

Review for revised manuscript CP-2021-17: Mid-Holocene monsoons in South and Southeast Asia: dynamically downscaled simulations and the influence of the Green Sahara by Huo et al.

The authors have addressed all comments and put a lot of effort into revising the manuscript. They carefully respond to all major issues raised by the two Referees.

They shorten the Introduction, reduced the number of figures and concentrate on the main question of the effect of a Green Sahara on the precipitation in South and South East Asia. Results are more explained than in the first version and are quantitatively evaluated against reconstructions. The sensitivity experiments with different convection schemes are shifted to the Appendix.

The manuscript is very much improved and reads much better than the first version. I agree with the publication of this revised manuscript in *Climate of the Past*, but still have some minor/technical suggestions:

General minor comments:

a) The introduction reads much better now, but is still very long. Please carefully look again through the paragraphs and try to further shorten it. It would also help to delete some sentences... For instance, in L 41 you state that the MH insolation was different from present-day. In the sentence afterwards you further describe this. This sentence (starting with During the MH...) would be enough to understand the main background. The paragraph starting at L 45 with the reconstructions is very long and it does not really help to understand your paper. You could simply say, that the insolation changes intensified the NH summer monsoons (orbital monsoon hypothesis) and that palaeo-reconstructions generally confirm this view (different references...) and then go on with the “detailed knowledge is still...”

I have the same feeling with other paragraphs, that there is just too much information given that is not necessarily relevant.

b) I have to admit that I was not precise enough in my comment on the comparison with other studies. My apologies. The authors do indeed draw references to other studies. I'm just wondering if there aren't already other studies with regional models to compare the results with. For India, I remember a study with HIRHAM (Polanski et. al. 2012), dealing also with the mid-Holocene climate.

Reference: Polanski, S., Rinke, A., Dethloff, K., Lorenz, S. J., Wang, Y., & Herzschuh, U. (2012). Simulation and comparison between mid-Holocene and preindustrial Indian summer monsoon circulation using a regional climate model. The Open Atmospheric Science Journal, 6, 42-48. doi:10.2174/1874282301206010042.

c) Unfortunately, there are very few reconstructions for South Asia. However, one could for example compare the model results with the semi-quantitative moisture reconstructions of Wang et al. 2010. I don't know if that dataset is available, though.

d) Regarding the quantitative comparison with reconstructions: It would be helpful to include a Table, showing all MRE values for the MH_{ref} and MH_{GS} simulations (regional and global model).

Specific comments:

L 23: “SA” is not defined before

L 31: “monsoon” instead of “monsoons”

L 36: Do you really mean ‘Additionally’ or should it be ‘Therefore’

L43: 'altered' instead of "enhanced", during winter NH insolation is reduced during 6ka

L44: the 20W/m², is it a mean over JJAS?

L76: A nice overview of the AHP is given in: Claussen, M., Dallmeyer, A. & Bader, J. (2017). Theory and modeling of the African humid period and the green Sahara. In *Oxford Research Encyclopedia of Climate Science* Oxford University Press.
[doi:10.1093/acrefore/9780190228620.013.532](https://doi.org/10.1093/acrefore/9780190228620.013.532)

L198: Do you mean Fig. 4c?

L215: Do you mean Fig. 5b?

L220-222: Since there are no reconstructions you can not state which model is correct. Maybe the reduction in precipitation seen in the global model is correct, maybe the increase in the regional model, but who knows?

L250-L256: Please include at least a warning on the cave records. I still think that they do not recorder local precipitation (see. e.g. Lui et al, 2014, or Maher, 2008)

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Maher BA (2008) Holocene variability of the East Asian summer monsoon from Chinese cave records: a re-assessment. Holocene 18(6):861–866

L260: In South China, about 30% of the rainfall occurs in the month before the monsoon sets in. This is the problem in most GCMs, they overestimate spring precipitation and also the decrease in spring precipitation due to less insolation during spring at mid-Holocene.... The decrease in spring precip exceeds the increase in summer precip and thus, the South China is drier during mid-Holocene than today (in the GCMs)

L271: During 6ka, perihelion occurs in September, so probably the overall insolation forcing was strongest during September, which may explain the strongest signal in precipitation simulated for September...

L278: It would be helpful to explain, why WRF-CROCO is more sensitive to the insolation forcing.

L345: Do you mean Fig 11e instead of 11k?

L411-412: ,including a GS'....'influence of a vegetated Sahara' → is the same, you can delete one of it

L430 Appendix: It would be helpful if you include 1-2 sentences on the differences in the ensemble members and why you are performing ensemble simulations (It is in the method part, but I think it is helpful to repeat it here)

Fig.11: I think, the headings of the sub-figures are not correct. The Figures are mixed up. Fig. b) and c) rather look like 850hPa winds, and e+f like 250hPa wind fields. Please check!