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Earth System Science Data Discussions

Interactive comment on "An updated seabed bathymetry beneath Larsen C Ice Shelf, west Antarctic" *by* Alex Brisbourne et al.

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General comments: The paper presents addition of seismic point measurements to existing ice column–water column thickness measurements at Larsen C Ice Shelf (LCIS). By measuring the travel times of the ice shelf base and seabed, the ice shelf thickness and water column are calculated. In addition to existing data points and bedmap2, a sub-shelf bathymetric map of LCIS is created.

The paper is well written, clearly built-up, and easy to follow. The method to calculate ice thickness and water column is straightforward and well explained, but certain parts are described vaguely,making it hard to judge the quality of the presented data, such as the p-wave velocity of the ice column and the gridding process.

The bathymetric sub-shelf map of LCIS is a valuable addition to the gap in bathymetric data under Antarctic ice shelves. The data points better constrain the sub-shelf bathymetry such as their key findings show, and improve the modeling of the ocean-shelf interaction. LCIS is probably next in line to disintegrate.

Specific Comments: 3.2/3.3 Seismic velocities/Uncertainties The velocity analysis of the firn/ice column is well explained but a number (or range) for the ice velocity(ies) would be nice. Indirectly this is mentioned at the uncertainty of the ice column thickness, being 3.8m at 1 ms uncertainty, which suggests the ice velocity is 3800m/s. If that is the case I come to half of the suggested uncertainty as the times of reflections are TWTs. To understand the uncertainty of the ice column, velocities of the ice column are essential.

It is not clear if the measurements are corrected for tides, I suspect not. This is important for those shots that do not show no ice base return. With a tidal range of 2 m, I would come to approximately 20m inaccuracy. How many shots do not have this ice base return, one at PRHB4 or more?

Although the error analysis is clearly described and the order of magnitude is correct, the choice of 10m accuracy seems somewhat arbitrary to me. Why not 9m or 13m I wonder?

4 Bathymetric gridding I think it is important here to be clear about the gridding method is used rather then "which is well suited to a dataset with an uneven distribution of data point". It is important to know how you get from data points to the gridded bathymetry map. A reference possibly?

I find the phrasing about the gridding problem at places where the "calculated seabed is shallower than . . ...the ice draft of the Bedmap2 dataset" unclear. Are these calculations ignored or overruled by a deeper seabed? If so it would make sense to mark these data points in map 3 so that we know exactly what data points have been used in the gridding

Figure 1: The text (3.1) and Table 2 mention 30 measurements (14 seismic bathymetry measurements and 16 seismic refraction and reflection surveys). In the figure I see 28 yellow dots (new measurements) and 3 red dots. - How do these 28+3=31 dots relate to the 30 measurements from Table 2? Please explain in the caption or adjust the figure.

Figure 3: Please use another color for the contour lines. They can hardly be made out.

Technical corrections: Table 1, receiver spacing MIDAS: Why an asterisk?

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