

Interactive comment on “Crustal Thickness of Antarctica estimated using data from gravimetric satellites” by Muriel Llubes et al.

Anonymous Referee #2

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This paper attempts to reconstruct the thickness of the Antarctic crust from a new satellite gravity map, which it then compares to a couple of published models. It concluded the CRUST1.0 model performs better than a recent seismic compilation (An, 2015). It has several problems, some of which stem from the poor documentation of CRUST1.0. The techniques are not original, and while the input dataset is improved on previous version, to have confidence in the work more assessment is needed (eg a comparison with receiver functions, and addressing non-isostatic support of topography).

English: In general, the English is not good, but hopefully something that could be addressed in copy editing.

Limits of Parker's method: The author's use Parker's method for deriving the terrain effect, which is appropriate for a flat plane, but may become problematic at scale where

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curvature is important; this should be justified at this length scale.

Airborne gravity: The new compilation of airborne gravity by Scheinert 2016, should be at least mentioned.

CRUST1.0 circularity: The biggest issue is the comparison with CRUST1.0. The authors use old studies for mean crustal thickness constraints, which presumably was an input for CRUST1.0, admit that CRUST1.0 used airborne gravity for input, in some unspecified way (even though they reject Bedmap2 because of its gravity contamination) and come up with the same result as CRUST1.0, which is not that shocking in retrospect. In general, CRUST1.0 is not well documented enough to determine how independent of the satellite gravity data it is. There is no attempt to compare with receiver functions for Moho depth (available at An's website at <http://www.seismolab.org/model/antarctica/lithosphere/ANMoho.html>). Given all that, the statement that CRUST1.0 is to be preferred seems to be far too strong.

Non-Moho support: There is no attempt to address flexural or mantle support of topography, something strongly suspected for Marie Byrd Land (Chaput et al. 2014), and likely an issue for Antarctica, given the thick lithosphere and time varying ice load.

Bedmap2: An additional issue is the use of Lythe 2001 over Fretwell 2013 for the bed topography. Figure 6 demonstrated that the authors know where Bedmap2 is using GOCE data, and certainly BEDMAP was not constrained by any data in those areas anyway. There is no value in not using Bedmap2, if you know which areas do have GOCE contamination.

Technical issues: Throughout: None of the figures have spatial scale bars or graticals. Throughout: BEDMAP2 should be Bedmap2 Throughout: Strictly speaking, BEDMAP1 should be BEDMAP. Page 7, line 10: the low RMS indicates stability, not “accuracy” Page 7, Line 17: Marie *Byrd* Land

References: An, M., Wiens, D. A., Zhao, Y., Feng, M., Nyblade, A. A., Kanao, M., Li,

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