

## ***Interactive comment on “King George Island ice cap geometry updated with airborne GPR measurements” by M. Rückamp and N. Blindow***

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This is a nice presentation of an important data set – good job! I only have a few comments/ideas/clarifications that I would like to see and hear more about (sorry, comments are not in importance order, neither in chronological, just random):

1. There are stuff in the section “Results” that should go under the heading “Methods”. I am particularly thinking of : “ Furthermore we added the coast line (taken from Ruckamp et al., 2011) with values of 0 m for the ice thickness except for the airborne surveyed areas. The spatially unstructured data set along the profile was then gridded using the kriging algorithm on a 250 m grid for the ice surface topography  $z_s$  and ice thickness  $H$ . Subtracting the ice thickness grid from the ice surface grid, we obtain a grid for the bedrock topography  $z_b$ . With these data sets we constructed digital ele-

C61

vation models (DEM) for the ice surface and bedrock topography as well as a map of the ice thickness distribution.” This is not results! That is methods and data. . . Please move to appropriate heading.

2. In “Results” section “3.1 Ice thickness map”. Ice volume and area... Could you give some error estimates on the area/volume?

3. In “Results” section “3.1 Ice thickness map”. “The smooth contours e.g. near the Admiralty Bay coast, are an extrapolation artefact.” Could you mark this area in fig? and areas where the data density is poor and the resulting grids is mostly an extrapolation construction? Maybe fade the area out a bit? Quasi transparent? Just so people like me, not familiar with the area, quickly can see where the good data is and where is it maybe a bit more questionable. I also think that is important for modelers - imagine you have some really detailed areas where you reveal rough bed topography well and then you have extrapolated smooth areas. . . that makes a difference.

4. I would find it very useful if you would have plotted the sounded lines on top of the grids. I know it could look a bit messy - but I do think it would help when getting an idea of what is extra/interpolation constructions. Maybe show the gridded area (like a polygon) as well as the taken surface topography area in fig 2?

5. “Results”, “After merging the data sets, we included an already existing ice surface topography data set for the Admiralty Bay available via SCAR KGIS (Braun et al., 2001).” Is there any way you could show where this is in relation to your profiles? Sort of a map showing all the data sources? Fig 2?

6. What is actually the blue line in all the grid figures (4-6)? Coastline? Maybe also change color?

7. “The radar consists of a shielded broadband antenna system with integrated electronics for downward transmission of the 30 MHz wavelet and reception of upgoing reflected waves.” (bottom of p 125). Later (p 127 line7) you write “frequency domain

C62

Butterworth-Bandpass filter from 5 to 30 MHz" - Sounds a bit strange to me to apply a bandpass filter where the upper "limit" is set equal to the center frequency. If it is broadband you cut away loads of the energy? What is the reason for putting the upper limit to 30 MHz - equal to the center frequency?

8. Page 127, Line 14, "The ice surface elevation  $z_s$  was obtained by subtracting the thickness of the air layer derived from the airborne GPR measurements from the measured DGPS height at the GPR antenna". How accurate do you get the ground elevation? Did you do the pick manually or automatic? What is the crossover accuracy over snow? What difference do you get depending on surface type (powder snow, wet snow, ice, stone)? Any risk for bias? i.e. you pick the right point in the returned waveform. For instance if you have a surface return mixing with a near surface return, the waveform you get will differ compared to a return from a single surface return. How do you account for that? Have you flown over different surfaces with known elevation to see what accuracy you get? Not that I think it really matters here just curious. . .

9. P 128 line 26. "The estimated vertical accuracy of the ice surface topography is about  $\pm 6$  cm for the groundbased measurements (a few thousands of crossover check points)." I know I am picky now. . . but is the "surface elevation" relative the "ice" surface? Or relative the "snow" surface? Or relative the "firn"? or what is it? I assume it is the snow surface? Or have you sub tracked the winter snow?

10. There are some error estimates/ideas given - But I would like to have a bit more. . . , especially in the results/conclusion sections. I know it is tricky, and I am not sure there are any good robust methods to really give it on the final interpolated results, but nevertheless a rough idea would be nice. I would guess you have an idea – don't think at this stage it needs to be much more than that.

11. Further. . . you could make a "heavily crevassed zone" map as well? Do you clearly see where there are lots of crevasses in the data?

Again, I think it is a nice piece of work, and I can imagine all the data processing. . . It

C63

doesn't really come through in the paper. . . Most be loads! Ola Brandt

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C64