

This paper proposed a new 500m DEM over Greenland using ICESat-2 data from November 2018 to November 2019, following the same approach as presented by Slater et.al. (2018). The new DEM is validated with OIB data and compared to existing Arctic DEMs. Results showed the ICESat-2 DEM has significant improvements in accuracy compared with other altimeter-derived DEMs and is also comparable to DEMs derived from stereo-photogrammetry and interferometry. There are three minor revisions as follows:

We thank you for the helpful feedback, these suggestions have significantly improved the text and figures, we are appreciative of your help and time.

- 1、 There are some doubts about the meaning of “grid numbers” in the tables of the article. It's not clear what these numbers mean.

Responses:

“Grid numbers” means the number of compared grid cells, i.e., the number of grids covered by IceBridge data. We have changed the table column name in the revised version.

- 2、 Table 4.2 would be nice to supplement the effect of a 5 km grid, which can be contrasted with Interpolated grids.

Responses:

We compared the grids derived from the 5 km grids, and it performed worse than the 2 km DEM but still showed a better performance than the interpolated grids.

Table R1: Elevation differences between the ICESat-2 DEM and IceBridge data under different DEM resolutions.

Resolution (grid numbers)	MED (m)	MD (m)	MAD (m)	STD (m)	RMSE (m)	R
500m (11186)	-0.09	-0.16	0.60	2.55	2.55	0.9999
1km (6903)	-0.01	-0.04	0.71	2.81	2.81	0.9999
2km (8453)	-1.37	-1.78	2.52	6.34	6.59	0.9998
5km (245)	-0.72	-1.39	6.89	14.18	14.24	0.9998

- 3、 Table 7 shows the comparison of ICESat-2 DEM with the 500 m ArcticDEM. The MED and MD of the ICESat-2 DEM are smaller than those of the 500 m ArcticDEM, but the MAD, STD, and RMSE are all larger than those of the 500 m ArcticDEM. Can we conclude that the new results are better than the old one?

Responses:

ICESat-2 DEM showed significant improvements in accuracy compared with other altimeter-derived DEMs and is also comparable to DEMs derived from stereo-photogrammetry and interferometry.

The MAD, STD, and RMSE are all larger than those of the 500 m ArcticDEM, and it is reasonable that stereo-photogrammetry can generate more consistent elevation

estimations at the regional scale than altimetry. Nevertheless, the ICESat-2 DEM is comparable to DEM and 500 m ArcticDEM when slopes are less than 1° , which occupies approximately 70% of Greenland. In addition, compared to the 500 m ArcticDEM, the ICESat-2 DEM can provide an elevation reference with a definite time stamp, which is essential for further ice dynamics and mass change estimation.