



## ***Interactive comment on “Set-up and preliminary results of mid-Pliocene climate simulations with CAM3.1” by Q. Yan et al.***

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The authors present results for Mid-Pliocene following the PlioMIP guidelines for Experiment 1. All Mid-Pliocene boundary conditions applied to the atmospheric general circulation model CAM3.1 are described in detail and, therefore, provide a good basis for a model–model comparison. The results are presented in a clear and comprehensive manner, although some of them need to be explained thoroughly (see Specific comments).

One major point struck my attention: I found the set-up of the reference experiment to be inconsistent. The authors term their reference experiment as “pre-industrial”, which is inappropriate, because some boundary conditions are based on modern data, for example, SST and sea-ice climatology from the HadISST data set (Rayner et al.,

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2003), and ozone concentration from satellite and ozonesondes (Liang et al., 1997). In contrast, greenhouse gas concentrations are prescribed with pre-industrial values. The authors should either explain their choice of boundary conditions, or, at best, redo a pre-industrial run with appropriate pre-industrial boundary conditions.

The paper is surely within the scope of GMD and the special issue regarding the PlioMIP effort. I, therefore, recommend the publication after revising my suggestions for the reference run and the following specific comments.

### **Specific comments**

- I was wondering why the author use the term “preliminary” so frequently (also in the title)? It reads as if there will be more important results to be presented soon, which I don't think is the case for this study.
- The conclusions read like a summary and they just repeat what has been written in the abstract. They do not tell anything about the mechanisms of the Mid-Pliocene warming which clearly is the aim of PlioMIP (see page 3341 l.12–13). Instead, the major finding of this study is the poleward expansion of the Hadley cell and the consequences for the climate system. This could to be pointed out in the conclusions.
- Is the poleward shift, by the way, also significant? To me, a difference of less than 1° seems to be very small.
- p.3340 l.14–15: The statement “The period has been a focus [...]” needs some references.
- p.3342 l.2: I don't know what a “data ocean” is, rephrase or explain.

- p.3342 l.16–20: As far as I can read from the provided references, the preceding version CAM3 has been used in these articles. This needs to be corrected, either by adding information about differences between CAM3 and CAM3.1, or by referencing studies that use CAM3.1.
- p.3345 l.1–7: Why not directly interpolating the Mid-Pliocene topography to T42?
- l.6–7: Is the resulting land-sea mask similar because of the T42 resolution?
- Fig. 5: Highlighting regions of statistical significance (as in Fig. 3 and 4) would simplify a comparison to the annual mean temperature and precipitation difference plots (Fig. 3a and 4a)

Some results are presented, but they need to be discussed in more detail:

- Table 2: Can you explain the TOA difference between Pre-industrial and Mid-Pliocene?
- p.3346 l.19–27: What are the causes of the warming over Greenland and Antarctica? Is it due to removed land-ice or a lower elevation, or is due to vegetation? This needs to be explained.
- p.3347 l.5–18: Interestingly, high latitude warming is stronger during boreal winter than during summer. Why is that?

### Technical corrections

- p.3340 l.11: change to “[...] at low latitudes than at high latitudes.”
- p.3341 l.22: remove “which are”

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- l.23: replace “summarize” with “conclude”
- p.3344 l.1: remove “eventually”
- l.22: remove “conditions in the”
- Do not use “~” as a meaning of “to” (p.3346 l.17 and 21, for example), instead use a dash “–”.
- p.3347 l.23: “greatly” does not add substance and can be removed.
- p.3348 l.5–6: Rephrase to: “In contrast, precipitation is enhanced over North Africa, the Middle-East region, Indonesia, and the adjacent oceans.”
- p.3349 l.9: replace “expend” by “expand”
- The y-axes in Fig. 1 and 2 need a label: “temperature (°C)”, as well as the x-axis in Fig. 1: “time (years)”

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