Reply to Editor on HESS-113 followed by answers to comments of Referee 1 and Referee 2

Editor Decision: Publish subject to revisions (further review by editor and referees) (16 Nov 2020) by Shraddhanand Shukla
Comments to the Author:
Dear Authors,

Similar to the part 1, there are still some outstanding and valid comments from the reviewers that need to be addressed before this manuscript can be formally considered for publication. Please make sure that you provide detailed response to reviewers comments and revise the manuscript accordingly. I'll try to see the reviews again as per reviewers' availability.

Thanks again,
Shrad

Author response to the editor comments

Dear Editor

Thank you for your comments and advice, as well as the reviewers who contributed with their feedback to improve the manuscript.

As suggested, we have sent the manuscript for a deep English Language editing (please see the certificate at the end of this document) to ease the reading and to avoid confusion due to language issue.

You will find in the next, our answers to the reviewers comments.

Thank you again and best wishes

Arona

CERTIFICATE OF ENGLISH EDITING

This document certifies that the paper listed below has been edited to ensure that the language is clear and free of errors. The edit was performed by professional editors at Editage, a division of Cactus Communications, in cooperation with Taylor & Francis Group. The intent of the author's message was not altered in any way during the editing process. The quality of the edit has been guaranteed, with the assumption that our suggested changes have been accepted and have not been further altered without the knowledge of our editors.

Title

Influence of initial soil moisture in a Regional Climate Model study over West Africa. Part 2: Impact on the climate extremes

Authors

Brahima Koné, Arona Diedhiou, Adama Diawara, Sandrine Anquetin, N'datchoh Evelyne Touré, Adama Bamba, and Arsene Toka Kobea

Order No.

RODIE_2

EDITINGSERVICES
Supporting Taylor & Francis authors

Signature

Vikas Narang

Vikas Narang,
Chief Operating Officer,
Editage

Date of Issue
November 30, 2020

Taylor & Francis Editing Services

www.tandfeditingservices.com
support@tandfeditingservices.com

Reply to the comments of referee 1 on HESS-113

This is the second revision on "Influence of initial soil moisture in a Regional Climate Model study over West Africa. Part 2: Impact on the climate extremes." I found the manuscript to be improved from the first, and the authors provided context on the review comments noting their experiment design. Overall, I think the results will be helpful for the field. I think the manuscript still suffers from some organizational issues, and if the authors can improve the organization the manuscript will be greatly improved.
I recommend minor revisions mostly for organization and clarity. While I only have a few comments, I think comment 1 will take some time and care to respond to.

Major/Specific Comments:

1. ***Comments:***

This manuscript is attempting to show a large amount of comparisons. For instance, the authors use 2 observational datasets that are compared, the RegCM4 control run compared to observations, stratify the analysis based on the two extreme years, and provide results based on their idealized soil moisture experiments. I appreciate the authors summarizing the results from each of their indices because it helped a lot with clarity, but I think the authors could go a step further and make it more clear what the main goal and results of this study are. i.e., Are the authors trying to mainly show the ability of RegCM4 to represent the extreme indices, the differences between two extreme years, or the idealized experiments? It could be all of these, but if that's the case I think your main points get somewhat lost in the details. In addition, while I again appreciate the authors care in comparing two observational datasets, I think it adds unnecessary information to the manuscript, and it also doesn't make sense when the authors say things like "TRMM is biased compared to CHIRPS" because they have not provided any reasoning why one dataset is preferred over the other. To sum up this comment, I think the manuscript would benefit from the authors picking a clear goal.

Author's response*: Thank you for your comment.*

First, we have sent the manuscript for a deep English Language editing (please see the certificate at the end of this document) to ease the reading and to avoid confusion due to language issue.

