

## Comment on **essd-2021-183**

Anonymous Referee #2

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Referee comment on "A new Greenland digital elevation model derived from ICESat-2 during 2018–2019" by Yubin Fan et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-183-RC2>, 2021

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DEMs are the basic datasets for digital hydrology, watershed analysis, quantification of remote sensing, glacier change, etc. Compared with the optical stereo images (photogrammetric method) and radar interferometry (microwave band), the DEM data obtained by laser altimetry satellite data has higher reliability, especially for the surface elevation of glaciers and snow cover. In this paper, a new Greenland DEM is derived from ICESAT-2 with a definite time (13 months), which is very meaningful and practical. However, the paper still has many problems, and substantial revisions are required before the acceptance of this manuscript can be recommended.

Specific comments:

- There are some problems with cryosat-2 satellite orbit description in the article. Some parameter values have inconsistencies or errors, please check carefully. For example, "which is a great improvement over CryoSat-2's along-track distance of 1.5 km and cross-track distance of 3 km".
- Each parameter in the formula needs to be defined, but there are no explanations for many parameters in the paper, such as formula (1)-(4). In formula (5), what does "h" mean and how to input its parameter values?
- There is no need to write specific formulas for commonly used parameters in the paper, such as slope and aspect.
- How to use ICESAT-2 laser point cloud data to simulate DEM data at 500m grid scale is the focus of this paper, but the paper does not describe it clearly. How to achieve "To improve ICESat-2 data utilization, DEMs with 1 km and 2 km resolution across all of Greenland and an additional 5 km resolution in southernmost Greenland were used to fill the DEM gaps. Kriging interpolation was used to fill the remaining 2% of void grids that were insufficiently observed by ICESat-2 measurements." And how to get calculated grids and interpolated grids in Figure 6. Therefore, it is recommended to expand the content of section 3.1.
- "We set the minimum number of grid points to 10 and the minimum timestamp to 2 months", are you sure it is 2 months timestamp here? Generally speaking, the revisit period of icesat-2 is 91 days.
- Some descriptions in the paper are not clear. For example, in Figure 4(b) and (d), how

is the elevation uncertainty calculated and which index is used?

- In general, the labels of the figures are arranged in the paper from small to large, please check the order of Figure 4 and Figure 5.
- The structure of the conclusion and discussion section is a bit confusing, please reorganize it. Generally speaking, accuracy verification is part of the results.

Please also note the supplement to this comment:

<https://essd.copernicus.org/preprints/essd-2021-183/essd-2021-183-RC2-supplement.pdf>