Clim. Past Discuss., 7, C140–C142, 2011
www.clim-past-discuss.net/7/C140/2011/

Climate of the Past Discussions

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

M. Huber and R. Caballero

huberm@purdue.edu

Received and published: 18 March 2011

Our thanks to Dana Royer for taking the time to read an admittedly rather long and dense paper, and we appreciate his positive remarks and constructive criticisms. As a starting point, I think all the papers he mentions are worth citing and we will inject some further discussion of these issues within the text of the paper. These are contentious and still evolving issues and it is unlikely that this paper will be the final word on any of it.

The two main issues that Dana raises are our treatment of CO2 and our temperature calibration.

With respect to the latter issue, our results are not overly sensitive to the assumed

calibration, as we have verified in calculations not included in the manuscript (but can be gleaned by comparing the estimated listed in Fricke and Wing 2004). The difference in calibration yields offsets of 2-4 degrees in nearly all of our estimates (although in two of our hottest estimates it is more like 8). These hotter estimates are all in agreement with or still cooler than independent terrestrial (MBT/CBT) and coastal marine records, although as we argue in the text we think the error bars around those estimates are also quite large. In general the interpretation of our results is not at all dependent on one calibration or another, if we removed several degrees from our results we would simply find a better comparison with the 2240 ppm Eocene case that we have also plotted. Actually, from our point of view the fact that it is very difficult to say with any accuracy what the mean temperature on land was within +- several degrees (or in our climate model within +-1200 ppm CO2) is a major challenge for estimating climate sensitivity, but not so much of a challenge for model data comparison and the resolution of the equable climate problem, which is the focus of this study.

The CO2 issues that Dana raises are clearly not going to be resolved within this paper, but in his comment he asks, "However, it is fair to ask, was CO2 above 1000 ppm during the entire early Eocene?". We would argue that the answer is to that question is probably yes! Certainly that is what is implied by the recently published results of Pearson et al., with respect to the Eocene to Oligocene transition (as reconstructed from the Tanzanian record) as well as prior published records (cited in the text). Or barring CO2, it is quite likely that methane was much higher than modern throughout the Eocene, yet we have no proxy constraints on this number and it remains one of the largest lurking variables in the problem. In our methodology we are using very high co2 (again, we do not claim values were actually that high, but that the equivalent radiant forcing was that high, perhaps due to other forcings), but this could just as well be represented in the model with lower co2 and higher methane. None of that would affect our conclusions.

As Dana says, this sort of a discussion is exactly one of the main benefits, or perhaps

the only benefit of an open review process, and it terrific to have a chance to engage in this kind of discussion. We will include some of this discussion in a revised version of the paper and welcome any further suggestions or input. Thanks again.

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