

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.

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Reply to Anonymous Referee #1 The paper is very well organized with five main sections: An introduction in section 1 Tools and data in section 2 Validation of the simulations of the climate model in section 3 Analysis of the correlations between the ENSO and the climate for the Blue Nile region from the observations and from the simulations in section 4 A conclusion in section 5 The paper mainly described the main connections between the Nino 3.4 SST and the climate condition over the Blue Nile region. This is a good paper and it worth to be published in HESS after some revisions to improve the manuscript. My specific comments on the paper are as

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follow: 1. The topic of the study is very interesting because it addresses the connections between the large climate system and the local land surface processes through the hydrology. However, the results presented in the study are fare away from the hydrology of the Blue Nile. There is any description of the Blue Nile hydrological regime in the study. I find that the study addresses the connections between the ENSO and the climate regime over the Blue Nile region. The two sections of the results are: - Validation of model climatology over East Africa; - ENSO Connections with East African Climate. Thus, there is any section on the ENSO connection with the hydrology of the Blue Nile basin. The hydrology of the basin should be analyzed at least through the discharge data. Hence, my proposition is to change the title of the study by “Simulating the connections of ENSO and the rainfall regime of the upper Blue Nile region using a climate model of the tropics”. Thank you, the title is changed to “Simulating the Connections of ENSO and the Rainfall Regime of East Africa and the Upper Blue Nile Region Using a Climate Model of the Tropics”.

2. The last sentence in the abstract, “We thus propose that observations as well as model forecasts of Pacific SST during this season should be used in seasonal forecasting of the Blue Nile flow” is the same with the last sentence in the abstract of another study (Zaroug et al., 2013) done by the authors. It’s curious that two different studies ended with the same conclusion. As I have said before, it’s very pretention to talk about the Blue Nile flow in the abstract. My proposition is to said, “We thus propose that observations as well as model forecasts of Pacific SST during this season should be used in seasonal forecasting of rainfall over the Blue Nile region”. Thank you for catching this. Actually the two studies address the same problem from different viewpoints (modelling vs. observations). In any case, the last sentence in the abstract was slightly modified.

3. Another issue in this study is that the analyses are based on the averages on the 9 ensemble members of the simulations. The problem here is that the mean data cannot be attributed to the physic of the climate model because they are processed data.

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The best way is to make the analysis for each ensemble member and then found the most relevant runs that can be used for the connections analysis. From that, you can explain why the connection is weak or good for some runs. The add-value of this paper should be the explanation of these differences between the 9 ensemble members in the connection between the ENSO and the climate of the Blue Nile region.

Fig. 11. Correlation between rainfall anomalies over the Ethiopian Highlands (Reg-TB ensemble average and each individual ensemble member) and SST anomalies over the Pacific Ocean in the Nino 3.4 region. This comment is well taken, however the ensemble average is taken in order to minimize the effect of the internal natural variability of the model, as is commonly done in seasonal and ENSO prediction studies (Shukla et al. 2000). Note that, the correlation between Nino 3.4 and the rainfall in the upper catchment of the Blue Nile River was calculated for each member as illustrated in Fig. 11. The averaging normally dampens the signal; however in this study it gives almost the highest correlation as member 7. In addition, almost all the members except member 6 captured the documented negative correlation (Eltahir, 1996; Wang and Eltahir, 1999; Amarasekera et al., 1997; Zaroug et al., 2014). Therefore, we think that the analysis based on the ensemble average is adequate and removes noise from the system. Another important conclusion from this analysis is that the internal variability of the tropical band model is significant, and therefore it is recommended to make at least 5 simulations when using it in order to reduce the internal variability of the model.

4. In section 2, specify the differences between the 9 ensemble members. Are they different in the lateral boundary or in what? The difference between the 9 members is in the initial day of the simulation, which varies by one day. The first member starts on January 1 1982, the second on January 2 1982 and so on until the 9th member starts on January 9 1982. (This text is now included in the paper).

5. Page 2233, line 13: Seasonal forecasting of the Blue Nile flow. For which season? Please, specify the months? The months were specified as: "in seasonal forecasting of summer rainfall over the upper Blue Nile region."

