

Interactive comment on “A generalised approach to reconstructing geographical boundary conditions for palaeoclimate modelling” by M. Baatsen et al.

M. Huber (Referee)

matthew.huber@unh.edu

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This is a review of "A Generalised Approach to Reconstructing geographical Boundary Conditions for Palaeoclimate Modelling" whose aim is to "provide a new method to efficiently generate global geographical reconstructions that are suitable for palaeoclimate modelling." I have some experience with the onerous task of generating paleogeographic boundary conditions suitable for inputting into climate models and I can say that an easier and more accurate approach would be helpful to the community. Nevertheless, this is a somewhat hard review to write: am I reviewing the actual reconstruction for 38Ma or am I reviewing the code and data sets and workflow necessary to

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generate it? Are either really appropriate for a journal about paleoclimate, rather than say, a Earth System Science Data or GMD? I'll let the editor answer that question and simply review the manuscript as it is.

The method involves cobbling together gridded paleobathymetry from Mueller and modern topography from ETOPO2 and then applying ad hoc corrections mostly derived from raster images, most of which are not from the peer reviewed original literature. Then some infilling and smoothing. In between are a set of rotations to a common reference frame and then re-rotations into a specific frame that the authors prefer. Much of the data and code for doing these steps is not provided in the supplement so I can not actually review the workflow, which greatly hampers a meaningful review. Some matlab code is provided, although being that matlab is not "free" nor open-source and I do not own or use it, the code itself is only marginally useful to me. Having written (<http://www.geosci-model-dev.net/7/2077/2014/gmd-7-2077-2014.html>) and made available a similar set of tools (<http://www.geosci-model-dev.net/7/2077/2014/gmd-7-2077-2014-supplement.zip>) which are both more complete and using open source and freely available codes/languages/applications I am finding it hard to see what is novel or better about the Baatsen et al approach. That does not mean it is not a good approach in and of itself, but that brings up the general issue of how to review a submission like this. Is it science or a description of a product? And if the latter, do we compare how well it works compared to other products?

One problem I see is that the code (perhaps I am not reading it right) as I said, I don't use matlab) does not seem to deal properly with moving objects around in an area preserving way. Movement of a raster/gridded object by more than a couple of degrees requires resizing it to maintain constant area. This is normally handled by a coordinate transformation before moving an object (lets say you move Australia ten degrees of latitude, it's "size" changes in lat/lon coordinates) or it can be handled transparently in a tool such as GMT (this is how we do it in our source code above). When cobbling together a bunch of different gridded and rasterized datasets, all for

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different time periods and all according to different projections/rotations one then has to take care to conserve area on a sphere when getting them to mesh together and then when rotating them to different periods of Earth's history. Maybe I missed it in the code, but this important step seems to be missing. My apologies if I just missed it, but if I'm right, this is a major technical flaw.

As mentioned in the other review, much of what this script has already been incorporated in the latest version of the freely available GPlates, which does somewhat cut down on the novelty and utility of this approach, and I not sure that has been done here has been done correctly. At the least, all parts necessary to test the workflow should be provided previous to submission, since in this case the workflow is what we are reviewing.

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