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Climate of the Past Discussions

Interactive comment on "The East Asian summer monsoon at mid-Holocene: results from PMIP3 simulations" *by* W. Zheng et al.

Anonymous Referee #1

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The authors analyzed some important aspects of the East Asian summer monsoon (EASM) from the simulations of the PMIP3 models for Pre-Industrial and 6ka. They also made some intercomparison between the models. This paper provides useful information about the mid-Holocene climate over East Asia and about the difference in model behaviors. It is also nice to see that the authors made an effort trying to understand the mechanisms that are responsible for the differences between the models. I recommend the following remarks to be taken into account in the revised version of this paper.

1. The EASM response in the PMIP2 models has been analyzed in Wang et al (2010). The readers would be interested to learn about the differences between the PMIP2 and PMIP3 models and to know if there is any new aspect regarding the mid-Holocene

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(MH) EASM found in this paper as compared to what has been found in Wang et al (2010).

2. I wonder why the simulated Pre-Industrial (PI) climate instead of the present-day one is used to compare with the modern observation (section 3.1, figures1, 2 and 3. By the way, which period of the modern observation is used?). As also pointed by the authors, the much lower CO2 concentration of PI (more than 100ppmv lower than present) induces significant biases in this comparison. If the authors prefer to use the PI climate to compare with the modern observation, the impact of the much lower CO2 on the possible biases in the comparisons of temperature and precipitation must be evaluated.

3. Section 3.1: The authors show that the median of the 10 PMIP3 models for the PI climate captures well the main features of the present-day EASM. It would be very interesting and useful to have an evaluation of the ability of each individual model to simulate this present-day EASM.

4. A careful model-data comparison is welcome in section 3.2 in order to see the improvements brought by the PMIP3 models, if any, when compared to the PMIP2 ones (Wang et al 2010).

5. P3258, L24: Is the 1-4°C warming in the proxy data of MH representing temperature change in summer or annual? One of the reasons that all the PMIP3 models underestimate the MH summer warming might be because all the models use the 6ka insolation. This 6ka insolation is not the strongest summer insolation during the Holocene. The maximum warming recorded in the proxy data results indeed most probably from the strongest summer insolation (when NH summer occurred at perihelion at 12ka). This is why the 12ka insolation has been used to simulate the Holocene peak climate in Yin and Berger (2010, 2012) taking into account a few thousands years difference between the forcing and response in the climate system. These should be discussed in the paper when make model-data comparison.

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6. P3258, L25-28: References should be given for “it was suggested by some proxy data that the TAS was warmer than present in the eastern China during boreal winter at MH”. The type of proxies and the uncertainties in them should also be commented. It is not sure that the simulated winter cooling at MH is a model weakness due to the lack of dynamic vegetation, because even models with dynamic vegetation simulates a winter cooling over East Asia in response to a decreased insolation in winter (e.g. Yin and Berger, 2012). Moreover, the results of Jiang et al (2012) obtained from the MH PMIP simulations show that interactive vegetation had little impact on the temperature.

7. Section 3.3, last paragraph: It is interesting to see the behavior of each individual model in simulating the summer precipitation change in China. It would also be nice to see an evaluation (even a tentative one) of the ability of individual model in simulating the MH EASM precipitation change through a comparison with reliable proxy data from different regions of China.

8. Section 4: What are the physical mechanisms that are responsible for the changes in the vertical velocity and in the water vapor content? This might be helpful for understanding the differences in the location and intensity of these two variables (Fig6 and 7) between different models and finally for better understanding the different model behaviors in simulating the EASM precipitation.

Other comments:

P3252, L23: I assume “the most important forcing” actually means “the most important forcing difference from present”

P3254, L22: Change “precession” to “longitude of perihelion”

P3255, L2: Does “the 100yr output” mean “the last 100yr model output”?

Please indicate the unit of precipitation in Fig 5b.

P3256, L12: change “green house gases” to “greenhouse gas concentrations”

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References:

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