Then, the introduction has been improved and the objective of this paper was made clearer as follows (lines 60-74): In part 1, the influence of initial soil moisture on the climate mean was based on a performance assessment of the Regional Climate Model coupled with the complex Community Land Model (RegCM4-CLM4.5) performed by Koné et al. (2018), where the ability of the model to reproduce the climate mean has been validated. In Part 2, before starting to study the influence of initial soil moisture on climate extremes, it was necessary to assess the performance of RegCM4-CLM4.5 in simulating the ten (10) indices of temperature and precipitation extremes used in this study. This has never been done before in West Africa with this version of RegCM with a non-hydrostatical scheme; therefore, we separated the work in

two parts, a first one assessing the ability of the model to simulate the climate extreme indices, and a second one investigating how and what is the time limit of the effect of initial soil moisture condition on the magnitude or duration of these climate extremes. The manuscript is organized as follows: Section 2 describes the RegCM4 model, the experimental design, and the methodology used in this study; Section 3 presents results of the two parts of the work and Section 4 documents the main conclusions.

Finally, we added in this revised manuscript the reason of the choice of CHIRPS product for precipitation and NOAA-CPC daily temperature from the GTS as reference data used to validate the model. We removed some details in this revised manuscript.

Author's changes in manuscript: *We did this following modification in the manuscript*

At the section 3.1.1 line 183 to 185: We have chosen CHIRPS as reference in this study, because of its high resolution and mainly because this product has been widely assessed and compared with other datasets and considered as more appropriate for study of extremes events in West Africa by Bichet et al. (2018a, b) and Didi et al. (2020).

In the section 3.2.1 line 446 to 451: Fan Y. and Huug van den Dool (2008) in their work showed that the Reanalysis 2 m temperature data sets may not be suitable for model forcing and validation. We have chosen NOAA-CPC GTS observation dataset as reference in this study over ERA-Interim reanalysis, because NOAA-CPC GTS consists of a blending of satellite-based data collection and in situ data archive available in the GTS (Global Telecommunication System).

2. ***Comments:***

I'm still having some issues/concerns with your significance tests. Almost the entire region is significantly different in most of your Figures, to the point where it would be easier to show areas where there is NO significant difference. You did use a 90% confidence level, perhaps this is too low given your datasets? Is your sample size too low to form a proper significance test?

Author's response*: Thank you for the comment.* We confirm that in these figures, *only values passing the 10% significance test are dotted.*

Minor Comments:

1. ***Comment:*** As in your first manuscript, I strongly suggest very careful editing. I gave a large amount of examples in my first review, and I'm going to give 1 example here: (Line 154) The statistically significant differences has been tested between the control and the sensitivity experiments, we perform the two-tailed of the student's t-distribution at every grid points as did by Liu et al. (2014) in a similar work over Asia. Can be rewritten to something similar to the following: Significance of differences was tested for the control vs. sensitivity experiments. We used a two-tailed Student's t-test at each grid point as in Liu et al. (2014).

   Author's response*: Thank you for the comment and suggestion which contributed to improve the manuscript. As told above, we have sent the manuscript for a deep English Language editing (please see the certificate at the end of this document). Your suggestion has been taken into account. Please see lines 154-155:* Significance of differences was tested for the control vs. sensitivity experiments. We used a two-tailed Student's t-test at each grid point as in Liu et al. (2014) over Asia.

2. ***Comment:*** *Table 2: This is a lot of data to look at. Is there a way to highlight some of the values you want to draw the reader to? Such as using an asterisk, bolding, italics, etc.*

   Author's response*: Thank you for the suggestion. We highlighted the values that we want to draw the reader's attention.*

   Author's changes in manuscript: *See Table 2.*

3. ***Comment:*** Table 3: Same comment as above.

   Author's response*: Thank you for your advice. We have highlighted the values to which we would like to draw the reader's attention.*

   Author's changes in manuscript: *See Table 3.*

References:

Bichet, A., & Diedhiou, A. (2018a). West African Sahel has become wetter during the last 30 years, but dry spells are shorter and more frequent. *Climate Research*, *75*(2), 155-162.

