Large-scale features of Pliocene climate: results from the Pliocene Model Intercomparison Project.

Haywood et al. Climate of the Past Discussions
September 23rd, 2012

1. General Comments

The paper offers an important and significant contribution to paleoclimate research as it provides a synthesis of a large volume of modelling work that has focused on a key interval of past global warmth – the mid-Pliocene Warm Period (mPWP). The paper addresses uncertainties in model simulations by comparing key outputs (surface air temperature, sea surface temperature, and precipitation) from two experiments conducted using eleven models. Furthermore, multi-model mean outputs were compared with proxy climate data derived from the PRISM3D data set.

I enjoyed reading this paper. It is well written and clearly structured. A succinct review of PMIP's objectives is presented and provides sufficient background. Research rational, experimental approach and major outcomes are also well presented. Outcomes regarding Earth System Sensitivity are important and discussion concerning possible causes of model-data discrepancies (including time-averaging) are thought provoking. I suspect these arguments will guide the direction of future paleoclimate research to include time slices outside the Pliocene.

In short I recommend that this paper be accepted and published with minor changes.

2. Specific Comments

I have two comments regarding treatment of the Antarctic region:

A land-sea mask was applied to WAIS in the preferred boundary condition data set, whereas WAIS was 'removed' in the alternate data set by reducing topography to sea-level and specifying tundra vegetation. Were these different boundary condition treatments used to run two simulations with the same GCM? If so, were there any significant differences in outcomes? Perhaps differences are more likely to be apparent in regional scale simulations?

The authors point out that the data point for Antarctic MAT is potentially spurious. Age control is the primary issue with this data point. If this MAT data point causes issues then perhaps this data point should be removed from the PRISM3D data set – or at least should be highlighted as problematic. I suspect that if similar age uncertainties existed for data at different geographic locations they would not be included in the data set.

3. Technical Corrections

The paper is well written – I include a few minor corrections:

Page 2981 line 9: remove "s" from "Models"

Page 2983 line 16: remove "s" from "models"

        Line 20: replace "unsurprising" with "not surprising"

Page 2984 Line 5: remove "the"

        Line 15: replace "cautiously" with "with caution"

        Line 20: remove extra "as"

        Line 25: replace "which" with "that"

        Line 29: replace "appears to be" with "is"

Page 2985 Line 16: add comma after "Sensitivity" and "climate" before models.

        Line 21: remove extra "and"

Page 2987 Line 10: "1.99" recorded as "2.0" in Table 2.

        Line 19: spell out Data-Model Comparison "DMC"

Page 2991 Line 11: remove "s" from "climates"

Page 2992 Line 6: remove "that"

The figures are relatively clear and well-constructed but I hope/trust that they will be published (or at least accessible) in larger format as they are difficult to read at the current scale (particularly Figs 1,2,3, and 6). The size used in Fig. 4 is about right.

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