EGUsphere, referee comment RC3
https://doi.org/10.5194/egusphere-2022-890-RC3, 2022

Comment on egusphere-2022-890

Anonymous Referee #3

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., EGUsphere, https://doi.org/10.5194/egusphere-2022-890-RC3, 2022

Summary

Jungandreas et al. report convection-permitting simulations of the mid-Holocene for North Africa. They show that without parameterised convection (-E) there is a weaker feedback between the land and the atmosphere compared to the parameterised runs because more of the rainfall falls during intense events and ends up as runoff so that less is thus available to re-seed further convection.

The paper is well written and thorough, especially because the authors include a comparison at a common resolution of 10km in addition to the main results presented at 5 and 25km grid-spacing. The simulations are analysed in some detail and the results should be of broad interest. I have a few minor comments given below, but otherwise would recommend publication of this very interesting study.

Main comments:

* At 5 km there is explicit convection but it may be more accurately named convection-permitting rather than explicit convection or storm-resolving.

* One of the major conclusions here is that the intensity of precipitation events is very different between the E and P models. This difference is shown to modify the soil moisture and hence the land-atmosphere feedbacks. One thing that is missing is any analysis of how this intensity distribution of precipitation events actually differs between the E and P models. I realise that it has already been shown in the previous work but it might help to include this here also.

* Related to this, many convection-permitting models overestimate the intensity of rainfall events (e.g. Kendon et al (2021, doi: /10.1098/rsta.2019.0547) because they do not resolve all convection at this resolution. The land-atmosphere feedbacks are dependent on this intensity, so can you comment on this potential caveat? Does ICON overestimate these downpours? More speculatively, would more-fully resolving convection (e.g. down to sub-kilometre scale resolution) address this, or could it sbring to light other effects not considered?

Minor points:

Page 7, line 147-156 and point 2: It's not clear what is meant here by the 75th and 85th percentile values? What are these used for? This explanation does not make sense to me.

The fact that the overall precipitation response is not wildly different between the explicit and parametrised convection agrees with studies of future precipitation change in Africa, e.g. Kendon et al (2019, doi: 10.1038/s41467-019-09776-9). It might be worth citing that study here.

Technical corrections:

Appendix: Please can you add the full descriptions of what each figure shows to the captions in the Appendix figures as well as writing "as in figure x". Otherwise the reader has to switch between the main text and the Appendix to understand what each figure shows.

Page 7, line 150: "Ee" should be "We".

Table 1: This values would be better at 1 decimal place. Adding an anomaly column GS - DS would be helpful.

Line 204 "Africa thus influences" -> "Africa and thus influences".

Line 366: "Also how the land surface (soil moisture and runoff) reacts to specific precipitation characteristics (drizzle or shower) needs"
->
"How the land surface (soil moisture and runoff) reacts to specific precipitation

characteristics (drizzle or shower) also needs"

Line 377: "This study highlights the importance to consider..."
->
"This study highlights the importance of considering...", or similar.