

Response - Review of the manuscript Egusphere-2022-458 (Lam et al.)

I appreciate the authors for taking into account my comments and conducting additional analysis. The scientific representation of the manuscript has improved compared to the previous version, and the results appear to be robust.

However, I would like to suggest some minor corrections to enhance the clarity of the manuscript. Some of the comments are related to sentence structures and word usage. I'd recommend that the authors review the manuscript again to check wordy sentences and correct any misuse of adverbs, which I may not have been able to identify all here.

- We express our gratitude to the reviewer for dedicating time to review the paper once again. We are delighted to observe that the reviewer acknowledges the enhancements made. In the revised and final manuscript, we have incorporated the necessary revisions to address the minor comments raised by the reviewer. Our responses to the reviewer's comments are provided in blue and in italics. The referenced line numbers in our responses correspond to the revised version of the manuscript and are indicated within brackets [xx].
- In addition, we reviewed the manuscript to address wordy sentences and improved any incorrect usage of adverbs. Here are a few examples of the modified sentences for illustration purposes:
 - [50-51] *"Unfortunately, a comprehensive ... not available yet" (improve readability);*
 - [37-39] *"Linking drought impacts ... and relevant assistance" (those two sentences were moved to the previous paragraph to ensure better alignment);*
 - [471-472] *"Drought resilience action" has been changed to "Drought adaptation strategies" to ensure consistency;*
 - *Throughout the text: the impact categories are written in italics and lower-case letters, ensuring consistency.*

Comments:

Line 10) *"Longer timescales (≥ 12 months) and the Standardized Streamflow Index were mostly present, "*

The sentence is not clear. "Present" in where?

- We thank the reviewer for this notification. With "present" we mean that longer timescales (i.e., accumulation periods) and the SSI were strongly connected to certain drought impact categories. We slightly changed the sentence to improve clarity, namely: [12] *"... were strongly represented in the list of predictors, indicating ..."*

Line 15) *"In doing so, however, spatial differences in aridity and water scarcity conditions have to be taken into account."*

I'd suggest removing this sentence or moving it to line 9, after "malnutrition.". As it is now, it is not coherent with the previous sentence. And remove "however".

- We thank the reviewer for this suggestion. However, we prefer to keep the statement at the end of the abstract as it is one of the keynotes from this paper. To improve the connectedness to the previous sentence, we changed the sentences as follows:
[13-16] *This study highlights the potential of linking drought indices with text-based impact reports, while acknowledging that the findings strongly depend on the availability of drought impact data. Moreover, it emphasizes the importance of considering spatial differences in aridity, water scarcity and socio-economic conditions within a region when exploring the relationships between drought*

impacts and indices.

Line 18) "Impactful" instead of "*Impactfull*"

- Done

Line 75) "*Strong gradients characterize the country...*"

I'd suggest "The country is characterized by strong gradients in precipitation ...".

- The sentence is changed according to the suggestion of the reviewer.

Line 108) "because of" instead of "*according to*"

- Done

Line 123) I'd suggest removing "*and also for consistency purposes.*".

- Done

Line 128) "reanalysis-based" instead of "*reanalysis*"

- Done

Line 184) The sentence "*When we compared the SPI calculated with a statistical distribution and SPI with ranking, the results were similar.*" can be removed. The previous sentence is sufficient to explain the SPI (and other indices) methodology.

- The sentence is removed according to the suggestion of the reviewer.

Line 235) About the Jaccard similarity equation: What are the A and B? When does the coefficient indicate that the two data series are statistically similar and when not?

Also, the significance test the authors applied (Chung et al. (2019)) should be briefly explained here.

- The A and B are the two sets for which you want to calculate the similarity. In this case, the difference between two drought impact category datasets. The coefficient is calculated by taking the number of elements that are common to both sets and dividing it by the total number of unique elements present in the data set. The coefficient can range from 0 to 1, whereby 0 indicates no similarity and 1 indicates complete similarity between the sets. For the significance test we applied the methods as proposed by Chung et al. (2019) which are implemented in an open source R package called "jaccard" (<https://cran.r-project.org/package=jaccard>). The following has been added to the text:

[233-235] "It measures the size of intersection of two binary sets divided by the size of the union. The equation for Jaccard similarity, comparing two impact category datasets represented by A and B, is as follows:

[237-239] "The Jaccard coefficient ranges from 0 to 1, whereby 0 indicates no similarity between the impact category datasets and 1 indicates complete similarity. To conduct a significance test, we followed Chung et al. (2019) and utilized their R package named "jaccard". In this test, we checked if the p-value was below 0.05 to determine statistical significance."

