Clim. Past Discuss., 5, C533–C535, 2009
www.clim-past-discuss.net/5/C533/2009/

Climate of the Past Discussions

Interactive comment on "High resolution climate and vegetation simulations of the Mid-Pliocene, a model-data comparison over western Europe and the Mediterranean region" *by* A. Jost et al.

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Received and published: 3 August 2009

We gratefully thank the Referee #2 for relevant comments on the manuscript.

Here we make some considerations **about the atmospheric CO_2 concentration used in the mid-Pliocene simulations**. For the mid-Pliocene simulations an atmospheric CO_2 concentration of 315 ppmv was used, following the experimental design defined in the mid-Pliocene climate simulations using atmosphere-only General Circulation Models (GCM) (Chandler et al., 1994; Sloan et al., 1996; Haywood et al., 2000; Jiang et al., 2005). We kept the same value for consistency with these previous simulations, just

as Haywood et al. (2009) recently did in the first comparison of mid-Pliocene climate predictions produced by two AGCM.

It should also be noted that the 400 ppmv value, which was used in ocean-atmosphere or vegetation-atmosphere coupled experiments (e.g., Haywood and Valdes, 2004, 2006, respectively), is not completely consensual for 3 Ma. First the error bar is large whatever the proxy used (Kürschner et al., 1996; Raymo et al., 1996). Second the mean value itself is often lower than 400 ppmv (Kürschner et al., 1996; Pearson et al., 2000; Zachos et al., 2008).

Furthermore by prescribing the sea-surface temperature (SST) distribution, the consequence of a $\sim$ 100 ppmv lower value of the atmospheric CO_2 concentration in an AGCM simulation is modest because the dominant part of their effect is already incorporated in the prescribed SSTs. Additional simulations with a synchronously coupled atmosphere-ocean-vegetation model are indeed needed to explore in detail the potential impacts that higher CO_2 would have. We agree on that point with the referee A. Haywood's opinion (given in Comment #3).

Minor changes suggested by Referee #2 will be taken into account in a revised manuscript. In particular:

Pag. 1373, line 13: "the recent past" is replaced with "the last thousands of years".

Pag. 1377, line 18: "certainly" means "without doubt".

Pag. 1394, line 19: we actually refer to the results presented in this study. The sentence will be reformulated accordingly.

References

Pearson, P., and Palmer, M.: Atmospheric carbon dioxide concentrations over the past 60 million years, Nature, 406, 695–699, 2000.

Zachos, J., Dickens, G., and Zeebe, R.: An early Cenozoic perspective on greenhouse warming and carbon-cycle dynamics, Nature, 451, 279–283, 2008.

See other references in the Discussion Paper.

Interactive comment on Clim. Past Discuss., 5, 1367, 2009.