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Interactive comment on "Seabed topography beneath Larsen C Ice Shelf from seismic soundings" *by* A. M. Brisbourne et al.

Anonymous Referee #1

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General comments:

The paper presents a very interesting validation of the bathymetry underneath Larsen C Ice Shelf (LISC), derived from the inversion of free-air gravity data, using seismic reflection soundings of ice thickness and seabed depth along some IceBridge flight lines. The scientific interest in LISC grew within the last decades due to (a) significant changes in atmospheric conditions at the Antarctic Peninsula and the related question whether LISC faces the same fortune like former Larsen A and B Ice Shelves, and (b) the awareness of the western Weddell Sea continental shelf being an important source region for Weddell Sea deep and bottom waters, which contribute to the ventilation of the world ocean abyss. The water masses involved in the formation process at the continental shelf break are carrying a strong signal of glacial melt, indicative for chipper

interaction of the ocean with the base of the remaining ice shelves, primarily LISC.

The tools predominately used for studying ocean-ice shelf interaction are numerical models of different complexity. All rely on the data quality of water column thickness and ice shelf draft, which both were quite unreliable in the past. Therefore, the present work is, though not complete, a big step forward towards a better representation of LISC cavity geometry in coupled ice-ocean circulation models. Another aspect of this work worth mentioning is the convincing evidence that cavity geometry derived from the inversion of free-air gravity data has to be handled with care.

I am not a geophysicist/seismologist and, therefore, my evaluation of this work will focus on its benefit for disciplines interested in the physical processes of the western Weddell Sea. This is only a minor part of the paper, but even from this (limited) perspective I recommend publication in The Cryosphere after consideration of the comments listed below.

Specific comments:

L 4178-02: ..and throughout the whole paper the term sub-shelf bathymetry is misleading, since both ice shelf and continental shelf are subject of the investigation. The term sub-ice shelf is more appropriate.

L4180-12: Shepherd et al. (2003) argue that increased basal melting and LISC thinning is rather caused by warmer shelf water on the western Weddell Sea continental shelf than a change in sub-ice shelf circulation.

L4180-25: It comes as a surprise that the paper by Pozdeev and Kurinin (1987) is not listed as one of the seismic surveys which has contributed significantly to the available maps of sub-ice shelf bathymetry (in this case Filchner-Ronne Ice Shelf).

L4192-7: It is a little bit counter intuitive to learn that basal accumulation of marine ice occurs close to the grounding line - normally the locus of strong basal melting. Though there is no doubt that it happens, the authors should state that the accumu-

lation of marine ice might occur in crevasses, which are quite numerous close to the LISC grounding line.

L4193-22: This paragraph is almost redundant with L4194-3 - please rephrase.

Technical corrections

L4188-17: "...visible in Fig.1?? directly east of Marmelon Point)."

L4192-14: "...water column thickness."

Fig. 6: Has to be reproduced as full page.

Reference

Pozdeev, V. S. and Kurinin, R. G. (1987) New data on ice sheet morphology, bedrock, and bottom relief in the southern Weddell Sea Basin, West Antarctica. Antartika, doclady komissii, 26, 66-71.

Interactive comment on The Cryosphere Discuss., 7, 4177, 2013.