Line 238) Suggest replacing "*namely*" with "known as".

- Changed accordingly.

Line 239) "*per region with the same aridity level*" with "for regions with the same aridity level".

- Changed accordingly.

Line 249) Suggest replacing "*per drought impact category*" with "for each drought impact category".

- Done

Line 253) "*after Kuhn (2008).*" to "(Kuhn, 2008)". Just citing Kuhn is enough.

- Incorporated.

Line 253) What are the typical values for variable importance? Is the link between two

variables more significant when the variable importance is higher?

- The variable importance measure provides insights into the relative importance of different predictor variables in explaining the outcome variable. The interpretation of variable importance scores in random forest models does not rely on specific numerical thresholds or predefined “typical” values. The significance or importance of a variable is determined relative to the other variables within the model.

Line 264) Similar question to the previous comment. What are the good values for OOB, F1-score, and AUC? Are higher or lower values better? Should they be close to 1 or 0?

- We appreciate the reviewer's suggestion to enhance clarity on this matter. Here is additional information regarding the different elements:
 - OOB (out-of-bag) error: Lower values of OOB indicate better model performance, as it implies that the model is making more accurate predictions on unseen data. The OOB ranges from 0% to 100%, with 0% indicating better model performance (and higher accuracy) and 100% representing no better performance than random guessing.
 - F1-score: Higher F1-score indicates a better balance between precision and recall, implying more accurate predictions on both positive and negative classes.
 - AUC: The AUC ranges from 0 to 1, with higher values indicating better model performance.

The following has been added to the text:

(p. 14, Table 4) % has been added to the OOB column and caption.

[264] *“The OOB error ranges from 0% to 100%, with lower values indicating better model performance.”*

[271] *“... whereby higher F1-scores indicate more accurate prediction on both the positive and negative classes.”*

[273] *“The AUC ranges from 0 to 1 with higher values indicating better model performance.”*

Line 266) I'd suggest replacing "method" with "the point-biserial correlation coefficient".

- Changed.

Line 275) Wrong sentence structure. "Noticeable" is an adjective. It should be "It is noticeable that ..."

- Changed.

Line 282) Suggest adding here that Masarabit is the arid region and Nyeri is the sub-humid region.

- We have added the following sentence to the manuscript: “Specifically, Marsabit represents an arid region, while Nyeri is classified as sub-humid”.

Line 283) "Noticeable" to "It is noticeable that" or something else.

- The start of the sentence is changed to “It is noticeable that”.

Figure 2) I wonder whether it would be possible to enlarge the labels on the x-axis (years) for the SPEI indices. The font is too small and not well visible when the manuscript is printed.

- The font on the x-axis (years) are slightly increased.

Table 3) Not the "statistical significance" is marked with asteriks. "The coefficients that are statistically significant (with a p-value less than 0.05)" are marked.

- We changed the caption of Table 3 to the following:

(p. 12, Table 2) *“The correlation between the impact categories, as measured*

by the Jaccard similarity. The coefficients that are statistically significant (p value < 0.05) are marked with asterisks, following the methods proposed by Chung et al. (2019)."

Line 293) Suggest changing "SPEI-12 values lower than 0" to "negative SPEI-12". Also, remove "which is prevalent" just leaving "between April 2016 and March 2018".

- Done

Line 294) Again, suggest changing "SPEI-12 values lower than 0" to "negative SPEI-12".

- Done

Line 295) "drought impact occurrence does not happen simultaneously with the drought time period of the other accumulation periods, except for SPEI-24".

So, does this mean that except SPEI-24, other drought indices with different time scales (or accumulated periods) do not occur simultaneously with drought impacts, right? The sentence is confusing. I'd suggest something like:

"In general, drought impact occurrence happens simultaneously with SPEI-24 but not with the drought indices with other accumulation periods."

