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Climate of the Past Discussions

Interactive comment on "Modeling a strong East Asian summer monsoon in a globally cool Earth, the MIS-13 case" *by* Q. Z. Yin et al.

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We appreciate the referee for her/his comments. We answer and discuss these comments as following.

1. We fully agree with the reviewer that the paradox is not limited to EASM. We have cited a few of these other extremes in our introduction (lines 5 to 15) where we refer to 7 papers (more are given in Yin and Guo, 2007, Climate of the Past Discuss., 3, 1119-1132). It is true that climates at different places are related through teleconnections. It might therefore be interesting to analyse all these features and their causes and to see how they relate to the EASM. We have started to look at some of these extremes, but we decided to concentrate over Eastern China because it is for that region that we have an impressive set of data confirming the strongest monsoon ever recorded there over the last 1 million years. The purpose of our paper is to offer one new explanation

related to this EASM but we acknowledge that it must be confirmed by other models and that it is not the only process acting on the EASM.

2. The influence of the ocean is also something which deserves more attention, especially the SST. In our analysis we have computed the water vapour flux from the Pacific to Eastern China and showed that it increases (line 6 page 1271) in relationship to both the increase in the westward component of the wind blowing from the Pacific to the continent and also in the evaporation related to SST. However, we have to say that the response of the SST in our experiments is weak, indicating that it is not the most important factor of influence. This remains however to be confirmed by other modelling experiments.

3. Summer precipitation over East Asia

The maximum differences in precipitation between the experiments with and without ice sheets are all statistically significant when you take into account the fact that the changes here are at the 100- to 1000's of years time scale (remember that the standard of a 100-yr mean is approximately $(100)^1/2 = 10 times less than the interannual variance which can be easily estimated from the many 100-yr experiments done$).

4. The vertical resolution of LOVECLIM

Our model is based on the quasi-geostrophic approximation. The influence of topography on model dynamics is included through the boundary condition on the vertical velocity and is thus independent of the number of levels in the model (see equation 5 of Opsteegh et al. 1998). As a consequence, we can easily impose small (or large) changes in topography. The sensitivity of the model to topography could be quite high as shown for instance in Timmermann et al. (2004).Both references are already cited in the paper.

Systematic finding of results which are expected from the laws of atmospheric dynam-

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ics, gives us even more confidence to the simulations. In particular, the generation of a train-wave can be theoretically expected from the Haurwitz-Hoskins study of quasi-geostrophic atmospheric dynamics. Moreover we have compared the experiments with and without the Tibetan Plateau under geographical conditions similar than today. This shows also a result that can be expected from the thermal influence of the Tibetan Plateau. The disappearance of the heat sink in winter and the heat source in summer, both related to the Tibetan Plateau, leads to less convection in summer and less subsidence in winter over East Asia. This feature is accompanied by a number of other changes as, for example, in the omega field over the Pacific, the Atlantic and the continental northern high latitudes.

5. The suggestion to add a figure in Section 5 is very welcome to illustrate better the description of the results given in this section.

Interactive comment on Clim. Past Discuss., 3, 1261, 2007.