Clim. Past Discuss., 5, C1174–C1178, 2010
www.clim-past-discuss.net/5/C1174/2010/

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

Received and published: 9 February 2010

We appreciate the constructive suggestions by Andrey Ganopolski very much. They certainly helped to improve our manuscript, and we have implemented all suggestions.

General comments

1.) Detailed comparison of the modeling results with paleoclimate reconstructions: We agree that a more detailed and systematic comparison with data would be beneficial. Therefore, we extend our 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. For a

more detailed comparison of the model results with reconstructions, numerical simulations with much higher resolutions are to be set up, as paleoclimate 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

We deleted the 'rather vague statement' to the reconstructed climate in the summary (page 2372).

2.) Comparison with other models: a) We agree with the referee's suggestion and we revised the summary and extended the comparison of our results with other modeling studies, including PMIP2 (see end of summary).

b) RC: "...The authors wrote "if applicable, our results are in line with recent studies". However, the authors themselves stated that this is not always the case, because previous studies disagree between each other, for example, in respect of the role of the interactive ocean for the strength of Indian summer monsoon. ..."

AC: In the introduction, we point out the disagreement between different modeling studies concerning the influence of the ocean on the Asian Monsoon precipitation (p. 2354, ll. 2-8). In the discussion part, we comment on this statement: 'Concerning the ocean-atmosphere feedback, our results confirm the conclusion, that the ocean rather suppresses the direct atmospheric response in the summer season (Liu et al. 2004; Ohgaito and Abe-Ouchi, 2007; Li and Harrison 2008)...' (p.2372, ll.10-14). This is not contradictory. In our revised version we address this issue more precisely.

Special comments:

1.) Title: We fully agree, and we changed the title to: Contribution of oceanic and vegetation feedbacks to Holocene climate change in monsoonal Asia

2.) Indeed, the study region is 60-140E, 10-55N, and we changed the latitudinal boundaries from 0-55N to 10-55N.

3.) Page 2353, lines 25,26: 'cross-equatorial ocean-land temperature gradient' just means, that regions from both sides of the equator are involved in the temperature gradient between the ocean and the land regions. The Indian monsoon circulation is influenced by the Mascarene high and Australian high (both on the southern hemisphere) and the low-pressure systems on the Asian continent (NH). We kept this term.

4.) Page 2353, l. 28.: Yes, it is vegetation and not land. We changed the formulation.

5.) Page 2355, ll. 26,27:

RC: " The sentence "the ocean was integrated as monthly mean values of SST and sea ice" is not very clear. I would rather say that "the oceanic characteristics (SST and sea ice) were obtained by interpolation of monthly mean values . . ."

AC: It is indeed puzzling. Hence, we now wrote: Thereby, the ocean (in the experiments AV6k, AV0k, A6k and A0k) was prescribed as monthly mean values of sea-surface temperature and sea-ice, taken from the present-day run AOV0k.

6.) Descriptions of the model runs:

a) RC:". . .I would suggest to use more space to give a more clear description of the methodology used in the study to make the paper under consideration self-sufficient."

AC: We improved our text to avoid any inconsistency with the description given in Otto et al. (2009). To our mind, all information, which define the factor separation, are given in the equations and in the text.

b) Page 2356, first paragraph: We agree that our description in this paragraph was not precise enough. The simulations used in this study were running for 600 model years in equilibrium. These 600 years are divided into 5 periods, with duration of 120 years each. Every 120 years, ocean (in AV and A) and/or vegetation (in AO and A) were prescribed again from the respectively runs (see p. 2356 l.20 p. 2356 l.2). The cited study of Otto et al. (2009) is based on the first period. The other periods are used in another study: Otto, J., T. Raddatz, and M. Claussen (2009), Climate variability-induced uncer-

tainty in mid-Holocene atmosphere-ocean-vegetation feedbacks, Geophys. Res. Lett., 36, 23,doi:10.1029/2009GL041457, 2009.

We added this reference to our revised text, and we modified the paragraph in: All simulations were brought to equilibrium before they were continued for another 600 years in total. To assess the robustness of our results, the entire simulation period of the final 600 years was subdivided into five subsequent periods of 120 years (Otto et al., 2009b). For each 120-year sub-period the sea-surface conditions (for simulations AV and A) and the global vegetation pattern (for AO and A) were prescribed from the corresponding 120-year period of the respective run. For example, for the first 120-year period of run A0k, sea-surface conditions and global vegetation pattern of the first 120-year period of run AOV0k were taken, and so on. Thereby individual members of each ensemble of five 120-year simulations do not have exactly the same boundary conditions. For example, the individual members of the ensemble of five 120-year runs A0k do not have exactly the same ocean and land boundary conditions.

7.) Page 2364, lines 2-3: The latitudinal gradient of temperature response to orbital forcing is presumably caused by both, latitudinal differences in insolation changes (ca. 8W/m^2 between 10N and 55N) and differences in cloudiness. In the revised version, we write: In line with the latitudinal gradient of the insolation change, higher temperatures of up to 2.26K in the northern region (NECH) and slightly higher temperatures in the other regions (0.29K in INCPIN - 0.68K in TP) are obtained (Fig.5). Besides, more cloudiness and higher evaporation rates associated with a stronger summer monsoon (except IND) cool the surface and diminish the temperature rise, particularly in YANG, PAK and TP. In IND, the contribution of the direct effect is not robust.

8.) Page 2370, lines 26,27. Indeed, the term 'elevated heat source' is used very often, we, therefore, kept this term.

9.) Fig: 9 (now Fig.14): The specification 'monsoon' in the title was wrong. We removed it.

Interactive comment on Clim. Past Discuss., 5, 2351, 2009.