

## ***Interactive comment on “The early Eocene equable climate problem revisited” by M. Huber and R. Caballero***

**A. Sluijs (Editor)**

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Dear Dr. Huber,

As an editor of CP, it is great to see so much online response to your paper. Thanks for also promptly responding to the comments by the reviewers and visitors. The comments they made are generally quite clear and the reviews are also positive. Your responses also indicate that you will embrace them in your revisions. Because a late reviewer had to finally decline sending in a review, I did a somewhat detailed final evaluation, which you'll find below. The most important problem with the current paper is the choice to exclude all available sea surface temperature data. It is clear these are subject to uncertainties, but so are the terrestrial data, as you indicate. The terrestrial data compilation is impressive. But for comprehensive reevaluation of the equable climate

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problem that includes comparison between the new model outputs and available data, it seems awkward that the marine data are not included, particularly because they are actually discussed at places in the MS to support model results. So please seriously reconsider to include the marine data, such as an updated version of the data set from your 2008 paper in Science. I feel that moderate revisions are required based on the reviews. Please clearly include statements how you have changed your manuscript. Collectively, I'm looking forward to receiving a revised manuscript.

Sincerely,

Appy Sluijs

Editor

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Page 243. line 17 please reduce number of references to the two to three most important ones, as done for the other hypotheses

244. 7 It is unclear to what 'these studies' refers. Please rephrase.

244. 20 CO<sub>2</sub> records for all proxies but stomatal indices are cited here (which are generally lower than other records) but it is not specified why. There may be problems with these records. The highest estimate is here specifically cited (the 4400 peak value from Pearson and Palmer, 2000; data that certainly may have problems too). Please indicate a potential range of CO<sub>2</sub> concentrations. In section 2 this is explored in detail.

246. 11 include 'than' between values and previously

246. 20. Should this be 'sensu stricto'?

247. 11-14 These papers, more than stating potential problems in proxy interpretations, provide better constraints on the mechanisms associated with the production and taphonomy of the proxy carriers.

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247. 16 It is not true that 6 different calibrations are in use for TEX86, as the older calibrations are not used anymore for good reasons.

247. 19 typo: pale - climates

247. 20- The most extreme mismatch between proxies in the literature is chosen. In general, proxy comparison is much better as indicated in several of the papers cited above.

One factor that induces uncertainty and needs mention here is seasonality, which has been treated in detail in the literature.

248. 14 A map with the available data points from the literature used in this study would be helpful at this stage. Is it possible to include points in Figure 1? Right now, this is only illustrated later on (Fig 5).

Marine SST data are not compared to the model because of the uncertainties in the proxies. The paper also states that the terrestrial proxies have problems too, including calibrations and biases. Hence, the decision to omit SST proxy data from the study is unfortunate and to me not natural. I would suggest including the data for completeness (an updated version of the Huber, 2008 Science paper). They can be color coded in the plots so that the reader can readily distinguish them. This should not change the discussion significantly because you explain why you think they are not reliable. Colleagues may have different opinions about this and I am sure that also the marine proxy community will benefit from a detailed comparison with the model presented in this paper. In fact, the model results are compared to marine proxy data in the paper and found to compare well, the data are however not in the figures. This aspect is particularly valid for the tropics. Since there is little data from both the marine and terrestrial realms, all data that can be compared to the model is important. Luckily, it seems that much discussion on the validity of several proxies (particularly TEX86) exists on the high-latitude data. The mid-to-low latitude data generally compare very well with other proxies. Hence, the range of SSTs that can be deduced from the various

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SST proxies for the tropics may be a vital constraint for this paper.

250 29. 'UK models', specify

253. 5-7 Check syntax of this sentence

253. 24 MBT/CBT not reflecting surface temperature at all. This is true but in special cases that are identifiable, as explained by Peterse et al., 2009. This uncertainty is clearly not relevant in the discussion on the paper by Weijers et al., 2007.

265. 17 Weijers et al., 2007 state that the MBT/CBT proxy may be biased to summer values if the soil in which the lipids are produced was frozen for (part) of the winter. This is clearly not the case in the model and unlikely in the real world, so the data and model are unlikely concordant.

One data point that is not included is the CMMT estimate during ETM2 in the Arctic based on the occurrence of palms (Sluijs et al., 2009 Nature Geoscience). I presume all hyperthermal data are neglected for this study?

266. 25. Are there significant differences between AMIP and ERA-40?

Figure 1 needs to be enlarged, or changed. Perhaps include data locations. Figure 2. Blue lines are not explicitly described in the caption (only AMIP). Please include annual, boreal winter and boreal summer above the three situations in the figure for clarity. Same holds for Figure 3

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Interactive comment on Clim. Past Discuss., 7, 241, 2011.

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