Bichet, A., & Diedhiou, A. (2018b). Less frequent and more intense rainfall along the coast of the Gulf of Guinea in West and Central Africa (1981 2014). *Climate Research*, *76*(3), 191-201.

Didi Sacré Regis M , Mouhamed, L., Kouakou, K., Adeline, B., Arona, D., Koffi Claude A, K., ... & Issiaka, S. (2020). Using the CHIRPS Dataset to Investigate Historical Changes in Precipitation Extremes in West Africa. *Climate*, *8*(7), 84.

Fan Y., and van den Dool H. : A global monthly land surface air temperature analysis for 1948 - present, J. Geophys. Res. 113, D01103, doi: 10.1029/2007JD008470, 2008.

CERTIFICATE OF ENGLISH EDITING

This document certifies that the paper listed below has been edited to ensure that the language is clear and free of errors. The edit was performed by professional editors at Editage, a division of Cactus Communications, in cooperation with Taylor & Francis Group. The intent of the author's message was not altered in any way during the editing process. The quality of the edit has been guaranteed, with the assumption that our suggested changes have been accepted and have not been further altered without the knowledge of our editors.

Title

Influence of initial soil moisture in a Regional Climate Model study over West Africa. Part 2: Impact on the climate extremes

Authors

Brahima Koné, Arona Diedhiou, Adama Diawara, Sandrine Anquetin, N'datchoh Evelyne Touré, Adama Bamba, and Arsene Toka Kobea

Order No.

RODIE_2

EDITINGSERVICES
Supporting Taylor & Francis authors

Signature

Vikas Narang

Vikas Narang,
Chief Operating Officer,
Editage

Date of Issue
November 30, 2020

Taylor & Francis Editing Services

www.tandfeditingservices.com
support@tandfeditingservices.com

Reply to the comments of referee 2 on HESS-113

The authors have not addressed my previous concerns. See below for portions of my original comment, followed by the author response, and my follow-up comment. I still have 4 concerns with the manuscript.

1. Original comment: *"Model evaluation: The authors need to either demonstrate that the model used can reproduce precipitation or temperature extremes in the study region or provide a citation demonstrating this otherwise this model may not be a good tool for this research question. It's important that the evaluation be of precipitation extremes rather than the means or seasonal cycle (as in Koné et al. 2018) since that is what the authors are focusing on.*

> ***Author's response:*** *Thank you for your comment. The RegCM model is one of the most widely used models by the scientific community to reproduce the mean and extreme climate around the world. In this study, we evaluated its performance in West Africa for extreme climate. The model performs well in West Africa as well as in Asia for the representation of mean and extreme climate".*

Follow up comment: *Please provide a reference for this, particularly with respect to climate extremes. Replying to my comment by stating it in an author response without reference is inadequate and unsupported. I don't mean to be stubborn, but the authors' response is dismissive.*

> ***Author's response****: Thank you for your comment. Our apologies for the inconvenience this response may have caused, this was not really intentional. The model performs well in West Africa as well as in Asia in the representation of mean and extreme climate (Thanh and al. (2016); Gu H. et al. (2020); Liu and al. (2014); Diba et al. (2019)*

2. Statistical significance: *The procedure for calculating statistical significance remains unclear. Do the authors pool all points in a given year into a single distribution to test significance of the test year against the reference? If so, this makes sense, but it does not make sense how they stipple point-wise statistical significance as in the bottom panels of Figure 2. With point-wise statistical significance the authors are apparently comparing the three model ensemble observations at each point against a single reference value? It's not possible to do statistical significance using 3 observations. Using a student-t distribution with three values is not appropriate. Please clarify, how many observations are in the reference distribution at each point in space and how many observations are in the wet or dry experimental ensemble at each point in space. As I mentioned in my original comment, it's okay if the authors simply remove the statistical significance.*

> ***Author's response****: Thank you for your comment. The statistically significant differences has been tested between 2 variables the sensitivity experiments (wet or dry) and the control (reference). Assume*

X (wet) and Y (CTRL). The null hypothesis that the sample temporal means are from the same population (i.e. H0: aveX=aveY).
The procedure to calculate the significance is:
-compute the temporal means at each grid point.
- Specify a critical significance level for the student's t-distribution and test if the means are different at each grid point.
The dotted area shows changes with statistical significance of a given level.

