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Climate of the Past Discussions

Interactive comment on "Relative impact of insolation and Warm Pool surface temperature on the East Asia Summer Monsoon during the MIS-13 interglacial" *by* Q. Z. Yin et al.

Anonymous Referee #2

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This manuscript attempts to evaluate the effects of strong summer insolation and enhanced SST over the Pacific warm pool region on the East Asia monsoon rainfall during the MIS-13 interglacial by a set of numerical simulations with an atmosphere general circulation model. This issue is important for our understanding of the long−term evolution mechanism of East Asian monsoon. The literature review is adequate, background of previous researches is clearly written, and experiment design is reasonable in this manuscript. I would like see that the manuscript will be given an opportunity to publish in the journal Climate of the Past after major revisions. The following is some specific comments. 1, P. 1033, L.11: The statement of "This is clearly indicated by the strongest rising motion at 35N in Hadley Cell (Fig. 5a) . . .. . ." is not correct. The

rising motion at 35N does not belong to the ascending branch of Hadley Cell. The figure actually shows the difference between the experiment of f10 and the experiment of f10 rather than a real circulation pattern, and thus the figure of difference cannot display Hadley Cell. There are similar problems in other places in the manuscripts. 2, P. 1035: As mentioned to in the manuscript, a previous study shows that the Warm Pool temperature increase can lead less rainfall in northern China and more rainfall in southern China (Zhao et al., 2000). Other observational studies with instrumental data or proxy records (e.g., Yang and Lau, 2004, Trend and variability of China precipitation in spring and summer: linkage to sea−surface temperatures, Inter. J. Climat.; Zhang et al., 2009: Reconstruction of the western Pacific warm pool SST since 1644 AD and its relation to precipitation over East China, Science China) have also obtained the same conclusion. However, the modeling result in this manuscript shows that the pure impact of enhanced Warm Pool SST slightly reduces the summer precipitation in both northern and southern China. The authors should give some explanations and discussions for the difference between the observation and their simulation. More important is that the warmer SST may actually increase rather than decrease the rainfall in southern China under a background of higher summer insolation period (see the following). 3, P. 1036: We may have a different understanding for the synergism effect. According to the authors, f11+f00−f10−f01 = (f11−f00)−(f10−f00)−(f01−f00). There is another explanation: f11+f00−f10−f01 = (f11−f01)−(f10−f00), or f11+f00−f10−f01 = (f11−f10)−(f01−f00). Here, (f11−f01) reflects the response of monsoon to insolation under the warmer SST background, while (f10−f00) reflects the response of monsoon to insolation under the control (present-day) SST background. Either (f11−f01) or (f10−f00) can be seen as a pure effect of insolation. Therefore, (f11−f01)−(f10−f00) may be explained as the modulation of the SST change over the Pacific warm pool on the insolation effect. In this way, pure effect of insolation can lead less rainfall (f10−f00) or more rainfall (f11−f01) in southern China. In other words, the response of monsoon rainfall over East Asia to insolation strongly depends on the background state of SST. As a matter of fact, all experiments were conducted with an atmosphere-only model in

this study, an atmosphere-ocean coupled model can modify the conclusion (Duan et al., 2008: Simulation of local air-sea interaction in the great warm pool and its influence on Asian monsoon, JGR). So the authors should be careful in explaining their results of numerical experiments.

Interactive comment on Clim. Past Discuss., 10, 1025, 2014.