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6. Page 2235, line 6: specify the period covered by the data used in the study of Amarasekera et al. (1997). The period was specified and included in the paper (during the period of 1912 to 1972).

7. Page 2236, line 17: our instead of out Done, thank you.

8. Fig. 1. Add the names of the oceans on the figure The names of the oceans were added to Fig. 1 as shown below.

9. Fig. 2-8. Add the box of the study area on the figures The box was added to Fig. 2-8.

10. Page 2239, line 9: of the Done, thank you.

11. Page 2240, line 26: to capture Done, thank you.

12. Page 2243, lines 3-4: the 5 El Niño years (1982, 1983, 1987, 1992, and 2002); Please clarify the statement made on the period of the oscillation of about 4 yr in page 2234 line 26. The oscillation of about 4 yr is the oscillation in the state of Pacific Ocean between El Niño (warm phase) and La Niña (cool phase).

13. Page 2242, lines 9-13: please put the maximum and the minimum correlation coefficient or the nine values that you have gotten from the nine ensemble members. The nine members were added as shown in comment no. 3 above.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/11/C3306/2014/hessd-11-C3306-2014-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2233, 2014.

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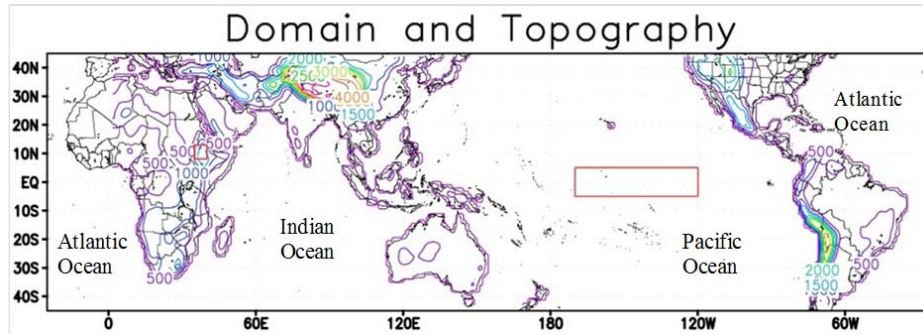


Fig. 1.

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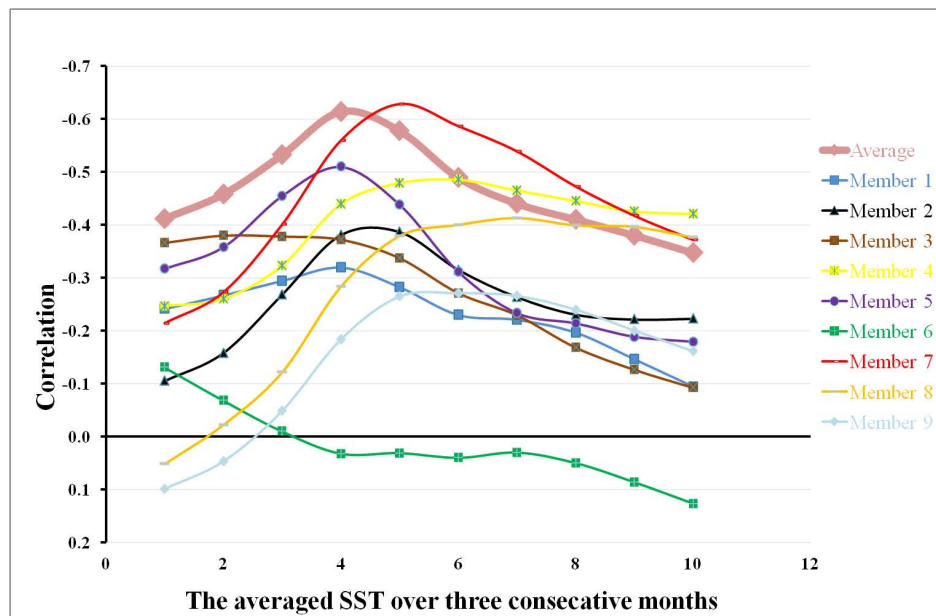


Fig. 2.

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