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Interactive comment on "Basal crevasses in Larsen C Ice Shelf and implications for their global abundance" *by* A. Luckman et al.

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The present paper provides an extensive comparison of the crack depths of measured bottom and surface crevasses and modelled crevasse depth using linear elastic fracture mechanics. The authors name several approaches for the evaluation of the depth of closely and wider spaced crevasses. The choice to take a model for wider spaced crevasses is motivated by radar.

General remarks

The authors conclude from several GPR data series that the width of the basal crevasses is several hundreds of meters (p. 2041) with a height of 100-200m. The LEFM approach following Rist et al. (2002) applied in section two implies the pres-

ence of a sharp (Griffith) crack, where the crack width is much smaller than the crack depth/the length of the flaw. On p. 2047 the authors also mention this requirement, yet not further respect it in the analysis. An aspect ratio of crack width/crack depth larger than 0.1 should not be considered as sharp and therefore the method of Rist et al. (2002) should not be applied in this situation.

On p. 2046 the authors argue that ice can be treated as brittle linear elastic solid in the context of fracture mechanics. This tacitly assumes elastic material parameters, the Young's modulus and the Poisson's ratio, even though they are not explicitly incorporated in the calculation of the stress intensity factors for stress boundary value problems as present in this paper. The assumption at hand of a lithostatic stress state in the ice (p. 2047) is only valid for incompressible materials (Poisson's ratio = 0.5). Literature of Greve and Blatter (2009) or Schulson and Duval (2009) show that ice on the short time scale should be treated as compressible solid with Poisson's ratios ranging from 0.2 to 0.4. Compressible material behaviour demands for a more complex evaluation of the normal horizontal stresses acting to close the crevasses. Fracture mechanical analyses treating ice as compressible solid can be found in Rist et al. (1999) and Hulbe et al. (2010).

Minor remark

With regard to reproducibility of the modelling part of this paper it will be helpful to display (as an equation or a graph) the depth dependent horizontal stress function that leads to the evaluated stress intensity factors in Fig. 6.

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