The Cryosphere Discuss., 4, C1196–C1198, 2010
www.the-cryosphere-discuss.net/4/C1196/2010/

The Cryosphere Discussions

Interactive comment on "An improved bathymetry compilation for the Bellingshausen Sea, Antarctica, to inform ice-sheet and ocean models" *by* A. G. C. Graham et al.

S. Jamieson

Stewart.Jamieson@dur.ac.uk

Received and published: 26 November 2010

The dataset generated in this paper is a significant improvement over previous data and will be extremely valuable in providing topographic boundary data for models of ocean and ice sheet/ice stream interactions, and as a starting point for palaeotopographic reconstructions. Models that operate on a basin- or trough-scale in particular are likely to benefit as they seek to understand localised responses to external forcing. However, with higher-resolution models comes a greater sensitivity to small-scale spatial variations present in boundary data and therefore to error in any such dataset. The authors include a clear discussion and table that incorporates the issue of error and the

robustness of their new dataset. However, I feel that although a degree of uncertainty is acknowledged, there is scope for additional quality checking around key features that could significantly impact model outcomes.

In particular, I write to ask about the bathymetry around the northern entrance to George VI trough directly adjacent to the present-day ice shelf front. Here, in the locality of the seam between GLOBEC data and a surface produced by interpolating between 'sub-ice soundings and contour picks' a prominent ridge crosses the trough. Is this ridge a real feature? Initial flowline modelling experiments carried out by my colleagues and I use your data as a base for investigating the retreat of the Marguerite-Bay palaeo-ice stream. Unsurprisingly, we find that the feature becomes a significant topographic pinning point that is difficult to overcome without using unrealistic forcing of sea level and/or temperature. Modelling notwithstanding, my feeling is that the feature is not real. Can you confirm this? If so, can you update your maps in this locality?

Possible options for the presence of the ridge might include: 1) It is real, with a geological or glaciological origin, and therefore its inclusion in the dataset is justified. 2) It is the product of having only 2 data points in the sub-shelf data near the present ice shelf front, and therefore your method needs modified locally to avoid introducing error. 3) It is an interpolation artefact that occurs when you join the sub-ice data to the wider bathymetric data in the latter stages of the creation of your dataset, and therefore your method for merging datasets needs tuned. 4) It is the globec data that contains this feature, and its presence in that dataset requires investigation.

A very similar feature was present on the floor of the Lambert trough, East Antarctica, in the original BEDMAP data (Lythe et al., 2001) and is believed to be erroneous (Galton-Fenzi et al., 2008). It has since been removed in the production of the ALBMAP version 1 dataset by locally reinterpolating any data below sea level that was above -600 m depth using a kriging method (Le Brocq et al., 2010). Such an approach might be well-justified in the case of George VI trough, and the use of the same method might further ensure a unified approach to such artefacts is taken. Thus, when continent-

TCD
4, C1196–C1198, 2010

wide datasets are constructed from a series of smaller datasets such as yours, there would be a clear understanding of the derivation of the data in areas where processing artefacts exist.

References:

Galton-Fenzi, B.K., Maraldi, C., Coleman, R., and Hunter, J. (2008). The cavity under the Amery Ice Shelf, East Antarctica. Journal of Glaciology, 54(188), 881-887.

Le Brocq, A.M., Payne, A.J., and Vieli, A. (2010). An improved Antarctic dataset for high resolution numerical ice sheet models (ALBMAP va). Earth System Science Data, 2, 247-260.

Lythe, M.B., Vaughan, D.G., and the BEDMAP Consortium (2001). BEDMAP: A new ice thickness and subglacial topographic model of Antarctica. Journal of Geophysical Research-Solid Earth, 106(B6), 11335-11351.

Interactive comment on The Cryosphere Discuss., 4, 2079, 2010.