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Climate of the Past Discussions

Interactive comment on "Contribution of oceanic and vegetation feedbacks to Holocene climate change in Central and Eastern Asia" *by* A. Dallmeyer et al.

A. Dallmeyer et al.

anne.dallmeyer@zmaw.de

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We thank the anonymous referee very much for his/her constructive critique.

Specific comments

1.) Detailed comparison of the modeling results with palaeoclimate reconstructions and other models: A detailed comparison of the model results with reconstructions is more appropriate in model-setups with higher numerical resolution, since palaeoclimate reconstructions are sparse and based on single sites. These sites are expected to represent local climate change, particularly on and around the Tibetan Plateau due to the strong heterogeneity of the topography in the Asian region. Therefore, we will perform

model simulations with much higher spatial resolution and compare these detailed simulations with pollen records, for example. However, in order to show the consistency of reconstructions with the model results in this study, we present a comparison of the modeled mid-Holocene land cover and vegetation reconstructions. Since vegetation reflects climate conditions, this is a good estimation for the performance of the model in calculating mid-Holocene climate. In our revised manuscript, we have extended the comparison of our results with other modeling studies (in summary and discussion).

2.) +3.) +4.) We agree that further material has to be shown. Therefore, we provide additional figures and information in the text and in an Appendix (e.g. evaporation, pressure + wind) to ensure a better understanding of our results. The aim of the paper is to explore and to estimate the sign of the contribution of different factors (vegetation, ocean, synergy and direct effect) to the change between mid-Holocene and present-day climate. Since the processes influencing the Asian climate are very complex, it is not possible to identify all mechanism causing the climate change and the differences between the simulations with and without a specific factor. Furthermore, some contributions and therewith the mechanisms behind are very small. Untangling these processes would require many more detailed simulations. Here, we present the most obvious and comprehensible effects and try to explain them.

Technical corrections:

1.) Mismatches between the cited reference and entries in the reference list It is Ren (2007). We also corrected the other mismatches.

2.) RC: " The following sentences are not clear or easy to understand. Please consider reformulating, or provide additional clarification or evidences."

AC: Done. See following comments:

2.1) P. 2361 ll. 27-29: Ren (2007) reported a decline of forest cover by about 90% in North China (middle and lower reaches of the Yellow River and Huaihe River basin)

since the mid-Holocene. This domain partly corresponds to our region YANG. These numbers are an example of the mismatch between the order of magnitudes of the forest decline in reconstructions and our simulations. They do not refer to exactly the same domain.

2.2) P. 2362 ll. 23-27: Due to a later onset of the East Asian summer monsoon, the evaporative cooling in the regions YANG and INCPIN is smaller in the A6k run than in A0k run. This has a warming effect on the surface. On the other hand, 6k-orbit yields less springtime insolation in these regions, which results in cooler surface temperatures. Having opposing signs, both processes counteract, so that the net temperature change is small in YANG and INCPIN. In our revised manuscript, we write: In spring, less insolation is received at the top of the atmosphere in 6k (10°N: ca. 10.5 W/m^2; 55°N: ca. -3.5 W/m^2). Nevertheless, the areas along the western Pacific (YANG, INCPIN) experience a relatively small cooling (-0.83K and 0.2K, respectively). This can be attributed to a reduced cloudiness and surface evaporative cooling (warming effect, cf. Fig. 6) due to a later onset of the East Asian summer monsoon, which can partly compensates the temperature decline expected from the insolation change.

2.3) P.2368, ll. 20-24:

RC: "It seems to need more clarification. It is not easy for a reader to tell whether it is due to decrease in cloud cover and snowfall, or even whether cloud cover and snowfall did decrease."

AC: We now write: In winter, the contribution of the interactive ocean to the precipitation change shows a robust signal in all regions, where the direct effect is robust. In PAK (-0.06mm/day) and TP (-0.12mm/day), the ocean-induced precipitation reduction partly compensates the atmospheric response to the insolation change. The atmospheric warming attributed to the ocean likely results in a decrease of cloud cover and precipitation in YANG (-0.11mm/day).

2.4)Title: In the revised version we focus attention on the Asian monsoon region, hence

we changed the title to: Contribution of oceanic and vegetation feedbacks to Holocene climate change in monsoonal Asia.

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