

Interactive comment on “The mid-Pliocene climate simulated by FGOALS-g2” by W. Zheng et al.

Anonymous Referee #2

Received and published: 24 April 2013

This manuscript by Zheng et al. has been submitted as part of the special issue, ‘PlioMIP: experimental design, mid-Pliocene boundary conditions and implementation’. It gives a brief description of the coupled climate model, FGOALS-g2, and the set-up for experiment 2 of PlioMIP. This is followed by discussions on the changes in surface air temperature, precipitation, the ocean mean states and finally changes in the inter-annual variabilities, namely ENSO and the East Asian monsoon. These results have been presented clearly and the objectives of the manuscript are within the framework of PlioMIP.

I believe the manuscript would make a valuable contribution to PlioMIP and would therefore suggest publication. However, the authors must first address some issues noted below, in addition to going through a long list of grammatical/spelling errors.

Line 28, page 2407: Did the authors apply the PRISM3 topography directly to their

C410

model or did they calculate the PRISM3 mid-Pliocene and present day topography anomalies and apply them to the model? If the former (as suggested by table 1), then was there any particular reason to do so? This certainly does not invalidate the work, but I think the majority of the other models, if not all, used the anomaly method as was suggested by Haywood et al (2010). The annual mean surface air temperature anomalies shown later in figure 2a appear to be positive everywhere. Many of the other models show at least some small regions where temperature has reduced, and this also shows up in the multi-model mean. Could the way that topography is applied (in addition to the Arctic bias which the authors later mention) affect the surface air temperature?

Line 22, page 2409: This should refer to figures 2a,b and not figures 1a,b. Also, as the authors are trying to say that the east-west SST gradient in the equatorial Pacific does not really change in the mid-Pliocene, a word like ‘only’ needs to be inserted before ‘slightly larger’, otherwise the two parts of that sentence seem somewhat disconnected.

Line 25, page 2409: Is Haywood et al (2013) really the appropriate paper to cite here? I don’t think that particular paper makes any mention of the permanent El Niño-like condition. Maybe the authors are confusing it with Haywood et al (2007), which is still based primarily on model results and does not even predict a permanent El Niño-like state. Instead, I would have referred to Wara et al (2005), etc.

Line 6, page 2410: How much would the extreme warming in the Arctic basin contribute to the total warming seen in the atmosphere? Since the global temperature increase is much higher than that calculated from the PlioMIP multi-model mean (and indeed higher than any individual model – a maximum of 3.6°C), it would be interesting to see what the ‘true’ warming would be. Have there been any previous studies where the model has been run (either for pre-industrial or any other scenarios) with corrections to the bias in the currents in the North Pole?

Other points:

C411

Included below are some corrections or suggestions related to grammar and spelling. However, this list may not be exhaustive.

The wording 'East Asia monsoon' needs to be changed to 'East Asian monsoon' everywhere in the manuscript.

Page 2404: Line 15: Change 'estimate approximately' to 'estimated to be approximately'. Line 19: Change 'tundra were replaced' to 'tundra was replaced'. Line 23: Change 'evidences' to 'evidence'. Line 26: Change 'monsoons system' to 'monsoon system'.

Page 2405: Line 2: Change 'South China Sea' to 'the South China Sea'. Line 5: Change '(2013), however' to '(2013). However'. Line 6: Change 'The study' to 'A study'. Line 11: Change 'substantially decline' to 'substantial decline'. Line 12: Change 'an rise' to 'a rise'. Line 15: Change 'recent study indicate' to either 'a recent study indicates' or 'recent studies indicate'. Line 17: Change 'Permanent El Niño condition was also though to' to 'A permanent El Niño condition was also thought to'. Line 21: Change 'preset' to 'present'.

Page 2407: Line 20: Change 'simualtion' to 'simulation'. Line 22: Remove the word 'respectively'. Line 25: Change 'was' to 'were'.

Page 2409: Line 18: Change 'locates' to 'located'. Line 19: Change 'North Atlantic' to 'the North Atlantic'.

Page 2410: Line 13: Change 'Arctics' to 'the Arctic' or 'the Arctic Ocean'. Line 14: Change 'the increased precipitation locates' to 'precipitation has increased'. Line 15: Change 'parts in the Atlantic Ocean with maximum locate in' to 'parts of the Atlantic Ocean, with maximum values located in'. Line 21: Change 'related with the model bias as that for the' to 'related to the model bias affecting the potential temperature' or something to that effect. Line 21: Change 'Except the bias' to 'Excluding the region of bias'. Line 22: Change 'the increasing of salinity' to 'the increase in salinity'. Line 26:

C412

Change 'to the global warming' to 'to global warming'.

Page 2411: Line 10: Start a new sentence before 'however'. Line 11: Change 'The maximum of variation locates in' to 'The greatest variation is located in'. Line 16: Change the word ordering to 'Although the changes in ENSO based on the proxy records and model simulations are not conclusive at present'. Line 18: Add 'and' before the word 'associated'. Line 25: Remove the word 'the' before 'eastern China'.

Page 2412: Line 2: Change 'locates' to 'located' and 'from' to 'of'. Line 11: Remove 'the' before 'stronger warming'. Line 24: Change to 'The changes in sea surface salinity'. Line 25: Change to 'over most parts of the Atlantic'. Line 27: Change to 'weakens in the mid-Pliocene, which leads to

Page 2413: Line 2: Change to 'changes in zonal SST'. Line 3: Change to 'in the Eastern tropical Pacific'. Line 11: Change to 'the underestimated SST'. Line 12: Change to 'needs further study'.

Figure 6c,d: What are the numbers in brackets? Standard deviation of the indices?
Figure 8 caption: Change 'between' to 'between'.

Interactive comment on Geosci. Model Dev. Discuss., 6, 2403, 2013.

C413