3. Pattern correlation in Table 3: *I understand that pattern correlation is a common statistical tool, but I don't believe it's appropriate to use the pattern correlation of absolute temperature values. It would be more appropriate to conduct a pattern correlation of anomalies of each variable rather than the absolute value.*

Author's response*: Thank you for your comment. In climate modeling we often used to compute the correlation pattern between two samples (For example between model outputs and observation datasets). This spatial correlation (PCC) is computed with respect to a reference. We don't know if this is what you call computing correlation of anomalies of each variable.*

4. My final comment was for Table 3. *I believe the left columns in Table 3 should not read "TRMM_2003" but rather "EIN_2003" correct? This table is evaluating the daily temperature anomalies from the EIN reanalysis, not the TRMM observations*

Author's response*: Yes, you are right. Thank you very much. We corrected it. Please see the Table 3.*

References:

Liu, D., G. Wang, R. Mei, Z. Yu, and M. Yu(2014), Impact of initial soil moisture anomalies on climate mean and extremes over Asia, J. Geophys. Res. Atmos., 119, 529 – 545, doi:10.1002/2013JD020890.

Thanh N.-D., Fredolin T. T., Jerasorn S., Faye C., Long T.-T., Thanh N.-X., Tan P.-V., Liew J., Gemma N., Patama S., Dodo G. and Edvin A.: Performance evaluation of RegCM4 in simulating extreme rainfall and temperature indices over the CORDEX-Southeast Asia region. Int. J. Climatol. 37: 1634–1647. Published online 28 June 2016 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/joc.4803, 2017.

Gu, H.; Wang, X. Performance of the RegCM4.6 for High-Resolution Climate and Extreme Simulations over Tibetan Plateau. Atmosphere *2020,* 11*, 1104.*

Diba, I., Camara, M. and Diedhiou, A. (2019) Impacts of the Sahel-Sahara interface reforestation on West African climate: intra-annual variability and extreme temperature

events. Atmospheric and Climate Sciences, 9, 35 – 61. https://doi.org/10.4236/acs.2019.91003.

Diba, I., Camara, M. and Sarr, A.B. (2016) Impacts of the Sahel-Sahara interface reforestation on West African climate: intraseasonal variability and extreme precipitation events. Advances in Meteorology, 2016, 3262451. http://dx.doi.org/10.1155/2016/3262451.

Saley, I.A.; Salack, S.; Sanda, I.S.; Mounkaila, S.M.; Bonkaney, A.L.; Ly, M.; Fodé, M. The possible role of the Sahel Greenbelt on the occurrence of climate extremes over the West African Sahel. Atmos. Sci. Lett. 2019, 20,e927.

CERTIFICATE OF ENGLISH EDITING

This document certifies that the paper listed below has been edited to ensure that the language is clear and free of errors. The edit was performed by professional editors at Editage, a division of Cactus Communications, in cooperation with Taylor & Francis Group. The intent of the author's message was not altered in any way during the editing process. The quality of the edit has been guaranteed, with the assumption that our suggested changes have been accepted and have not been further altered without the knowledge of our editors.

Title

Influence of initial soil moisture in a Regional Climate Model study over West Africa. Part 2: Impact on the climate extremes

Authors

Brahima Koné, Arona Diedhiou, Adama Diawara, Sandrine Anquetin, N'datchoh Evelyne Touré, Adama Bamba, and Arsene Toka Kobea

Order No.

RODIE_2

EDITINGSERVICES
Supporting Taylor & Francis authors

Signature

Vikas Narang

Vikas Narang,
Chief Operating Officer,
Editage

Date of Issue
November 30, 2020

Taylor & Francis Editing Services

www.tandfeditingservices.com
support@tandfeditingservices.com