Geosci. Model Dev. Discuss., 5, C694–C696, 2012
www.geosci-model-dev-discuss.net/5/C694/2012/

Geoscientific
Model Development
Discussions

Interactive comment on "Simulations of the Mid-Pliocene Warm Period using the NASA/GISS ModelE2-R Earth System Model" *by* M. A. Chandler et al.

Anonymous Referee #1

Received and published: 19 September 2012

This paper outlines some very interesting results of a mid-Pliocene experiment using the NASA GISS Model E2-R (I think).

Unfortunately it would seem that the paper does not present results from the Pliocene experiment that GISS submitted as part of PlioMIP. This special issue of GMD was specifically designed as a means for all participating groups in PlioMIP to discuss the implementation of PlioMIP boundary conditions in their own models (as per an established experimental design), and to present initial results of the runs submitted as part of PlioMIP (either Experiment 1 or 2 or both). That is what every other group did.

This likelihood becomes clear when examining the Supplementary Figure S5 in Hay-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

wood et al. 2012 (Climate of the Past Discussions Paper - large-scale features of Pliocene climate) versus Figure 3 in this paper. The SST anomaly plot for the GISS model in Figure S5 looks nothing like the SST plot shown in this paper but they should be identical.

I have accessed the PlioMIP database (today) to examine all the data uploaded by GISS. Although more data was uploaded very recently, none of it appears to pertain to the model results presented in this paper (I reproduced the figures to make myself certain that this is the case).

The results presented here were performed (apparently) with the same version of the GISS model used in Haywood et al. (2012), but the naming convention for the model changes in the text so this is very difficult to determine for sure, yet they are not the same results (showing a totally different sensitivity in the North Atlantic), and therefore cannot be taken as the GISS contribution to PlioMIP as stated in the paper.

Also it appears that the experimental design used to generate the model results presented in this paper may have been modified from that specified in Haywood et al. (2011), and used by all other PlioMIP groups who have run Experiment 2. If so, it cannot really considered part of PlioMIP for that reason either. These changes I believe could explain the variation between the GISS PlioMIP submission (Haywood et al. 2012) and the results presented here in the North Atlantic (Figure 3). Evidence for these changes can be found in Table 1 (parametrization of straits), and also in the implementation of a 25 m sea-level rise.

In Table 1 there appear to be a number of indications that the configurations of straits where modified in the experimental design and do not follow the PlioMIP protocols of Haywood et al. (2011). A number of these are in the Canadian North West Territories. It may be no surprise therefore that the SST change from this realization of results, and those submitted as part of PlioMIP, vary so much in the Labrador region and have a large knock on effect in the North Atlantic.

GMDD

5, C694–C696, 2012

Interactive Comment

If so the statement that an improvement in model physics has led to the best realization of Pliocene environments to date using the GISS model could be incorrect. It appears to be perfectly possible to get one realization (PlioMIP submission) with a 'poor' fit to data and another with some adjustment to parameters (e.g. bathymetry and straits) which provides a 'better' fit to data. Poor and better is very qualitative and needs to be backed up by some hard statistics to be convincing though.

The premise that GISS have altered their bathymetry in the North Atlantic in this Pliocene simulation is also suggested by examination of Figure 5 and 6 which appears to show different bathymetry in the Pliocene versus pre-industrial experiment. In the PlioMIP experimental design all bathymetry (except around deglaciated regions of West Antarctica and the Hudson Bay) was to be specified in the same way as each group's pre-industrial control run.

Even if this is not the cause, the dramatic difference between one simulation and the other requires a full explanation in this paper. In fact it is not even clear if the same model has been used in both cases as reference to the model varies between GISS ModelE2 EaSM and GISS ModelE2-R and even ModelE2.

So what to do. . ...the quick and easiest solution is for the authors to include the results and discussion of the data that they actually submitted as part of PlioMIP, and then compare and contrast that to the results of this new run already shown.

Otherwise this paper will not really meet the objectives of the GMD PlioMIP special issue, and will stand out as an anomaly compared to the efforts of all the other groups to achieve as much uniformity and documentation as possible.

Time series for model spin up (SAT and AMOC) would be useful. No information is provided for how long the model was integrated and averaged for and whether an equilibrium state has been achieved.

Interactive comment on Geosci. Model Dev. Discuss., 5, 2811, 2012.