The growth and decay process of landfast sea ice is very sensitive to water depth. In this study, three observation equipment were not installed together. Although they were not far apart, the water depth was quite different. Therefore, how to judge the impact needs further discussion. Or it is necessary to further analyze the difference of

sea ice thickness time series at the three measuring sites.

- Limitations, errors and uncertainties of measurement and parameterization methods also need to be discussed, which are missed now.

Special comments:

- Line 28, "As a structural part of the polar ecosystem", what is the meaning of structural part here.
- Line 36 "Fast ice" use the consistent terminology pls.
- Line 99 "at an accuracy of ± 0.0625 ", This is the resolution, not the accuracy. Its accuracy is 0.1 .
- Line 102 "The records showed that snow and ice thickness was 0.045 m and 0.440 m on 16 April, while 0.020 m and 0.460 m" The measurement accuracy of snow and sea ice thickness is 0.01 m, so three decimal places are unnecessary.
- Line 115 "with a maximum of 4.24 between" similar as Line 102. One decimal place is enough. Similar problems can be identified somewhere else.
- Line 124, "However, after the 21 April, there was a decrease in the thickness of the landfast ice, with basal melt accounting for nearly 2 cm." The accuracy of SIMBA data in identifying sea ice bottom is 2 cm, so the uncertainty of melting of 2 cm here is relatively large.
- Line 144 "The diurnal anomalies based on the according daily mean." change to "The deviation relative to the according daily mean."
- The paper has given a lot of equations, and these formulas are very basic for both ocean and sea ice physics. Therefore, I suggest that only references should be given, and it is unnecessary to list them all.
- The estimation uncertainty of ocean heat flux by the residual energy method is very dependent on the calculation time interval, and there would be large errors for high-frequency calculations as shown in Figure 9.
- Line 280 "the height of the mixing layer temperature above freezing point" change to "the deviation of the mixing layer temperature above freezing point".
- Line 292, here miss the start for u as the superscript.
- 11, can be combined with the Fig.10.
- The influence of tides in the study area on sea ice growth rate has been observed and analyzed, which can be referred to:

Lei et al., A New Apparatus for Monitoring Sea Ice Thickness Based on the Magnetostrictive-Delay-Line Principle, Journal of Atmosphere and Oceanic Technology, 2009.