

Interactive comment on “Full-fit reconstruction of the Labrador Sea and Baffin Bay” by M. Hosseinpour et al.

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Interactive comment on “Full-fit reconstruction of the Labrador Sea and Baffin Bay” by M. Hosseinpour et al. K. Gohl (Referee) karsten.gohl@awi.de Received and published: 27 August 2013

General comments This paper presents an outstanding study of reconstructing rift motions of the conjugate margins of Greenland and North America. The authors’ main method is the usage of a crustal thickness grid derived from gravity inversion and checked against seismic constraints. Based on their best-constrained and interpreted COB and extent of the COT, they went through various cases of crustal characteristics to find the best closure fit. The method, which had already been well tested with the Australian-Antarctic margin pair, is absolutely sound, their reconstruction results

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are very convincing, and the paper and figures are extremely well lined out and prepared. I would not say this if there were not the modelling results from recent seismic refraction work in the Davis Strait and Baffin which are – in most aspects – consistent with their preferred model. The authors need to cite this prior work by Suckro et al. (2012), Funck et al. (2012) and Suckro et al. (2013) in more appropriate places in the text and figure captions. Also missing are references for used Moho depth constraints of W Greenland and E Canada. Some useful data and models seem to be ignored (e.g. Gohl & Smithson, 1993). I highly recommend this paper to be published and would recommend only minor revisions.

Specific comments 1. p. 922 lines 24-28: Cite also Suckro et al. (2013), because of their refraction and gravity model also infers mafic intrusions near the UFZ which can be related to the plume event.

Answer: Added.

2.p. 923 lines 6-14: Cite also Suckro et al. (2012). They demonstrate clearly the nature of the S Baffin Bay crust as being oceanic and show the difference in character of the margins on either side of the bay.

Answer: Added.

3.p. 924 line 15: Cite also Suckro et al. (2013) with the most recent seismic results on the nature of the Davis Strait crust.

Answer: Added.

4.p. 926 line 1: The sedimentary thickness results of Bassin et al. (2000) are of a very low order of resolution compared to known thicknesses from reflection/refraction seismics. It may not be appropriate in this area.

Answer: Our method relies on having grids of sediment thickness. So we constructed a grid that patches together the highest resolution grids available for different parts of the study area. In the northernmost part, this is the grid from Bassin et al (2000),

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and so the sediment thickness in this area is more uncertain and may show deviation from individual seismic profiles that transect that region. An assessment of the amount of uncertainty introduced by using lower resolution grids in the RCOB process is presented in Williams et al (2011).

5.p. 926 line 17: Correct line names and citation: AWI-20080600 (Funck et al., 2012), AWI-20080700 (Suckro et al., 2013)

Answer: Corrected.

6.p. 928 line 7: This is consistent with the Moho depth of W Greenland from refraction seismics e.g. by Gohl & Smithson (1993).

Answer: New reference has been reviewed and added.

7.p. 926 line 29, p. 927 line 1-2, and Fig. 8 caption: References of used seismic data for Moho depths are missing.

Answer: The seismic data have been used for comparison between seismic and gravity inversion Moho depth is using the same seismic refraction and reflection profiles together with receiver functions being illustrated in figures 1 to 5 and Figure 7. We add References to these figures in appropriate places. We also added references for the receiver function data being used to evaluate Moho depth and set UCCL in both margins.

8.p. 934 line 13: Where are the references for subsidence curves calculated from wells in the Hopedale Basin? Are these freely accessible?

Answer: They were represented in Figure 3, Dickie et al. 2012. I added this reference to the text.

9.p. 937 lines 11-12: References are missing for Moho depths from refraction profiles and receiver function stations.

Answer: References were added in previous sections where we first talk about them.

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10.Fig. 1 caption: 'NAGGAT line 2' must be spelled 'Nugget line 2'.

Answer: Corrected.

Reference for bathymetry is missing.

Answer: Added.

The correct names and references of the seismic lines are: Suckro et al. (2012) AWI-20080500/20100400 (not 20100700); Funck et al. (2012) AWI-20080600; Suckro et al. (2013) AWI-20080700. Check also the main text for correct line names.

Answer: Corrected.

11. Figs. 2-4: Number annotations of seismic lines and isochrons are too small to read.

Answer: They were made bigger.

12.Fig. 5: Correct seismic line names and references: 12. Seismic line AWI-20080700, Suckro et al., 2013 13. Seismic line AWI-20080600, Funck et al., 2012 14. Seismic line AWI-20080500/20100400, Suckro et al., 2012

Answer: Corrected.

13. Fig. 6 caption: Laske et al. (1997) is not in reference list. Or replace it with Bassin et al. (2000).

Answer: Reference has been replaced by Bassin et al. (2000).

14. References: The following ref is missing: Suckro, S., Gohl., K., Funck, T., Heyde, I., Schreckenberger, B., Gerlings, J., Damm, V. (2013). The Davis Strait crust - a transform margin between two oceanic basins. *Geophysical Journal International*, 193, 78-97, doi:10.1093/gji/ggs126.

Answer: Added.

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15. May want to add the following reference for constraints on Moho depth and underplating. along W Greenland inner shelf at S. Davis Strait and N Labrador Sea: Gohl, K., Smithson, S.B. (1993). Structure of Archean crust and passive margin of southwest Greenland from seismic wide-angle data. *Journal of Geophysical Research*, 98, B4, 6623-6638.

Answer: We have added the reference to the text.

Technical corrections

1. p. 935 line 18: 'Our' must be spelled 'our'.

Answer: Corrected.

2. p. 937 line 17: Correct: ' ... effects ... '

Answer: Corrected.

3. p. 937 line 18: Must read: '... continental crust ...' This sentence reads weird; better re-write the whole sentence for clarity.

Answer: Corrected.

3. p. 937 line 24: Must read: '... Iceland mantle plume ...' or '... Iceland plume ...'

Answer: Corrected.

5. Throughout the manuscript, Appendix A and Fig. 5 caption: Density units must be in kg/m³.

Answer: Corrected.

Authors Note:

During the review process, we detected a small computational error in the process of restoring COBs from different models to their pre-stretching locations. We corrected the error and repeated the restoration and reconstruction processes for all our 8 mod-

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els. The amount of change in the location of restored COB and poles of rotation is small and this correction does not affect the results or conclusions of the study. According to this correction these tables and figures have been changed: Tables 1 and 2 and figures 11, 13, 14, 15, B1, B2 and B3. Supplementary material also has been updated.

Interactive comment on *Solid Earth Discuss.*, 5, 917, 2013.

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