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Interactive comment on "Simulating the connections of ENSO and the hydrology of the Blue Nile using a climate model of the tropics" *by* M. A. H. Zaroug et al.

Anonymous Referee #2

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Review of "Simulating the connections of ENSO and the hydrology of the Blue Nile using a climate model of the tropics" by Zaroug et al. first of all, sincere apologies for this belated review. The scope of the paper is interesting in that it uses a regional circulation model to assess the influence of La Nina/El Nino on the precipitation pattern in the Blue Nile region. However, I recommend that this paper undergoes a major revision before it can be accepted for publication.

Main comments

1. The most interesting result of this paper is presented in Figure 8, where you assess

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how well RegCM4 can capture the difference between LN/EN years. However, as I can read from the figure this is not the case, in fact, the El Nino years are wetter than La Nina, not drier. Your discussion on page 2241 is wrong, since you state the opposite! I would suggest to also add the raw ERA-Interim to this figure, what is the signal of precipitation in this data, and is it different from RegCM4 results? You state something about the ensemble members having variability, what do you mean by that? Also, how was the figure 8 created? Did you take the mean of the difference of each of the ensemble members, or did you compare the difference after averaging (see also below comment?

2. This follows from the previous comment. Also Fig 11-14 (which needs to be correctly referenced on section 4.3) shows that RegCM4 cannot capture JJA precipitation, since the signal is so much weaker than in observations (Fig 12b compared with 14b). Also Fig 11b compared with Fig 13b shows a very different regression pattern between RegCM4 and observations. How about ERAInterim, which is use as the forcing model? Please add the same analysis for ERAI to fig 11-14 for comparison and deeper analysis of the results.

2. There is no mentioning on how the 9 ensemble members were created, please add this information. Please also state something about the spread of the ensemble, how well does it represent uncertainty/variability? And then, why use ensemble mean in all the analysis? Surely you will lose a lot of detail taking the average? Why not perform the analysis on the individual members?

3. In your discussion on page 2242 regarding fig 9 and 10, please add correlations with GPCP precipitation as well for comparison. Also, you state that the ensemble mean has a higher correlation than the individual members. This is surprising to me, since an averaging usually dampens the signal. I would suggest to show results from the individual members, even if they are noisy.

4.The fact that you have a correlation between SST and precipitation is great, it points

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to a potential of predictability, but if your model cannot capture this pattern, then you cannot use it for forecasting (see comment 1). It seems to me from the results that El Nino 3.4 SST is a very good indicator of precipitation anomalies, so what is the added value of RegCM4? Can it beat a simple regression model between SST and temperature? If not, then why not?

1. The paper needs to undergo a thorough language review to correct unclear statements and typos.

Minor comments:

1. P2234, L1-5. Please merge these two sentences.

2. There is no figure or thorough description of the Blue Nile, please consider to add this to the paper. Also mark the study area in figures 2-8 to aid the discussion, at least to fig 7-8.

3. P2234, L24. This statement might very well be true, but it needs to be backed up by references.

4. P2236, L6. Please rewrite: "RegCM4 (Giorgi et al., 2012) is an evolution. . .". Rewrite all ""is described by" since they are superfluous.

5. In figure 3, I assume you mean T2M in the figure?

6. P2242, Section 4.3. The references to the figures in this chapter is not correct.

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