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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Influence of initial soil moisture in a Regional Climate Model study over West Africa: Part 1: Impact on the climate mean" *by* Brahima Koné et al.

Anonymous Referee #1

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Reviewer Comments Influence of initial soil moisture in a Regional Climate Model study over West Africa: Part 1: Impact on the climate mean

The manuscript describes a range of experiments to determine the impact of soil moisture anomalies on the summer (JJAS) climate of West Africa. The experiments include 3 experiments for each JJAS 2003 (a wet year) and JJAS 2004 (a dry year). The 3 model experiments are a control run using ERA20C initial soil moisture, a dry initial soil moisture state, and a wet initial soil moisture state. The impacts of these varying initial states are discussed for each year, precipitation, temperature, sensible and latent heat, the Bowen ratio, and PBL height. For precipitation, the authors found that

(generally) results agree with previous studies and homogeneous impacts are found in the transition zones between wet and dry climate regimes, though the wet experiment impacts precipitation more strongly than dry. However, the results vary regionally, for example the West Sahel and Guniea coast show increased precipitation in both dry and wet experiments. Temperature showed more sensitivity to soil moisture initialization, where dry experiments caused increased warming and vice versa. Wet experiments caused cooling of surface temperatures, smaller sensible heat flux, greater latent heat flux, and a smaller depth of the PBL which was mostly homogeneous over the region. Overall the results may be significant for future studies of soil moisture initialization over West Africa.

I think that the manuscript shows merit, and soil moisture initialization remains important for climate prediction - the authors indeed show differences in precipitation and temperature depending on soil moisture initial state; however, I have some concerns about the experiment design. I'm curious about the choice of JJAS 2003 and 2004, and if these two years allow for a robust study of the influence of soil moisture initialization. I have a number of other comments below, but I believe that this paper needs major revisions before acceptance.

Major/Specific Comments: 1. As noted above, my main concern stems from your year choices. While this results in 6 experiments for comparison, I am not convinced that the results are robust given only a 2 year sample size. Moreover, I'm curious how these years were chosen - are they extreme wet and dry years? How often do years such as these occur? How is "wet" and "dry" defined?

2. I'm not sure I understand why you discard the first 7 days as spin-up - perhaps because I'm used to prediction, where those 7 days are included in the forecast and would show large impacts of soil moisture initialization.

3. Line 152: Is a normal distribution the correct choice here?

4. Line 156 - 157: Given you only have a few experiments, a significance test would

be difficult to achieve. Do you feel that you have sufficiently large "n" to address significance? You may have enough grid points to address spatial significance (given that you modify your n due to autocorrelation, but I note in my minor comments that you should include your sample size), but temporally I don't feel the results are robust.

5. It seems that in a broad sense your results largely agree with those from Koster et al., etc. which show that the largest impacts occur in transition zones, and you note that this is poorly understood over West Africa. I'd like to see some additional explanation on the impacts of this manuscript to the scientific community - how does this manuscript provide better understanding and what could this better understanding lead to? Basically, your conclusions are more of a summary/rehashing, and I'd like to see more impactful statements.

Minor/Technical Comments: 1. I noticed a number of grammatical and spelling errors in the manuscript, I suggest having someone read and edit the manuscript specifically for editorial remarks such as these.

2. You use a number of parenthetical references such as "impacts of the wet (dry) soil moisture on wet (dry) years etc." - I do not mind these at all, but sometimes the text is very difficult to read when they are used in excess. For example, line 464-468.

3. Define the lat and lon range of your domain(s).

4. You make a number of references to differences at the "local" scale - how do these differences impact your results, if at all.

5. Table 1: What is your sample size (how many grid points?)

6. Fig. 1 and your domains, did you only include land points for precipitation and temperature?

7. You may want to consider keeping a consistent naming scheme for your experiments - I found it hard to follow at times when you had wet vs. dry years, wet vs. dry initializations, etc.

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