

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

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We thank the reviewer for their constructive feedback. While we will address each point (many of which I agree with, particularly regarding uncertainties) in detail in our final response I'll take the opportunity here to respond to a few concerns the reviewer has that are a result of misunderstanding – and therefore of a lack of clarity in the manuscript.

Firstly, while we agree that uncertainty needs to be treated more thoroughly in the manuscript – and will endeavour to do this in our revision – we also want these datasets to be a community effort. Thus, we hope to leave the majority of the uncertainties to be identified, quantified and hopefully corrected by members of the community with far more experience and expertise in their niche fields. We intend this group of datasets to

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be a work-in-progress that spurs community interaction. This is in part why we chose GMDD as a publishing venue; if members of the community feel strongly that any parts of our datasets require correction they are able to post critiques, comments or even data.

Secondly, it is not our intent to imply that researchers modelling the Eocene need use these datasets. We fully appreciate the benefits of different groups using their own boundary conditions to simulate a particular time period in that it may better capture the uncertainty in our understanding of what the Earth was like (e.g. the justification for EoMIP). In this contribution we merely present one set of updated and self-consistent boundary conditions that other groups may use either a) if they do not have fundamental disagreements with the details of our reconstructions, or b) if they wish to use our boundary conditions as a reference for which sensitivity tests may be conducted for areas of uncertainty or disagreement.

Thirdly, the topography section is longest and also first in the manuscript and thus it is understandable that an emphasis is implied on this boundary condition. However, this is only the case because a large amount of novel - and especially unpublished - work was done on this boundary condition. In particular, the re-rotation of the continents using the rotation model of Müller et al. (2008), the derivation of sub-grid scale topographic variation and several geographic/topographic changes to the original Markwick (2007) topography needed to be detailed. Yes, the mean elevation of the original Markwick (2007) topography is largely the same, but it is the consistency of our boundary conditions as well as the sub-grid scale representation of topography that we believe adds value. This is something we will try to express better. We also note that the more recent work of Markwick that has been used in recent Eocene HadCM simulations (e.g. Lunt et al., 2010) is propriety and therefore not available as a community resource.

Lastly, it is not necessary, for the sake of reconstructing a plausible Eocene vegetation distribution, that a consistent CO₂ concentration be used between BIOME4 and the climate simulation we use to drive it. We are only interested in deriving a final

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boundary condition that looks plausibly 'Eocene'. And in comparing our BIOME4 vegetation with inferred Eocene vegetation distributions based on proxy data (Morley, 2007; Utescher and Mosbrugger, 2007) as well as to gross climatic indicators (Crowley, 2012) we have to some approximation succeeded, though uncertainties – even in the proxy data – abound. I agree that using multiple climate models' output would mediate model dependent biases and this is something we will explore.

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