

Interactive comment on “The HadCM3 contribution to PlioMIP Phase 2 Part 1: Core and Tier 1 experiments” by Stephen J. Hunter et al.

Anonymous Referee #1

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In their manuscript, Hunter et al. (2019) describe setup as well as first results and interpretations of an extensive set of simulations produced with the HadCM3 global climate model in the framework of the Pliocene Model Intercomparison Project (PlioMIP2; Haywood et al., 2016). The simulations encompass the most important part of the proposed PlioMIP2 simulation ensemble, i.e. the E280 and Eoi400 simulations, as well as all Tier1 model simulations and some selected simulations of Tier2. With their manuscript the authors provide a very valuable service to scientists that study the climate of the Pliocene, both with a focus on modelling and the study of indirect evidence from proxy records. The extent and quality of the work presented in the manuscript is astonishing, and I would like to congratulate the authors to achieving an impressive scientific output. While simulations and results derived by the authors have a scien-

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tific value of their own and the manuscript is hence by itself absolutely worth to be published, it must not be overlooked that additional value of the work by Hunter et al. (2019) will arise from the intercomparison of their results to those derived by other PlioMIP2 modelling groups, and those interpreted from the geologic record. Hence, it is important that the authors' work will be available in peer-reviewed form during the analysis phase of PlioMIP2.

Description of the methodology employed in creating model setup and spinning up simulations is sufficiently detailed. Derived results are generally well-presented in the manuscript with small deviations from that rule. The choice of climate variables presented in their manuscript is suitable for the task of not only providing a general overview on the derived climate states, but also to already allow the identification of interesting patterns of Mid-Pliocene climate characteristics that may be a focus of more detailed analysis in the model- and model-proxydata-intercomparison that shall follow in the framework of PlioMIP2. The discussion could potentially be covering the model results a bit more broadly.

I fully agree with the authors to also use traditional (i.e. not-any-more state-of-the-art) models in PlioMIP2. Not only do traditional models have an advantage with respect to being computationally comparably economic, which has certain advantages if one aims at providing a complete simulation ensemble to PlioMIP2. In addition, only the approach of employing a PlioMIP2 model ensemble, that at least contains some of the models that were already used in PlioMIP1, enables identification of those differences in modelling results that appear from PlioMIP1 to PlioMIP2 due to updates in boundary conditions from PRISM3D to PRISM4. Using up-to-date models has a certain disadvantage in this respect. This does not mean, of course, that state-of-the-art models should be ignored by the model ensemble, as they often provide other advantages – like, for example, increased spatial resolution and updates to model-physics and parametrizations.

In addition I would like to highlight that the decision by the authors to consider further

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simulations than those suggested for the official PlioMIP2 model ensemble (Haywood et al., 2016) is very laudable. Testing the impact of differences in incoming shortwave radiation at the top of the atmosphere and of an alternative (and likely more realistic) Mid-Pliocene orbital configuration will certainly help to test the modelling results with regard to robustness during the model-proxy-data- and model-model-intercomparison.

Based on my review I suggest the manuscript to be considered for publication in *Climate of the Past* with minor corrections. While I have no remarks with regard to the soundness of the science presented in the manuscript, and while there are no major problems with the work by Hunter et al. (2019), there are a lot of details that should in my opinion be considered and fixed before proceeding to publish a final version of the manuscript. Although there are no major problems, due to the vast amount of details that could (and in my opinion should) be fixed, I would ask the responsible editor to decide whether or not a second round of reviews is necessary despite absence of indicators for major revisions. If the editor comes to the conclusion that a second round of reviews should be aimed for, I will volunteer to review the revised manuscript once more. I am confident that the work by Hunter et al. (2019) can accordingly be improved by the authors relatively easily. Let me once more reiterate that while the amount of my comments appears large, these are mostly referring to details, and do not impede the scientific quality of the work provided by the authors.

In the attachment, I will outline the points that should be modified in my opinion. I structure these as follows: 1.) remarks regarding the model and simulation description; 2.) remarks regarding the results derived from the simulations and the related interpretations; 3.) remarks regarding the presentation of the results; 4.) remarks regarding referencing; 5.) recommendations regarding the grammar, typesetting, consistency of nomenclature, and understandability of the text. All this is followed by a page-and-line specification of smaller things that I suggest to consider. I have to admit that I myself am – presumably in contrast to the authors – not a native speaker of the English language, and hence I cannot exclude that some of my suggestions may not be the best

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one could aim at. Yet, I have the feeling that the quality of the text itself could be improved at many locations throughout the manuscript. Doing so would ensure that the valuable work provided by Hunter et al. (2019) becomes much easier to comprehend for the readers.

References:

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Hunter, S. J., Haywood, A. M., Dolan, A. M., and Tindall, J. C.: The HadCM3 contribution to PlioMIP Phase 2 Part 1: Core and Tier 1 experiments, *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2018-180>, in review, 2019.

Please also note the supplement to this comment:

<https://www.clim-past-discuss.net/cp-2018-180/cp-2018-180-RC1-supplement.pdf>

Interactive comment on *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2018-180>, 2019.

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