

Response to RC1

Thank you for your time and constructive comments on the manuscript “Estimation of duration and its changes in Lagrangian observations relying on ice floes in the Arctic Ocean utilizing sea ice motion product”. We would consider comments carefully and incorporate practically all of them in the revised manuscript.

Comments:

This manuscript is interesting to me, in which the ideal deployment locations in the central Arctic Ocean for ice camp or buoy have been discussed by using SIM product, and the main standard is to ensure that Lagrangian observations can last a period as long as possible. The logic and structure of the manuscript are ok for me, but I still suggest the authors should address the following issues.

(1) L66, “The Arctic sea ice is mainly driven by wind and oceanic current stresses”. Maybe you mean the drift of Arctic sea ice or sea ice dynamics is driven by....

Reply: Yes, we will revise this sentence to “Arctic sea ice dynamics is mainly driven by wind and oceanic current stresses”.

(2) L73-77 tell the motivation of this study. But I am not sure if there is any similar study on this topic? From the statement here, this study is the first one considering the ideal deployment location in Arctic Ocean.

Reply: We will consult more literature to confirm if similar studies have been done before. Meanwhile, in the introduction, we will also provide a broader overview and summary of the main achievements of previous studies in related work.

(3) The content in the introduction section is a little confusing. What exactly you want to summary in this part? Sea ice dynamics? Pervious ice stations? Or something else?

Reply: Thank you for pointing it out. Actually, what we want to emphasize is history and challenges of long-term observations based on ice camps or buoys, as well as the importance of identification of ideal deployment areas to ensure continuity and effectiveness of observations. We will further improve the relevant expressions.

(4) L110. The definition of the rectangular area in Fig.1 is still somewhat arbitrary to me. Maybe you can put the EASE-Grid as the background and then select some from all of them. “The reasons for this diagnosis will be given later.” Please specify where you have discussed this problem.

Reply: Thanks to your suggestion. To specify this definition to avoid any arbitrariness, we will add the description of the selection of rectangular areas with the EASE-Grid grid as background. The detailed reasoning for this selection is discussed

in [lines 211-214](#), and we will revise these sentences to make the explanation more explicit and accessible.

(5) [Section 2.3](#). If the ice floe is broken into pieces during drifting, is there any impact on the calculation of the survival time (ST)?

Reply: In reality, the breakup of an ice floe during drift certainly has an effect on survival time. However, in our calculations, we cannot be judged when and where the ice floes break up using the sea ice motion product. In this study, we mainly use sea ice concentration (SIC) and exclusive economic zone (EEZ) boundaries to determine survival time. We have already explained such limitations of this study in [lines 518-522, 525-530](#). Based on our analysis and diagnosis, we wish to identify potential ideal areas for buoy or ice camp deployments. In actual operation, the operating time of buoys or ice camps also depends on the breakup or collapse of the ice camp or buoy and its supporting ice floe, the formation of melt ponds and the intrusion of polar bear, etc. Therefore, what we infer should be the maximum potential survival time. However, we also argue that such analysis is still necessary for the selection of deployment areas for buoys or ice camps, especially when we hope to obtain longer observation time series.

(6) [L197](#), “FDD(TDD) refers to the integral of near-surface air temperatures below...”. What kind of air temperature? hourly average or daily average?

Reply: We use the daily average air temperature for the integration of FDD and TDD, which we will clarify in the manuscript.

(7) [Section 3.2](#). Air forcing such as temperature and long-wave radiation have been investigated here. How about the precipitation? Snowfall poses an important impact on sea ice growth and decay.

Reply: Thanks for your suggestion, we will add some discussions of regional differences of the precipitation and snowfall and their influence on sea ice growth or decay.

(8) [Section 3.3](#). The ice-wind speed ratio in [Fig.8](#) is also overall lower than the typical values in free-drift analytical solution. You can also discuss this difference, maybe relating to sea ice concentration.

Reply: Thank you for the suggestion. We will further discuss why the ice-wind speed ratios are lower than typical values in free-drift analytical solutions, which are likely related to sea ice consolidation.