

Interactive comment on “Interferometric swath processing of Cryosat-2 data for glacial ice topography” by L. Gray et al.

L. Gray et al.

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Author Reply to Reviewer 1

We would like to thank the first reviewer for the careful reading of our manuscript. All the comments are useful and the resulting changes will lead to a better paper. More detailed responses are given below:

The suggestions made by reviewer 1 were described as 'minor', and most were due to poor grammar. The corrections identified by the reviewer will be fixed, and the final manuscript will be proof-read by an experienced editor. As well as the corrections and suggestions for grammar, reviewer 1 also had some technical comments and some related to the illustrations:

C1742

Comment... P3141L18; maybe I will find later in text, but is it worth discussing here how bright targets like crevasses in the amb beam could screw things up in limited areas? Or is this in not a concern.

Answer... As the altimeter is viewing the glacial terrain almost vertically, the normal side-looking backscatter dynamic range isn't applicable. In particular, a 'rough' area, like a crevasse field, won't necessarily be 'bright' in the nadir or near-nadir direction as it would be in an off-nadir, side-looking, geometry. As discussed in the text the main parameters dictating the strength of the return are the footprint size and the local incidence angle.

Comment... P3142L2 where you mention 240 meter range window, it might be good to point out what this maps out to in ground range to give the reader the notion you are going to produce several km scale swath widths.

Answer... The mapping of the total range window (a 'slant range' swath of 240m for our data) to a ground range swath depends on the terrain slope and the local cross-track incidence angle. This will vary for different data takes and in different areas. The wording here will be changed to... 'These values span a total range window of 240m which will translate into a ground range swath typically up to ~5 km. In the latest ESA data release the sampling has been increased by a factor of 2 so that the total swath window for 512 samples has been reduced to 120 m'.

Comment... 3148L8 I don't think a blanket assumption about Greenland slopes applies. For example, supraglacial lakes in Greenland form in regions with substantial slopes (by ice sheet standards). Soften statement a little with "typically" or something like that.

Answer... The cross-track slope limitation applies to the average cross-track slope between the 'main' and the 'ambiguous' regions, which are normally tens of kilometres apart. Local, higher slopes can be recovered by the swath processing technique as long as they are more limited in size. However, the reviewer is quite correct to raise a flag here (the potential of swath processing in Greenland and Antarctica is unproven)

C1743

and the sentence will be removed.

Comments on Figures...

Answer... All the figures will be redone to answer the criticisms below, and they will be saved at 300 dpi (the TCD paper used figures saved at 150 dpi, which wasn't adequate).

Figure 1: Would benefit if you could add a "cartoon" depiction of the beam pattern to show why one beam is ambiguous.

The beam pattern will be added.

Figure 2: use (a) and (b) or Top and Bottom, but not both. I can't distinguish magenta from other colors. Doppler is not really identifiable (only some indistinguishable dots).

This will be fixed.

Figure 3. Thicken plot lines (in my copy after jgging, its hard to distinguish colors).

Figure will be redone to address this problem.

Figure 4. Add units to color bar (easy to do in Matlab). Provide citation or explanation for where topo comes from.

Figure 5. Add units to the color bar.

Figure 7. Add units to the color bar. Heavier fonts.

Color bar etc., will be fixed.

Figure 9. Label y-axis middle plot (e.g., number of points).

Figure 10. Label color bar. Add (lower image) after "simulated power". Here and in the text, it would good to describe "relative" to what (e.g., I assume its not Main relative to ambiguous).

These changes will be made. The dB scale is relative to the maximum value.

C1744

Interactive comment on The Cryosphere Discuss., 7, 3133, 2013.

C1745