The Cryosphere Discussions

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Interactive comment on "Airborne mapping of the sub-ice platelet layer under fast ice in McMurdo Sound, Antarctica" *by* Christian Haas et al.

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In addition to the minor points raised by the two reviewers, I would like to add to the comment from RC2 about the accuracy in derived SIPL for different hi. I note that for the thicker SIPL layers ($\sim$4-8 m), assuming a conductivity in the middle of the estimated range ($\sim$1200 mS/m), that the behaviour upon which eq. 5a-c are based does not really hold. The decrease in I with increasing SIPL levels out, and Q shows a slight, increase, comparable to the variability in I (Fig 3). Hence, ha,I has a modest increase as SIPL increases between 4-8m that is comparable to the decrease in ha,Q over the same range. But Fig 6 is very convincing that eq 5b and 5c work. I think this is because the relationship between ha,Q and SIPL is roughly linear over this range, so that 5c remains linear, but would slightly modify the effective value of alpha. It might be that since the

effect is modest, this relationship still works well enough over the range of SIPL. I do note that I'd expect this to reduce alpha for larger SIPL (if I have the direction of the effect correct), which is not consistent with the lower value used for 2013 and 2016, so it seems it is not a large enough effect to make much difference to the empirical fits. However, similar to RC2's question, I wonder if this effect may become important if the consolidated ice thickness varied significantly?

As noted, the effect seems to be unimportant, so I do not necessarily suggest any major changes need be made; ultimately eq. 5c is semi-empirical, and the effect of variability in ha,Q is not so important. However, for these ranges of SIPL and conductivity, neither I or Q vary much (figure 3). This would suggest that the derived SIPL values may have quite large uncertainty. Can you provide some estimate of uncertainty due to the precision and/or accuracy of the instrument for these SIPL thicknesses? Given figure 4a, it seems that for SIPL thicknesses above ∼5-6m, that the SIPL estimate would be essentially indeterminate. Particularly since relatively slight variations in conductivity seem to have as great, or greater effect. Given this, it is perhaps somewhat surprising that the SIPL thicknesses match observations as well as they do (although many of the estimated SIPL thicknesses are well outside the drill hole error bars in Figs 9 and 10). Some further discussion of potential limitations of this method based on this may be helpful to add to the text.

A couple other suggestions (up to authors' discretion):

Figure 1: Might it be better for the green dots to show the total estimated thickness (consolidated + SIPL), or just the SIPL thickness, rather than the apparent thickness (which is not an actual thickness)? A casual reader might look carefully only at this figure, as it provides a clear geographical presentation of the results. I think it would be best if this showed the actual results.

Figure 6: it might be useful to show the full drill hole thicknesses here as well (consolidate + SIPL) so that the scaling factor is more apparent.

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Discussion paper