Geosci. Model Dev. Discuss., 4, C85–C87, 2011
www.geosci-model-dev-discuss.net/4/C85/2011/

Geoscientific
Model Development
Discussions

Interactive comment on "Pliocene Model Intercomparison Project (PlioMIP): experimental design and boundary conditions (Experiment 2)" *by* A. M. Haywood et al.

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Received and published: 23 March 2011

When trying to specify CO2 as far back in time as the Pliocene uncertainty is inevitable.

Evidence for Pliocene CO2 comes from a number of sources: 1) The stomatal density of fossil leaves (Kürschner et al. 1996) 2) Carbon isotope analyses (e.g. Raymo et al. 1996) 3) Alkenone-based estimates (Pagani et al. 2010; Seki et al. 2010) 4) Boron isotope analyses (e.g. Seki et al. 2010).

The values of CO2 from each of these proxies differ. However, within error they overlap.

The stomatal density records support a CO2 of $\sim$350 to 380 ppmv (Fig. 6 page 308)

The average of the Raymo carbon isotope analyses is similar to the stomatal-based estimates but peaks above that value (beyond 450 ppmv) occur and are entirely plausible (Fig. 5 page 320).

The Pagani et al. study looked at reconstructed CO2 from a number of different marine records and the work shows clearly that in three of the six marine records a CO2 value of 400 or 405 is perfectly reasonable (sites 806, 1012 and 882; Fig. 2 page 28). The CO2 range stated in the abstract of this paper is 365 to 415 ppmv.

In the Seki et al. study the alkenone-based CO2 record (ODP Site 999; Fig. 5b page 206) is consistent with a value around 400 ppmv. The highest resolution section of the Seki et al. boron isotope record (Fig. 8 page 207) shows a decline in CO2 from $\sim$400 to 280 after 3 million years.

Given that range in CO2 estimates within the literature, and that fact that a number of the records and techniques can easily support a value of 405 ppmv, we do not accept that we have in any way biased the PlioMIP ensemble "too hot".

The CO2 value was chosen at the first PlioMIP workshop hosted by the Goddard Institute for Space Studies in New York in 2008. It was the subject of much discussion and debate, but finally a value of 405 was agreed by everyone. This choice has subsequently been validated by the Seki et al. and Pagani et al. studies.

The chosen value is the same as that presented in the experimental design for PlioMIP Experiment 1 already reviewed and published in GMD.

We wish to keep the CO2 value the same between Experiment 1 and 2 and given (a) that the proxies are perfectly capable of supporting that choice (without even the need to infer changes in CH4) and (b) that groups have already completed the simulation, or they are running it, we find no justification in altering the experimental design at this stage.

Pliocene CO2 is an important ongoing area of research with new records coming on line in the next few years. Beyond Experiment 2, CO_2 is an obvious choice for sensitivity tests as part of PlioMIP.

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Interactive comment on Geosci. Model Dev. Discuss., 4, 445, 2011.