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

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This paper is topical in the sense that there is a definitive need in the community to develop shared workflows to generate new paleogeographic boundary conditions for paleoclimate models in a re-usable, iterative fashion. I am sure that the entire paleo-climate and –ocean modelling community welcomes efforts such as Baatsen et al.'s to move in this direction.

Combined continental and oceanic paleo-elevation models have been constructed for some time, and even though Baatsen et al. provide a new workflow, workflows not too dissimilar to the one employed here have been used previously. A paper worthwhile

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citing in this context would be Markwick and Valdes (2004) who constructed a Maastrichtian digital global elevation model – however, neither their workflow nor their model was made publicly available. Next Herold et al. (2008) published a mid-Miocene global elevation model; this paper should be referenced as well, seeing that their workflow was also somewhat similar to that of Baatsen et al. They made their digital elevation model publicly available, and the main reason why their workflow was not explicitly published was that it included many manual steps, which are hard to automate. This is clearly what motivates the Baatsen et al. paper, ie the desire to publish a streamlined, easy-to-use workflow that can easily be re-used for different plate reconstructions and different times, and their advance is therefore expected to be in this area.

The critical test to the innovation presented in this paper is therefore in assessing to what extent their workflow is usable and re-usable. Firstly, the authors use the Seton et al. (2012) reconstruction (in a different reference frame), but the Müller et al. (2008) paleo-age grids (and convert for the different reference frames). But the paleo-age grids differ between the 2008 and 2012 model, e.g. in the Pacific since the Seton et al. model incorporates the Ontong-Java-Manihiki-Hikurangi plateau break-up. So the age grid and subsequent bathymetry are inconsistent with the tectonic reconstruction. Paleo-age grids that are compatible with the Seton et al. reconstruction were published by Müller et al. (2013) and are freely downloadable:

http://www.earthbyte.org/seawater-chemistry-driven-by-supercontinent-assembly-breakup-and-dispersal/

In order to edit the rotated continental topography to reflect the topography at 38 Ma the authors manually edit regions for paleo-topography (e.g. Andes) – to use this workflow to make paleotopography grids through time in an automated fashion is extremely tedious. As an aside, GPlates 1.5 can export a reconstructed netcdf grid, which completely eliminates the necessity to convert image files into a gridded format, so a semi-automated workflow should utilise this functionality. The authors write (lines 1-6, pg 4929) that "The primary focus was to use a plate tectonics model not originally de-

signed to create numerical grids as output, that can be altered afterwards without having to run through the entire process again (only some of the masks may need to be redefined). Creating a new grid for a different point in time or a new configuration (e.g. using a different rotation framework) should allow the user to make multiple reconstructions in a few days' time." I would argue that to make new grids through time using this approach, e.g. to test different rotation frameworks, would take MUCH longer than a few days, since one would need to manually edit the paleo-topography for each time slice.

I tried to run the matlab script the authors provide, but note the following severe obstacles: the authors haven't provided any of the files needed for it to run, such as any of their masks (such as their land-ocean mask, which is needed for the regions they manipulate in Asi, for instance), nor do I have their 'corrected' bathymetry grid. It looks like they extract land/shallow seas/oceans etc based on the rgb values of a png file. In contrast, a generalised, re-usable workflow should be based on digital netcdf-type grids only (which, as I mentioned above, can be imported, rotated, and exported by the community GPlates software, eliminating the need to use any conversion between image rgb values and elevations. A complete example with working files would be essential for such a community workflow, and I cannot say that I find the current workflow either usable or easily re-usable. I hope the authors will be able to revise their workflow to make it usable.

Other small corrections needed: - Is Hinsbergen meant to be referenced as 'van Hinsbergen' or without the 'van'? It occurs without the "van" on line 10 of pg 4921. - extra 'a' in line 23 on pg 4921 - What does a.s.l. Mean (line 3 of pg 4924)

References:

Herold, N., Seton, M., Müller, R.D., You, Y., and Huber, M., 2008, Middle Miocene tectonic boundary conditions for use in climate models, Geochemistry, Geophysics, Geosystems, 9, Q10009, doi:10.1029/2008GC002046

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Müller, R.D., Dutkiewicz, A., Seton, M. and Gaina, C., 2013, Seawater chemistry driven by supercontinent assembly, break-up and dispersal, Geology, 41, 907-910.

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