

Interactive comment on “Regional climate model experiments to investigate the Asian monsoon in the Late Miocene” by H. Tang et al.

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Overall this is a well put together study which examines the effect of model resolution on simulations of the Asian monsoon during the Late Miocene (specifically the Tortonian Stage).

To my knowledge no one has attempted such a study in exactly this way before so the work is novel and the subject matter is clearly suitable for publication within Climate of the Past. The authors are known for their work on modelling Miocene climate and this paper makes an important contribution.

I think the work is suitable for publication following minor revisions, which for me centre
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on expanding the discussion around some of the uncertainties in the boundary conditions and experimental design (although I generally agree with the comments made by the first reviewer as well and did not wish to repeat them here).

From modern climatological studies we know the potential importance of using higher resolution models for improving the prediction of regional phenomena such as monsoons. So one would expect that moving towards high resolution in palaeoclimate modelling studies may also help to resolve long standing mismatches between data and models. However, for the results to be robust we must have an excellent constraint on the topography at the resolution in question. Otherwise we end up simply prescribing high resolution topography into a model which has large uncertainties and so what do we really learn? To be fair to the authors they do try to address this in terms of justifying the larger scale variations they make to the TP. However, I would appreciate some discussion on the potential magnitude of the errors on these estimates. If they are significant it would raise the question of why were more simulations were not carried out to explore this uncertainty more fully?

The model is nested within a coarser resolution GCM that has been used to produce global estimates of Late Miocene climate in previous papers. That is an often used and perfectly valid approach. I would appreciate some discussion though on how well the global model performs against Miocene proxies - it does after all provide the lateral boundary conditions for the higher resolution study.

The integration time is stated as being 10 years with the final 9 being used for the analysis. This is a very short spin up time. I think the authors might want to include some diagnostics (perhaps of soil moisture in the region in question) to demonstrate that the model has in fact reached equilibrium and that no trends in the data are observed which might have a bearing on their data/model analyses).

I think that the difference made by moving to higher resolution for the Tortonian Stage could potentially have been made more clearly if the authors had performed an inter-

mediate experiment between GTORT and TORT in which the TP is retained at 70% of the present-day height. As it is there are two changes to pull apart 1) the change in resolution and 2) the change in the details of the orography. It is difficult to assess the real impact (gain) of moving to higher resolution on its own given the current experimental design. I dislike reviews that say "do more simulations" as you can follow that road forever but some discussion or an acknowledgement of that possibility for future work is in order.

As I have said these are simply comments rather than criticisms and I think overall that it is a very nice piece of work.

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