Response to RC1

Thank you for your time and constructive comments on the manuscript "Seasonal and interannual variations in the landfast ice mass balance between 2009 and 2018 in Prydz Bay, East Antarctica". We would consider each comment carefully and incorporate practically all of them in the revised manuscript.

Major comments

What does the negative F_w mean as shown in Figure 7? In general, the ice base temperature is higher than the sea water temperature, which indicates the positive F_w. Does the significantly negative F_w occurred in DS2015 and DS2018b mean the existence of supercooled water? Or is it just a modelled error? How large are the modelled errors for heat flux components? If it is difficult to quantify these errors, the uncertainties of modelling results should be discussed at least.

Reply: The oceanic heat flux in Figure 7 is derived from the heat flux residual method, and its minimum, sometimes negative, usually occurred in late September or early October near ZS (Lei et al., 2010; Yang et al., 2015). Given that the nearest glacier, Søsdal Glacier, is about 12 km south of DS and in the absence of simultaneous oceanic measurements, we cannot ascertain that the significantly negative F_w in DS2015 and DS2018b originates from supercooled water. These small negative F_w can also be partly attributable to the potential estimation uncertainty (1-2 W m^{-2}, Lei et al., 2014). To address this still open issue, we recommend to combine the observation of under-ice turbulence in the future to improve estimation accuracy of ocean heat flux and clarify whether there will be a negative value really associated with supercooled water. In the revised manuscript, we will add some relative discussions.

Ref.: Lei, R., N. Li, P. Heil, B. Cheng, Z. Zhang, and B. Sun (2014), Multiyear sea-ice thermal regimes and oceanic heat flux derived from an ice mass balance buoy in the Arctic Ocean, J. Geophys. Res. Oceans, 119, doi:10.1002/2012JC008731.

I realize that this study provides abundant helpful information about LFI evolution based on observations. However, these findings are not well summarized. I would suggest the authors to add a sketch map to summarize the key findings and related mechanism, especially for describing the critical factors/ thermodynamic processes that are responsible for the LFI variabilities.

Reply: Good suggestion. A sketch map is very helpful to summarize the findings. We will add a sketch map in section 5 to compare the characteristics of LFI near ZS and DS, and also point out the critical factors and thermodynamics processes that are responsible for the LFI variations.

Specific comments:

Figure1: the expression in Figure 1(a) could be easily misunderstood. The whole Antarctica and the study region in east Antarctica should be given separately.

Reply: To avoid misunderstanding, the map of the Antarctica and the study region in Figure 1a will be separated and given as two panels.

Table2: add a column to present the type of buoys.
Reply: We think you are referring to Table 1. We will add the type of IMBs to this table as your suggestion.

An additional table is needed to summarize the observed variables of each buoy, and give the corresponding key technical specifications (e.g., precision, uncertainty, measurement range).
Reply: The technical details concerning CRREL-IMB and SIMBA as well as the key technical specifications of the observed variables for these two types of IMBs can be found in Richter-Menge et al. (2006) and Jackson et al. (2013). For easy reference, we will add a table S1 in the supplement to summarize the above-mentioned information.

What does vertical red bars represent in Figure 6b and Figure 9d?
Reply: The red lines in Figure 6b and Figure 9d represent the isotherm at −5 °C, which is defined as the threshold temperature of the potential percolation phase transition (Golden, 1998). As the diurnal cycle in air temperature becomes more outstanding since late September, which could further affect the upper sea ice, the −5 °C isotherms start to cluster together and look like red bars. To avoid misunderstanding, we will optimize these two illustrations in the revised manuscript.