

The authors would like to thank the referee for the invaluable comments. The following revisions and corresponding replies are made for each comment (in *green italic* font). Also, a revised version of the manuscript is provided as attachment. The replies to comments are as follows, and the revisions are highlighted in the manuscript in **green**.

Reply to comments of Referee #3:

This is an interesting study which analyzes variability between CryoSat-2 and airborne data sets of freeboard from Operation IceBridge and CryoVEx. The analysis provides a useful look at scales of variability between the data sets which considers instrument noise, retrieval errors, and random error sources.

I found this to be a well-written manuscript which provides valuable information useful for comparisons between the satellite and airborne data sets, as well as interpretation of results from the data sets on an independent basis. I just have a few minor comments listed below:

P2 L30: I think it's a misconception to state that the radar penetrates a certain percentage of the way through the snow cover, rather what happens is that the return contains energy from the snow surface, snow volume, and ice surface and depending on the local conditions and tracker used this can lead to a bias in the retrieval of ice freeboard.

Reply: the authors have corrected this sentence to be accurate, as follows: "... the backscattering of radar signal may occur at the air-snow interface, through snow volume scattering, as well as at the snow-ice interface. With dry snow, it is usually assumed that radar signals can effectively penetrate the snow cover".

P3 L27: I believe the bandwidth-limited range resolution of CS-2 also greatly contributes to the low correlation on a shot-to-shot basis.

Reply: the authors agree with the referee's comment. Indeed the range resolution of CS-2 is limited to about 0.23m due to limited bandwidth of 320MHz. This will be a contributing factor of low correlation on a shot-to-shot basis, and the sentence is revised for the sake of completeness. However, with local averaging, the effect of limited range resolution behaves like a random error and should diminish fast. But as investigated by many studies, even with local averaging, the correlation of mean Fr is still quite low with airborne collocating tracks. The authors acknowledge that it should be a factor, but possibly not a major one.

P14 L 7: There was actually temporally coincident data between OIB and ICESat in 2009, however the laser energy of ICESat had degraded substantially by this point to make data potentially problematic for a comparison such as this.

Reply: the authors have made revisions to make the sentence more accurate, as follows: "Since there is no collocating data available between ICESat and OIB, ..."