Respond to Reviewer #2

A) General comments:

1)   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.

Authors' answer: Thanks for the reviewer's suggestions. We have extended our time series to the entire observation period, from April to December, although there were several interruptions during the period. For example, the instruments failed to work for 20 days at the end of April due to improper operation, which was caused by battery exhaustion.

We recognized the problem of the short data in the original article, so in the revised manuscript we extended the time series. Although there were data interruptions in several months, the new results of the analysis are still attractive, and the annual variation characteristics of each element are given, which is of great significance to the study of the ice-sea interaction along the Antarctic coast.

2)   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.

Authors' answer: Thanks for the reviewer's comments. When we deployed the instruments, we tried to put them in the same location, but we failed to make it because of a problem with the power system. However, this became an opportunity to see what happened to sea ice growth and sea water temperature changes when the water depth is different. The Discussion section will discuss the potential influences caused by different water depths.

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

Authors' answer: Thanks for the suggestions. Indeed, many previous empirical formulas are quoted, and there are differences in different parameterization schemes. For the longer time series of oceanic heat flux calculation, we consider the equations of different parameterization schemes given by different predecessors, and it is also proved that the results are different, so we retain these results in the revised manuscript and let readers understand the differences of different equations. These analyses will be presented in the new Discussion section.

B) Specific comments:

Line 28, "As a structural part of the polar ecosystem", what is the meaning of structural part here.

Authors' answer: This was a writing error and is corrected in the revised version.

Line 36, "Fast ice" use the consistent terminology pls.

Authors' answer: Thank you for your suggestion. We will unify the terminology in the article and change "Fast ice" to "Landfast ice".

Line 99, "at an accuracy of $\pm 0.0625℃$", This is the resolution, not the accuracy. Its accuracy is 0.1℃.

Authors' answer: Revised.

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 0.01m, so three decimal places are unnecessary.

Authors' answer: Thank you for your comments. In the revised manuscript, we will further confirm the observation accuracy of various instruments and carefully retain the decimal places of different data sources.

Line 115, "with a maximum of 4.24°C between" similar as Line 102. One decimal place is enough. Similar problems can be identified somewhere else.

Authors' answer: Revised.

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.

Authors' answer: Thanks for the comments. The sensor spacing of 2 cm limits the observation accuracy of SIMBA, we tried to smooth the data to reduce the uncertainties. The 2 cm melting at the bottom identified by SIMBA was also confirmed by the results of drilling observations in the same period, therefore we can confirm the 2 cm melting was believable.

Line 144, "The diurnal anomalies based on the according daily mean." change to "The deviation relative to the according daily mean."

Authors' answer: Revised.

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.

Authors' answer: Thank you for your comments. In the revised manuscript, we will integrate and simplify the calculation formulas of the two methods, and give the corresponding references.

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.

Authors' answer: Thanks for the comments. We realized that there are large uncertainties in the calculation using the residual energy method, and we compared these results with parameterization methods.

The oceanic heat fluxes calculated by the two parameterization methods also showed different

results. In the revised manuscript, we will also explore and discuss the uncertainty of the calculation results of various methods.

Line 280, "the height of the mixing layer temperature above freezing point" change to "the deviation of the mixing layer temperature above freezing point".

Authors' answer: Revised.

Line 292, here miss the star for u as the superscript.

Authors' answer: Revised.

11, can be combined with the Fig.10.

Authors' answer: Thanks. We will redraw all the illustrations in the article to complete the missing tags and use color-vision deficiency-friendly and perceptually uniform colors to make the presentation of the figures more perfect.

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 Magneto strictive-Delay-Line Principle, Journal of Atmosphere and Oceanic Technology, 2009.

Authors' answer: Thank you for your recommendation. We will cite this paper as a reference in the new version.