

Interactive comment on “Mid-Pliocene global climate simulation with MRI-CGCM2.3: set-up and initial results of PlioMIP Experiments 1 and 2” by Y. Kamae and H. Ueda

Anonymous Referee #1

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This paper documents the implementation of boundary conditions for the mid-Pliocene climate simulation with the MRI model, in the PlioMIP framework. It presents the climate model outputs from three simulations (Experiment 1 with atmospheric model, and two Experiments 2 with the coupled model). In addition, the authors used the vegetation model BIOME4 to simulate the equilibrium vegetation resulting from the three simulated climates. The differences in the simulated vegetation are then used by the authors as an index of the change of surface conditions. It is clear that a great amount of work was necessary to carry out all these simulations. Boundary conditions used are well detailed. The way mid-Pliocene and Control experiments were carried out is very clear. Climatic and vegetation outputs are also commented in detail. Globally,

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the paper is well structured and clear, even if sometimes the English is not very good. Tables and figures are appropriate and correctly labelled. This paper will help the model/model comparison in the frame of the PlioMIP and is of good scientific quality. I recommend that this paper be published with the minor revisions suggested in the following “specific comments”, and “technical comments”.

*** Specific comments ***

1/To my opinion, the vegetation simulations should be mentioned in the abstract, because they constitute an original aspect of this paper, which should be highlighted.

2/In the SAT section (4.2) and the discussion section (5), you mention the differences in calculated SSTs between AOGCM_NFA and AOGCM_FA simulations. Could you (very briefly) compare the calculated SSTs to the SST data? Is one simulation closer to the data than the other? (especially in the Northern Atlantic)

3/ In section 3.1.1, p 389, from line 10. If you used the anomaly method to implement your topography and SSTs in the AGCM simulation, it means you used the PRISM3D data for modern topography, which is derived from Edwards et al., 1992, and the PRISM3D data for modern SSTs, which is derived from Reynolds and Smith, 1995. These references should appear in the text and in the reference list.

4/ In section 3.1.2, p390, line 27-28. For readers who are not familiar with Haywood et al., 2010, you should precise how the anomaly is constructed.

References to add : Edwards, M.: Global Gridded Elevation and Bathymetry. In: Global Ecosystems Database, Version 1.0 (on CD-ROM), Documentation Manual, Disc-A: National Geophysical Data Center, Key to Geophysical Records Documentation No. 26 (Incorporated in: Global Change Database, Volume 1), Kineman, J.J., and Ohrenschall, M.A., eds., Boulder, CO, National Oceanic and Atmospheric Administration, p. A14-1 to A14-4, 1992.

Reynolds, R.W. and Smith, T. M.: A high resolution global sea surface temperature

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climatology. *J. Climate*, 8, 1571-1583, 1995.

*** Technical comments ***

Although I am not a native English speaker, I suggest some corrections where there are understanding issues or obvious mistakes. The manuscript quality would be improved if it could be corrected by a native English speaker.

Page 384. Line 5: "using with", remove "with". Line 6: "using of the", remove "of".

Page 385. Line 18: "studying on", remove "on". Line 19: "has focuses", do you mean "has focused" ? Line 22: "access", do you mean "assess" ?

Page 386. Line 14: "using with", replace by "using an".

Page 389. Line 6: "broader than it", remove "than it". Lines 16-17 : "Over the off the western continent". Choose between "Over the" or "Off the". Line 17: "western coast of the continent". It would be clearer to name the continent, for example "western coast of the Eurasian continent".

Page 390. Line 17 : "Mg/Ca paleothermometry shows generally", replace by "Mg/Ca paleothermometry, which generally shows". Line 22. "the all experiments", replace by "all the experiments" or by "every experiment". Line 24 : "As with the present-day condition, any modifications were applied". Do you mean : "the land/sea mask being set to modern, no modifications were applied" ?

Page 391. Line 8 : "In this study". I don't understand if you're talking about your own study or the one from Sato et al. cited just before, and the meaning of the following sentence is not clear. Please briefly explain why it is important to know that vegetation is not classified into three types.

Page 392. Line 2: "Any modifications", replace by "No modifications". Line 11: "and integrate", do you mean "then we integrate" ? Line 13: "then continue the integration", replace by "Then we continue the integration" or " then, the integration is continued".

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Lines 21-22: "with the integrations" is useless. You can remove it for more clarity. Line 25: "large drift than", replace by "larger drift than".

Page 393. Line 4: "climate data". I would rather use "climate outputs".

Page 394. Line 13: "represented", I would rather use "presented". Line 14: "patterns of them", remove "of them". Line 22: "its", replace by "the" or "their".

Page 395. Line 12: "are reached", replace by "have reached". Line 28: "They", replace by "it" or "this effect".

Page 396. Line 3: "dominated", replace by "dominant". Line 5: "are match", remove "are". Line 5-6: "land glaciers". In this case, I would rather use "ice sheets". Line 27: "It is also noting", replace by "Note also"

Page 397. Line 8: "dominated", replace by "dominant". Line 9-10: "possible mechanisms for them". I would rather say "the related possible mechanisms". Line 23: "accompanying with", remove "with".

Page 398. Lines 12-13: "any significant changes are not appeared", replace by "no significant changes appeared".

Page 399. Line 26: "the poleward shift of biomes". This sentence can lead to a misunderstanding. Not all the biomes are displaced polewards during the mid-Pliocene. It only concerns some temperate and cold biomes. For example "the poleward shift of some temperate and cold biomes". Line 27: "which are", replace by "and is".

Page 400. Line 9: "is also appeared", replace by "also appears". Line 14: "are not appeared", replace by "do not appear". Lines 19-20: "the increasing of SST are dominated", replace by "the SST increase is dominant". Line 28: "have already pointed out", replace by "have already been pointed out".

Page 401. Line 8: "are also suggestive to drastic changes", do you mean "are also suggesting drastic changes" ? Lines 9-10: "Comparisons ... frameworks...", replace

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by “Comparing the changes in the simulated AMOC and discussing the related mechanisms under PlioMIP framework...”. Lines 10-13: “Changes in surface water . . . and reproducibilities of AMOC”. It seems to me that the sentence would be slightly prettier like this: “Changes in surface water cycle including precipitation, evaporation, runoff, the associated sea-water salinity and sea ice cover, during the Pliocene compared to the Control, as well as AMOC reproducibility ...”. But this is just a suggestion. Line 12: “Pliocen”, replace by “Pliocene”. Line 15: “access”, do you mean, “assess” ? Line 26: “are suggestive of different characteristics”. I would rather say “are suggesting different characteristics”.

Page 402. Line 1: “performances of them”, replace by “model performances” Line 2: “for investigate”, replace by “to the investigation of”.

Page 409. The last reference of the bibliography list, Zachos et al., is 2001, not 2011.

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