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The Cryosphere Discussions

Interactive comment on "Improved GNSS-R bi-static altimetry and independent DEMs of Greenland and Antarctica from TechDemoSat-1" *by* Jessica Cartwright et al.

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The manuscript is well presented, the study expands and improves a previous one by the same author/s.

A few minor issues:

- What is the difference between Table 2 and 3? (interpolated error and gridded data, what does it mean?). Could these two concepts be clearly explained in the manuscript?

- The Introduction reads: "As stated by Slater et al. (2018), DEMs can help in the understanding of ice sheet hydrology through mass balance calculations, grounding line

thickness, and delineation of drainage basins. These further improve understanding of ice dynamics and potential sea level rise associated with ice sheets.". Which precision is required for DEMs to serve this purpose? Are biases at ten/s of meter level and RMSE at hundred/s meter level sufficiently good for these purposes? (values in Tables 2 and 3).

- Figure 2 and lines 209-212: authors report some relationship between the biases in Figure 2 and topography/terrain slopes. Can they report on potential penetration effects biasing the altimetry over very dry snow –light density of the ice? Cardellach et al., 2012 reported rather deep penetration of GNSS-R signals into Antarctica ice sheet at Dome Concordia. How is this accounted in this study? Only a few sentences are added (page 10, line 209-212), to point that penetration is unknown. However, experimental work with GNSS-R at Concordia Dome (Antarctica) did show large penetration, up to ∼250 m under the very dry/light ice conditions of the area (quite typical of most of Antarctica). Rius et al., 2017 did take penetration into account, reducing the actual geometric path traveled by the signal by considering the slower propagation through dry snow. Would the authors consider a refined DEM with penetration issues accounted for?

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