

## ***Interactive comment on “A new bed elevation dataset for Greenland” by J. A. Griggs et al.***

### **Anonymous Referee #1**

Received and published: 4 January 2013

#### General comments

The paper presents a new compilation of bed topography for the Greenland Ice Sheet. A substantial amount of data has been collected since the last compilation, so this is a timely contribution carried out in a manner that produces a high quality product useful for many purposes. The authors should be commended for the inclusion of grids giving more info on the processing and an error analysis providing important information for the users. As such, I recommend the paper for publication.

The paper does require some minor modifications, however, mostly where the text needs tightening up in some places to make it clearer to the less initiated, I have listed the specific suggestions below.

A general comment relates to the subglacial water routing. Whilst it is good to have a demonstration of the application of the new data, the way it is implemented in this

C2723

paper seems like a bit of an add on. The routes are presented in a very broad scale manner with little detail, when one of the key benefits of the paper is to provide an improved resolution and amount of detail. I would recommend instead that a close up of the water routing for a specific outlet is displayed, and the difference between the routes predicted from the old and new DEMs investigated. This would follow the overall pattern of comparison throughout the paper and would demonstrate why it is important to have better bed topography input into such analyses.

Another general comment relates to the application of the two distance/error relationships to the rest of the ice sheet based on the 2000 m threshold. This requires a big leap of faith that all other outlets have a similar spatial error variability to Petermann Glacier. I am not convinced that this is the case. I would be more convinced if the exercise was carried out for at least one other outlet to demonstrate that this was the case.

#### Specific comments

Author List: Dowdeswell is spelt incorrectly.

p4830, line 10: This sentence is slightly confusing, using “ice shelf thickness” and “floating tongue” for the same thing, please reword.

p 4830, line 19: “changes” - in what? please clarify with further background

p4831, line 1: Give a reference for ice velocity being proportional to the fourth power of ice thickness, otherwise this is a bit of an unqualified statement.

p4831, line 2: What do you mean by estimated velocities? Modelled velocities?

p4831, line 6: what other reasons? This is a bit vague, either mention them or remove these words.

p4831, line 16: give more details of what you mean by changes in “boundary conditions”

C2724

p4832, line 21: changed how?

p4833, line 2: vertical accuracy of which surface?

p4833, line 19, sentence starting “Several ...” is not clear, you interchange “outlets” and “glaciers” – be consistent, probably best to use “outlet glacier” each time for consistency. Use “unsurveyed outlet” rather than “new outlet”. Change “flown” to “re-flown” for clarity.

p4834, line 14: do you mean over outlet glaciers or the whole of SW Greenland?

p4834, line 4834: Change to “It has been flown...” – sounds like the radar is flying itself otherwise!

p4834, line 24: Young et al., 2011 is probably a better reference here than Wright et al., 2012.

Full reference: Young, D.A., A.P. Wright, J.L. Roberts, R.C. Warner, N.W. Young, J.S. Greenbaum, D.M. Schroeder, J.W. Holt, D.E. Sugden, D.D. Blankenship, T.D. van Ommen and M.J. Siegert, (2011), A dynamic early East Antarctic Ice Sheet suggested by ice covered fjord landscapes, *Nature*, 474 (7349), 72-75, doi:10.1038/nature10114.

p4835, line 25: You could add coupled ice-ocean modelling as an application that requires bathymetry too.

p4836, line 4: add (IBCAO) acronym which you use later.

p4836, line 25: Define KMS.

p4837, line 3: add “reprojected and resampled onto the...”

p4837, line 19: this is the first use of the word “postings” and you sporadically use this later on the text. Is it necessary to use this word – it won’t be an overly familiar word to most readers – can you just say 5 km resolution instead?

p4837, line 19: Why did you use a 3 standard deviation filter – was it from trial and

C2725

error?

p4838, line 7: Why was 2000 m chosen as the threshold? Again, was this from a visual analysis or from some quantitative analysis? It would be useful to have the contour plotted on fig 1 so the reader can be more aware of the changeover.

p4838, line 19: rephrase the “ first 100 km of each variogram” to include something about this referring to the separation distance.

p4838, line 24: Why did you choose 2.5 km? It seems a little odd that this number is not a multiple of 1 km.

p4839, lines 5-10: Does this minimum thickness introduce discontinuities anywhere around the margin? You are artificially lowering the bed near the margin, potentially making it up to 50 m lower than the neighbouring ice free topography, which could introduce an unrealistic overdeepening.

p4839, ice shelves section: This method not completely clear on the first read, it could do with some rewording. e.g. line 13: Change to something like : “... was found by combining all GIMP, ATM surface elevation measurements with surface elevation derived from airborne ice thicknesses measurements using a hydrostatic equilibrium assumption”, also “most of each ice shelf area” is not very definitive. line 21: add “Ice shelf thickness was then calculated”.

p4843, line 12: “...confirm its presence...” what is its referring to? the trough or the discontinuity?

p4843, line 19: ...is now seen as...” is a bit colloquial, please reword.

p4843, line 25: remove “potential” this is confusing with hydraulic potential

p4844, line 1: how did you derive the flow paths? More details needed.

p4845, line 4: which “differences” – add more detail from the figure caption.

C2726

p4856, Figure 3: A closer examination of Fig 3 shows that there are a few artefacts in the bathymetry in the area defined by the red box and also south of Helheim Glacier – is this inherited from IBCAO or a result of processing in this work?

---

Interactive comment on The Cryosphere Discuss., 6, 4829, 2012.

C2727