



EGUsphere, referee comment RC2
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Comment on egusphere-2022-890

Anonymous Referee #2

Referee comment on "How does the explicit treatment of convection alter the precipitation–soil hydrology interaction in the mid-Holocene African humid period?" by Leonore Jungandreas et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-890-RC2>, 2022

Review of the paper "How does the explicit treatment of convection alter the precipitation–soil hydrology interaction in the Holocene African humid period?" by Jungandreas et al., submitted for publication in *Climate of the Past*.

General comments

The paper discusses the simulation of precipitation during the Green Sahara period performed by using a storm-resolving set up, highlighting the effect of the interaction between precipitation and soil moisture. The paper is well written, in a clear and concise manner. Relevant literature is cited, the methodology is suitable for the purpose of the study and clearly presented, conclusions follow from evidence. Results are original and relevant for the field, and I recommend the paper for publication. However, a few minor issues should be addresses first.

My main comment is about the presentation of the implications of the results, which are very relevant for the modelling of the GS. The main finding of the paper highlights the importance of considering the precipitation–soil moisture interaction when high resolution simulations are used. I have the impression that this is not sufficiently highlighted in the abstract and in the introduction, when the objective of the paper is stated.

For instance, in the abstract the authors could add a few lines to briefly explain how run-off influences soil moisture instead of referring to a previously published paper. And make a more logical link with the following sentence.

Similarly, in the Introduction, after the description of previous results by Jungandreas et

al. (2021), a clear statement is needed of what is missing in the previous paper and what the present paper aims at.

Specific comments

L14: I don't understand how to connect the conclusions on the role of precipitation type in this sentence with the conclusions on the role of soil moisture in previous sentences. Please make a clearer logical link.

L82-87: I believe that you should not summarise here your findings. You could outline here the content of the next sections.

L110: why do you use 5 km for simulating explicit convection? Usually in CPM/storm resolving setups, 2-3 km resolution is used. Running the simulations at higher resolution would change your results?

L130: this sentence is unclear to me. Do you simulate land cover by using IFS or do you use the same land cover used in IFS (as I guess)? Please clarify.

L132-135: I don't understand how you use MPI-ESM Holocene simulations, desert fraction and the present-day vegetation to build your GS land cover. Please rephrase and clarify.

L144: which version of ERA? ERA5?

L182: in the discussion of the changes in the heat fluxes at the surface, you mention the changes in cloud cover, which are not presented anywhere in the paper. A figure is needed to illustrate cloud cover changes.

L187: moisture is not limited with regard to what? Do you mean "abundant"? Please clarify.

Section 3.1.2: a map showing the differences in the lon-lat projection would be helpful in illustrating the changes in horizontal transports.

L243: please add brief descriptions of CAPE and CIN.

L246: LFC is not defined.

Section 3.1.4: this section is not very clear in my opinion. At L252, you state that the increase of vegetation in the coastal region leads to a decrease of precipitation, which I find rather counterintuitive. I'd say that the decrease in precipitation is mostly lead by the change in the thermodynamical gradients due to the dramatic increase in vegetation in the Sahara-Sahel, in turn leading the changes in the dynamics, which you also highlight at the end of the section. Please rephrase to clarify these aspects.

Technical corrections

L75-78: the sentence does not read very well, please revise the location of commas.

L150: We.

L335: please check this sentence, something is wrong/missing.