**The Cryosphere
Discussions**

# Interactive comment on "Bedmap2: improved ice bed, surface and thickness datasets for Antarctica" *by* P. Fretwell et al.

**B. Smith (Referee)**

ben@ess.washington.edu

Received and published: 13 November 2012

Everybody who's done Antarctic glaciology in the last ten years knows Bedmap, and some of us know it too well. There are lots of places where it works well, and lots of places where it doesn't, and experience teaches that if you don't check the data coverage carefully, there's the danger of interpreting a data gap as a smooth spot on the bed. A dozen years of data collection have gradually pushed the old maps out of date, and the introduction of the new BEDMAP-2 dataset is a cause for celebration. The paper under discussion, by Fretwell and many, many others (hereafter Fretwell et omnis, 2012), does a good job of presenting the difficulties in collecting a set of data from diverse sources and deriving maps of bed elevation, ice thickness, and surface elevation from them. Of particular interest are the sections about assigning errors to the

measurements, which I found quite straightforward, given the potential complexity of the subject. There are even some new statistics presented, about the volume, maxima, and minima of the new data set, which point the way towards clearing up some of the debate about the potential sea-level contributions of the Antarctic ice sheets, and suggest where further ice-thickness measurements would be helpful.

I have only minor quibbles with the paper and its presentation. The first is the Topogrid routine used to fit the data. In the test on Scottish STRM data, the algorithm clearly fared best compared to the other options considered, so it seems a reasonable choice. However, the algorithm is fairly complicated and, as implemented in ARC, has a long list of options. It would be worth describing Topogrid in a bit more detail than "based upon a thin-plate spline" and it would be good to detail the options selected to give the best results, both for Scotland and for Antarctica.

Second, the process of generating synthetic data is not entirely clear from the text. Unlike in the BEDMAP-1 paper, the regression coefficients for the thin-ice model are not given here, nor is there a description for how the trough thicknesses for the mountain glaciers were determined. I assume that they were interpolated along the length of the profile from whatever ice thickness measurements could be found, but I can't find where the text say so. It would be good to see 1-2 more sentences describing the thin-ice data, and another two or three about how the profiles were determined.

These points can be addressed simply within the structure of the paper as it now stands, and should not be seen as major faults in the paper. Overall I was quite pleased with the quality of the writing and the thinking behind it, and look forward to using the new dataset for the next dozen years at least.

A few editorial points follow, listed as page:line

Throughout: The word "data" should be treated as plural. See 4309:14, 4309:29, 4313:23.

4311:18– a "bull's eye" is defined only much later in the paper– it would be good to define it here.

4324:23, figure 10. Lumping all the data together here ignores some of the analysis that comes later about the errors in rugged vs. flat terrain. Could the histogram be split into a rugged-bed histogram and a smooth-bed histogram? I think that would show that the errors are large over mountainous beds, and small for flat beds.

4326:3 change "long" to "longitudinal 4330:20 change "high freqencies in" to "short-wavelength"