- We thank the reviewer for this notification. To enhance clarification, we changed the two sentences as follows, whereby we also address the comment below:

[303-305] *"In general, drought impacts show alignment with SPEI-12, but not with SPEI values based on other accumulation periods. The majority of the analysed impacts occurred after the onset of drought identified with accumulation periods of less than 12."*

Line 296) "In particular" does not fit here well. The connection is not very smooth from the previous sentence. Do you mean "moreover", "Also" or "In addition"?

- See above.

Line 301) Suggest replacing "have" with "shows"

- Done.

Line 302) Suggest replacing "other relations" with "other impact categories", and "have" to "show".

- Done

Line 305) "This" is confusing. Suggest replacing "This is done..." with "the analysis is performed (or done) for the period of ..."

- Replaced with [312] *"The analysis is performed for the period of March 2018 to December 2020 due ..."*

Line 317) The sentence "The RF models have been trained on 75% of the data and tested on 25% of the data." can be removed as it is already in the method section.

- The sentence is removed in accordance with the suggestion of the reviewer.

Line 320) Same as my question for line 264. So, close to 1 means better performance? Figure

5) Mention that the values on the x-axis are different for each category.

- The interpretation of the OOB error, F1-score and the AUC are added in the method section, see our answer on the comment above. At the caption of Figure 5, we added that the values on the x-axis are different for each category:

(Table 5) "The scale of the x-axis differs for each category".

Figure 4-6) Change "importance" to "variable importance".

- The figures are changed and included.

Table 4) Include in the caption what "Discussed" indicates. (That the authors are selecting only those indices and categories that are also statistically significant in the point-biserial correlation analysis).

- We thank the reviewer for this suggestion. We added the following to the caption of Table 4:

(p. 14, Table 4) "The last column indicates the variables that are discussed, determined by two criteria: (1) the performance of the RF model on the test dataset and (2) the similarity with the point-biserial correlation."

Line 344) "namely" does not fit here. Suggest something like "which are".

- Done

Line 354) Remove "namely".

- Done

Line 356) "Although the slightly underestimation of the MSWEP data compared to CHIRPS over East Africa" to "Although there is a slight underestimation of precipitation in MSWEP compared to CHIRPS, ..."

Line 359) Remove "namely".

- Done

Line 359) "different per county," to something like "depending on the county".

- Done

Line 361) "months" to "period".

- Done

Line 362) "reliable list" to "reliability"

- Done

Line 363) Remove either "data" or "information". "Data information" is wordy. Line

364) "Europa" to "Europe".

- Done

Line 364) "assess" means "estimate, measure". I don't think this verb fits there. Change to something else.

- The word "assess" has been changed to "explore".

Line 371) Mention the point biserial technique too as this method was also used. Suggest something like "Random Forest technique in combination with the point biserial correlation analysis... "

- Done

Line 375) "This study confirms this,". What does the second "this" mean? And I'd replace first "this" with "our".

- The second "this" means the findings of the studies mentioned earlier. For clarification, we changed to sentence to the following: [382] "Our study further validates these findings, as ...".

Line 379-381) "deviations in the link between drought impacts and indices among the counties, making the model perform worse when the counties are combined together (i.e., the models in relation to the semi-arid regions)."

So does it mean that aggregation can affect the result because the links between drought indices and impacts may differ for each county? But how can the authors make this claim if the analysis in finding the link is only performed by using aggregated regions? (or was the analysis also performed for each region individually from the beginning?)

Also, This part of the sentence is confusing "deviations in the link between drought impacts and indices among the counties". If this means that each country may have a different link, please be more explicit.

- We thank the reviewer for the suggestion to improve clarity on this matter. The link between drought impact occurrence and drought indices is highly specific to each impact category and region according to aridity levels. Since the regions are grouped based on aridity levels, it is possible that the models would perform better when focused on each county separately as the data would be more county specific in terms of drought types and impact occurrence. However, we have not specifically addressed

this aspect, so there may or may not be a direct correlation. To improve clarity, we changed the sentence to the following:

[387-388] "... and (2) potential variations in the link between drought impacts and indices across the counties, which could result into decreased accuracy when counties are aggregated.

Line 383) "in accordance with" to "related to".

- Done

Line 395) Throughout the text, the authors sometimes use British English spelling and at other times U.S. English spelling (analyze vs analyse). Be consistent.

- We appreciate the reviewer's notification. The reviewer has identified several grammar mistakes, and we have conducted our own grammar check to address them accordingly.