Review of "Estimation of duration and its changes in Lagrangian observations relying on ice floes in the Arctic Ocean utilizing sea ice motion product"

The paper focuses on improving Arctic Lagrangian observations by analyzing long-term sea ice motion data (1979-2020). The study evaluates suitable deployment zones for ice camps and buoys by using sea ice motion products and incorporating atmospheric circulation patterns like the Arctic Oscillation and Arctic Dipole. The authors highlight the declining survival time of ice floes and the increasing challenges for Lagrangian observations due to climate change. This research is highly relevant, given the rapid transformations in Arctic sea ice dynamics and the growing need for precise observational data for climate modeling. By integrating trajectory simulations with EEZ constraints, the study provides actionable insights for future observational campaigns.

I appreciate the exhaustiveness of all sea ice thermodynamic and dynamic throughout the manuscripts. However, I have several concerns regarding the Area Of Insterest (AOI) , the methodology protocol, and some logic explanations. Therefore, I recommend that the paper undergo major revisions before it can be considered for publication.

General Comments:

1. I realized that the aim of the work is to provide the reference for the ideal deployment locations in the central Arctic Ocean (in Line 73), but I don't understand why author choose the starting points region just within the rectangular area instead of within the EEZ boundary since EEZ anyway is devided into BG and IPD? So, I am not sure the motivation, is it just want to find the ideal depolyment region within the rectangular only?
2. Data and method part: How do you interpolate the 25 km ice motion when employing Lagrangian methods, linear or inverse distance weighting? Do you apply the Lagrangian method from start to end without any regridding during the period? How do the results compare to a semi-Lagrangian approach?
3. The validation of buoy trajectories seems to focus on data after 2014. Are there additional buoy datasets available from earlier periods? If not, are the selected buoys representative and exhaustive for this study?
4. Another interesting point to explore could be backtracking trajectories instead of forward tracking. For trajectories with >9 months survival time (ST), does the backtrack reveal that their starting points are mostly within the rectangular AOI? This may provide valuable insights into uncertainties and trajectory origins.
5. When using 2m air temperature for calculating Freezing Degree Days (FDD), how was the daily value derived - was it simply a mean of hourly data? Providing clarity on this calculation is crucial for reproducibility. How about the bias in ERA5 temperature.
6. I am more interested in Figure 5, which is more pratically in the future. Shouldn't you further add more recommendation on the depolyment for the future based on the 2007-2020 analysis (and also, could you longegate the time span from 1979-2023), and further make some uncertainties or high-recommend and midiate-recommend about the region? Since now for me, the all materials somehow distract me about the whole movitation. Incorporating uncertainty estimates and differentiating regions into high-recommendation and moderate-recommendation zones would greatly enhance the practical utility of the paper. As it stands, the extensive materials somewhat distract from the core motivation of the study.

7. Section 3.3, I'm not sure how much information related to the motivation can ge obtained from here, please considering make them concrete.
8. Section 4.1 requires further elaboration. In particular, I recommend adding an uncertainty analysis or sensitivity test to strengthen the robustness of the findings.
9. I don't fully capture the Table 1 concerning its physical mechanism, first of all, how to understand the autumn CAI only have the obvious significant correlation with longitude in BH, but more correlated with both IPD and IPD/BH in latitude.

Specific Comments:

Line 23: change to "as the sea ice thins"

Line 117: use "optimal" instead of "most optimal"

Line 308-309: I am not sure about the statement since we don't know the casuality between ice motion, wind circualtion, near surface ocean current/stress. It is truly that sea ice motion, wind speed, ocean surface stress increase with climate change, but correlation doesn't give us some ideas in who is the trigger and who is the influencer. Could you provide more evidence.

Line 347: "form" to "from"

Line 393-395, can you explain why?