

Interactive comment on “A suite of Early Eocene (~ 55 Ma) climate model boundary conditions” by N. Herold et al.

Anonymous Referee #2

Received and published: 19 March 2014

I found this manuscript to be a useful contribution for those interested in simulating climate at Early Eocene times. It will be suitable for publication after some minor modifications that, in particular, ensure levels of uncertainty are considered/communicated a little more. My comments are listed below.

In the abstract, there is an indication that major improvements include the paleotopographies of... but it isn't too clear that for some of those topographic components, you are simply incorporating existing reconstructions – thus please make sure this is clear throughout the paper.

Your justification for doing this work (Page 1, line 19) is that there has been a growth in paleoclimate modelling. I should think that there is a better scientific justification which directly relates to Eocene climate and the challenges of simulating it – thus perhaps

C164

re-phrase to indicate this.

Your approach here is to provide a single paleotopography and assess uncertainty in relation to modern topography. However, other paleotopographic reconstructions provide a maximum and a minimum paleotopography (e.g. Wilson et al Antarctic topography). I therefore think you should consider or communicate: 1) why/how you can be confident that a single, rigid reconstruction will be suitable for everyone to use; 2) where you have better vs. worse uncertainty (you could generate a map which indicates/assesses uncertainty so that this is available spatially and can be incorporated in numerical models); 3) a clearer indication/discussion of why you think the assessment of sub-grid scale variability using modern topography is transferable to Eocene topography (and indeed why you did not add any assessment of this variability in Greenland or Antarctica – there are good modern subglacial topography DEMs for these areas (Fretwell et al. 2013, BEDMAP2 in 'The Cryosphere', and Bamber et al. 2013, New Greenland DEM in 'The Cryosphere'), or you could assess variability for Antarctica using the Wilson et al Max and Min topographies).

You should indicate whether you used the 'maximum' or the 'minimum' Antscape palaeotopography reconstruction. Moreover, you should indicate clearly that the Antscape topography is specifically for the Eocene-Oligocene boundary (e.g. 34 Myrs) rather than 55 Myrs – so justify why it is suitable for use at 55. It has previously been used (Pross et al., 2012, Nature) as a closer approximation of Eocene 55Ma topography than would otherwise be possible using modern topography.

Your application of tension splines with 'a constant tension factor of 10' means what for topography exactly? Does it have implications for the kinds of shapes produced? E.g. can rough topography be well represented?

You could add additional sub-section headings to make reading simpler. For example, in the 2.2. Bathymetry section, you could subsection the detail on LIPs and on Gateways so that each of these is easier to home in on.

C165

Beyond section 2.3 it appears that data is actually model derived. Is this the case? If so, then perhaps you need to say something about that.

On the biome detail, you show biome maps simplified to 10 mega biomes. This is fine, but in the actual dataset, will you make this available as 10 biomes or as 27 biomes? What does 'efficacy with regard to paleoflora data' mean?

The river direction component is a little odd: 1) the map/figure is not easy to read because you cant really tell they are arrows at the scale of a figure that is 1 page wide. You need to improve its clarity. One way to do that is to use different colours for different flow directions – as is used in software like ArcGIS. 2) It is not clear why it is included as I would have thought climate models compute runoff themselves based on the steepest slope in the DEMs, so this additional grid (and therefore figure) seems redundant. 3) I assume that you do follow the path of steepest floe (or D8 algorithm) when generating this? You should probably indicate whether the Rosenbloom scripts actually do anything more sophisticated than this simplest form of flow routing.

Interactive comment on Geosci. Model Dev. Discuss., 7, 529, 2014.