The SDUST2024MSS_AO model presented in this paper, based on CryoSat-2 SAR altimeter data, showcases an innovative waveform feature optimization method that improves the resolution and accuracy of the Arctic Ocean mean sea surface model. The dataset, with a long-time span (2010-2023) and high resolution (5 km), provides valuable support for climate change research. While the dataset quality is high, the discussion of error estimates and sources of bias is limited, and there is insufficient analysis of waveform retracking errors from CryoSat-2 data and the impact of melt ponds. The paper is well-structured with detailed methodology, but some aspects, particularly error analysis and data bias, need further refinement. Overall, the paper provides strong support for dataset publication but requires revisions and additions:

1. In Line 47, "MODIS" is used as an abbreviation. It would be helpful to spell out the full name of the acronym the first time it appears in the text, followed by the abbreviation in parentheses.

2. In Line 84, the reference period for the CLS2022 model is incorrectly stated as spanning from 1993 to 2021. The correct reference period is from 2002 to 2020. Additionally, the data used in the CLS2022 model does not include T/P, ERS-2, GFO, Envisat, or Sentinel-3A. Please verify and correct this information.

3. In Lines 88-89, the reference period for the DTU21 model is incorrectly stated as spanning from 1993 to 2020. The correct reference period is from 1993 to 2012. Additionally, the data used in the DTU21 model does not include ERS-1, ICESat, Geosat, or Sentinel-3A, but does include SARAL/AltiKa. Please verify and correct this information.

4. The UCL2013 model is outdated. Please consider using the more recent MSS model, mss_sio_32.1, instead.

5. In Lines 120-127, a more detailed analysis of the characteristics and differences of these 14 waveform features is needed. This will allow for a clearer comparison and understanding of their individual properties.

6. In Line 130, could you clarify why selecting the appropriate features and thresholds for lead detection is crucial? A brief explanation of their impact on detection accuracy would be helpful.

7. In Line 132, could you explain why the method combining mutual information and the F1 score was chosen? Providing the rationale behind this selection would be beneficial.

8. In Line 136, each parameter in the formula should be explained in detail, as should the parameters in the other formulas throughout the paper. This will help readers

better understand their significance and application.

9. In Line 165, could you provide a clearer explanation of what is meant by the "gridded approach"? A brief description of this methodology would help readers understand how it is applied in the context of this study.

10. The results presented in this paper should be discussed and analyzed in greater detail, particularly those shown in Table 1, Table 3, and Figures 4 and 5. A more thorough interpretation of these results would enhance the paper's clarity and depth.

11. In Figure 4, why is the F1 score for the 14 waveform features not provided? Additionally, could you clarify what the horizontal coordinate represents in the figure?

12. The different MSS models discussed in the paper (e.g., DTU21, CLS2022, and SDUST2024MSS_AO) have different reference periods, which may affect the comparability of their results. Specifically, DTU21 covers 1993–2012, CLS2022 spans 2002–2020, and SDUST2024MSS_AO covers 2010–2023. The paper does not adequately address how these temporal discrepancies are handled to ensure that comparisons between the models are valid. A clearer explanation of how to manage these time variations is necessary.

13. There is mention of discrepancies in model results due to differences in data coverage, such as the lack of CryoSat-2 data coverage north of 81.5°N. While this is a valid concern, the paper should discuss the extent to which these gaps in data coverage may affect the overall model accuracy, particularly in the central Arctic.