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The Cryosphere Discussions

Interactive comment on "The internal structure of the Brunt Ice Shelf from ice-penetrating radar analysis and implications for ice shelf fracture" *by* Edward C. King et al.

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I enjoyed reading this paper, and getting an insight into the internal structure of a topical ice shelf. I suspect that most of these comments should be very straightforward for the reviewers to address; my main concern is that the discussion seems a little brief, and there might be some room to consider quantifying some of the properties considered in the Conclusions.

Abstract - seems a little qualitative. Can we add a few numbers in? The ice thickness, for example? Quantify specifically what is meant by thicker and thinner bands of ice?

P2 Line 25 – possibly a little bit of a pedantic request, which potentially can't even be better-specified anyway. . . But might be worth adding the actual date of Halloween just to formalise the onset of rifting?

P2 Line 25 – does the heterogeneity of Brunt Ice Shelf actually make it an ideal place to study rift propagation? Presumably, you'd also want to characterise and compare it through homogeneous ice too - perhaps Brunt is actually too heterogeneous to be useful? I don't think this invalidates the study by any stretch, I just think that a more measured description could be better.

P3 Line 26 – give the manufacturer "Sensors&Software" too, and the model name is stylised PulseEKKO PRO. Also, when were the radar data acquired?

P3 Line 26 – clarify what is continuous about the acquisition mode - e.g., "towed behind a snow mobile, with traces recording continuously." Also, at what speed was the snow mobile towed, since this ultimately dictates the spatial sampling interval.

P3 Lines 1 and 2 – filter parameters required.

Section 4.1. I appreciate that Line 04, Line 05, and Line 62 are so-called because this is the naming convention given by the PulseEKKO, but for the purposes of this manuscript should this be simplified just to (e.g.) Profiles 1, 2 and 3?

What radar velocity was used to depth convert and migrate? Did you take any account of a firn gradient, or was it an average velocity?

P4 L15: Might be worth simply explaining the term 'multiple'?

P4 L30-31: Seems like a slightly irrelevant point? Almost the style of comment one would write to address a reviewer's question!

P5 L10: I agree that the horizontal reflection is likely a brine infiltration front but there are two other compelling observations that support this interpretation. First, the reflection appears in places to cross-cut the firn stratigraphy (where you don't think the

impermeable barrier is present), implying that the reflection represents a hydrological rather than stratigraphic discontinuity. Secondly, the radar signal is vastly attenuated immediately below it, suggesting a transition in an electrically conductive regime. Might be worth dropping this evidence in, in support?

P7 L30: A point of discussion rather than a recommendation here, but is the behaviour of the Halloween Crack rather contradictory to the observed propagation of the Larsen C rift? Rift propagation seemed to be slowed down when propagating through suture zones of marine ice, and accelerated through regions with more homogeneous meteoric ice. For Brunt, you're suggesting that the crack preferentially seeks to propagate through the mélange... Potentially worth a comment on this – it might add another comparative dimension to what (at the moment) reads like a bit of thin Discussion?

P8 – Conclusions. There feels like some speculation introduced here, and some of this might be better placed in the discussion. Can you comment on the absolute or relative temperature, strength and density of the ice in question?

Figures: All of generally high quality, but the captions seem over-long. They contain useful information, although some is already contained in the main text. Cut out the repetition, and shorten their overall length?

Figure 2: Axis labels in elevation profiles will likely be too small to be readable.

Figure 4: You include a Vertical Exaggeration annotation in Figure 5, so why not Figure 4 as well?

Figure 10 (and P7 Line 5): It's difficult to judge the correlation between the data in these figures; there are obviously a lot of lumps and bumps, but when presented like this it's difficult to appreciate their alignment and how well a big elevation bump corresponds to a high backscatter response. Can you derive a correlation coefficient or (possibly even better, as a third panel in this figure) cross-plot the elevation and the backscatter?

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