

## Response to comment by D. Steinhage (original comments in gray box)

We thank Dr. Steinhage for his useful comments and suggestions which have helped us to improve the paper.

The paper by Luckman and others provides a detailed study of basal crevasses in an Antarctic ice shelf by means of GPR, optical satellite remote sensing, and a fracture mechanical modelling of the height of crevasses. The comprehensive case study on Larsen C Ice Shelf however would benefit considerably by including also radar satellite imagery in addition to the optical ones, because they reveal features below the surface, which are otherwise hidden under the snow cover.

We have studied many radar satellite images of Larsen C Ice Shelf and disagree. Such images may reveal features below a dry snow layer, but we do not think that such observations would enhance this paper or change the conclusions.

Basal crevasses and coincident troughs in the layering at the surface of ice shelves were quite recently discussed by the paper Humbert & Steinhage, TC, 2011. The paper reports similar findings and we recommend an in depth comparison with those results and the explanation for their origin given therein.

When we submitted our manuscript the paper mentioned was in review so we did not refer to it as is normal practice. Now that it has been published we are only too happy to do so.

We would like to mention that Swithinbank (1977) does not deal with floating ice and is thus not a suitable reference.

We admit to this mistake and have removed reference to this paper.

To our knowledge, the study on the evolution of the Fimbul ice shelf showed these structures for the first time.

Given the papers we cite from the 1970s and 1980s, which clearly demonstrate the presence of basal crevasses in ice shelves, we find this claim not to be substantiated. If the comment refers to the surface structures (troughs) which are the expression of the basal crevasses below, then we note that Shabtaie and Bentley made this association back in 1982.

Page 2042/2043: In particular the issue of surface crevasses linked with basal crevasses is of interest. Humbert & Steinhage found no prominent surface crevasses directly above the basal crevasses in high-resolution TerraSAR-X images: "The hyperbolae are clearly not located at the surface, nor is there any hint in TerraSAR-X images that surface crevasses in coincidence with the dark stripes exist (whereas few narrow, short cracks on the sides of the dark strips exist, possibly arising from bending stresses)". Thus, the discussion (p. 2043, l.7) about its origin would benefit from a comparison with these statements, in particular as the spatial resolution of the optical satellite imagery and the radar imagery is considerably different, as well as the radar imagery penetrates the surface.

We agree that this is of interest. However, this is not the focus of our paper and we discuss surface crevasses mainly to demonstrate the distinction in commonly used optical satellite imagery between the signatures of surface and basal crevasses. We have made sure to refer to Humbert & Steinhage where suggested.

Thanks