

Comment on **essd-2022-178**

Anonymous Referee #1

Referee comment on "SDUST2020 MSS: A global 1'×1' mean sea surface model determined from multi-satellite altimetry data" by Jiajia Yuan et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-178-RC1>, 2022

Mean sea surface(MSS) has important applications in geodesy, geophysics, and oceanography. The manuscript constructed a new global MSS model SDUST2020 with the resolution of 1'x1' from multi-satellite altimetry data, and evaluated its accuracy using several methods. Comparing with previous MSS models, several new altimetry missions and longer time-span data were included for modeling SDUST2020. Generally, it is a good MS and provide a valuable dataset. The results are of scientific sense. I recommend a moderate revision and English expression need to polish. Please find detailed comments on the current MS below.

- Whether the altimeter data were retracked? If so, what retracking method was used? And how coastal altimeter data were treated in this study?
- What's the meaning of $f(t)$ in equation (4) ? It is suggested not to use the same character for different quantities in equation (3)-(5).
- According to the comparison and validation, SDSUT2020 have better accuracy than CLS15 and DTU18. Except the accuracy, is there any obvious improvement to reveal details features of MSS? It is suggested to compare these MSS models in some typical sea regions.
- In section 3.1, T/P series data between 66°S and 66°N were used to calculate ocean variability correction for ERS/GM, HY-2A/GM, SARAL and Cryosat-2 which latitude ranges beyond 66°. It need to extrapolate. How does the polynomial fitting interpolation(PFI) perform to do the extrapolation?
- In section 3.2, for crossover adjustment, did the author set threshold of time difference of two tracks?
- In Figure 6-8, there are large differences in polar regions between MSS models. What's the reason?

Technical corrections:

- Line 22-23: 'sea level contains a variety of variation information about time scale.' should be rephrased.
- Line 36-37: 'are published' ---> were published
- Line 214: 'decimeter magnitude to centimeter magnitude RMS'
- Line 232: delete 'since'
- Line 242: 106m should be -106m.
- Line 378: 'that' ---> those