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Climate of the Past Discussions

Interactive comment on "Mid-Holocene climate change over China: model-data discrepancy" *by* Yating Lin et al.

Anonymous Referee #3

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The manuscript entitled "Mid-Holocene climate change over China: model-data discrepancy" by Lin et al. presented a study on model-data comparison by using the pollen data collection in China and PMIP3 mid-Holocene simulations. From the large discrepancy showed in model-data comparison, both in annual mean, warmest month and coldest month, they conclude that the major reason that PMIP3 simulations do not agree with data is because the vegetation distribution is not properly represented in climate models, where most models do not include dynamical vegetation and the prescribed MH vegetation map is the same as preindustrial. The MH vegetation issues have been recognised in recent years and many efforts are made to reconstruct a better MH land cover map, this includes the PAGES working group on Landcover6k. Therefore a good vegetation map from China would be expected to contribute to an

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eventual global land-cover map during the mid-holocene and benefit the paleoclimate community. However, the current work has a somewhat mislead focus and I have the following major concerns.

General comments:

1. The reconstructed mid-Holocene climate in their study is largely depend on the pollen data collection. I am not an expert on pollen data, but I am wondering if all the published data use the same standard on data process. Can they be synthesised by Webb1-7 standard and put together for comparison? I hope a reviewer from pollen community may have some insights on the data process. There are no discussion on the potential uncertainties on collected data, at least one comparison with other proxy data can provide the cross-proxy verification. The authors emphasised three original data but no detailed information, which are important if they are not published. When the significant differences are found in model-data comparisons, the uncertainties from the data should be discussed as well. One can not regard reconstruction is the truth. We need to know how reliable is the reconstructed climate from pollen data, given that the IVF method used to reconstruct the climate is a crude estimate. Otherwise it is dangerous if this paper is published and people take for granted that this is the climate (and vegetation map) in China during mid-Holocene.

2. The BIOME4 produced vegetation pattern in fig5 is determined by the input climate variables from the model, given the supplementary figures s1-s6 and previous studies by Jiang et al. (2012) have already show different climate patterns produced by different models, therefore the mismatch in vegetation pattern and reconstructed map in Fig5 is expected. I don't think this mismatch can be used to argue that the modelled MH climate is not good because they did not use a correct vegetation map and include the vegetation-climate interaction. Those vegetation patterns produced by BIOME4 are not used in PMIP experiment setup, it would make more sense if authors compare the reconstruction and PMIP prescribed landcover map, or compare BIOME4 produced vegetation map with the ones produced by those climate models (for ex-

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ample HadGEM2-ES) that have dynamical vegetation to gain some understanding on vegetation-climate feedback.

Specific comments:

1. The abstract need to provide more information from this work, now only contains motivation and conclusion. And the conclusion in abstract actually is a speculation, did not come from the results of this work.

2. Take line 49 as an example, 0.5K should be write as 0.5 K, follow SI standard, there is a space between number and unit. May correct throughout the manuscript.

3. Line 116, “The new sites”, if it is new, the data information should be described, otherwise they are unknown.

4. LIne 120, what is cloudiness, how are they measured? Because this is not a common variable, should be described.

5. Line 129, how do you determine the anomalies for biome scores? What is the purpose of this paragraph L120-L139, to produce reconstruction in Fig5?

6. Line 143 to Line 147, on description of PMIP is a bit strange, what do you mean “in which the PI experiment was denied”. “The main variability between MH and PI” should be “The main forcing between MH and PI”.

7. Line 156, "interpolated to a common 2.5 grid”, why do you think 2.5 is a common grid, given the pollen data are very local, 2.5 degree grid is too coarse.

8. Line 161-162, How do you obtain the sunshine data from observation and model? Should be described more specific.

9. Line 184, “Weighting the attributes is subjective”, will it cause uncertainties?

10. Line 191, from Zhang et al., 2010, the reference can not be found in reference list.

11. I am wondering if the warmest month and coldest month changes between MH

and PI (and between the models), or always July and January? Give there is a change in seasonality in MH, authors should mention this.

12. Line 261, “with a decrease in the northeastern regions”, also decrease in east monsoon region at Yangzi river valley.

13. Line 310-312, “this failure to capture ..”, see above general comment 2.

14. Line 320, “triggered” is a weird word.

15. Fig 7 on feedback discussion, how do you determine the feedbacks from the cloud cover or surface cover? In Line 356 the authors mentioned the “surface albedo and cloud change are calculated . . .”, I don’t understand why the changes in forcing can be regarded as feedback, physically it is a climate response to forcing.

16. Line 733, “Importance” should be “Important”.

17. Table 6, should give more information for meteorological data, how long, and give which month is the warmest coldest month, in line 742, should be “warmest month”.

18. Line 744, “stand error” means “standard deviation”?

19. Figure 1, should you mark your three original data in this map separately?

20. Figure 4, the huge annual precipitation anomaly in reconstruction, how reliable is it? I highly suspect it. The unit for precipitation is mm, does it mean annual 240 mm equal 20 mm/month? I suggest you use mm/month to avoid confusion.

21. Figure 6, Line 848 to 850, why do you give the abbreviation, they are not in the figure.

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