

21 Jan 2022

Executive Editor decision: Publish subject to minor revisions (review by editor)  
by Joaquim G. Pinto

Comments to the author:

Dear authors, thanks for the revised version of the paper.

Both reviewers state that the paper has improved, but they still have some comments that need to be taken care of before the manuscript can be accepted for publication in NHESS. In particular, I agree that the title is indeed too long and should be revised.

Please revise the manuscript accordingly and provide the corresponded replies.

best regards,  
Joaquim Pinto  
(liason editor)

January 26<sup>th</sup>, 2021

Dear Editor and Reviewers,

We are sending you the second revised version of the manuscript -ref: **NHESS-2021-121-** and entitled (new title) “An approach to identify the best climate models for the assessment of climate change impacts on meteorological and hydrological droughts” by Antonio-Juan Collados-Lara, Juan-de-Dios Gómez-Gómez, David Pulido-Velazquez, and Eulogio Pardo-Igúzquiza.

We would like to express our sincere gratitude for your in-depth revision that unquestionably helps us to improve the manuscript as well as the opportunity given by the Editor to submit a revised version.

We have taken into account all the comments raised by the reviewers and we have provided explanations with our answers to the reviewers’ comments in the response document. The new version of the manuscript was also reviewed by a professional English translator.

Thank you very much for your time and consideration.

Yours sincerely,

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### REVIEWER #3 (Report #1)

Dear authors,

Thanks for your reply and efforts to improve your work also based on my previous comments.

My only criticism is that the title is still too long and discordant. Besides, "basic statistics" sounds too vague. Please make a further little effort to improve the title.

We thank the Reviewer for recognizing efforts to improve your work and for the recommendation of publication. We modified the title according the suggestion of the Reviewer:

An approach to identify the best climate models for the assessment of climate change impacts on meteorological and hydrological droughts

### REVIEWER #4 (Report 2)

1 Overview

The authors study whether RCM simulations that provide the best approximations of the local meteorology also provide the best assessments of the local hydrological impact. The authors propose a methodology that briefly follows these steps: the bias in RCM control simulations is corrected, hydrological series are estimated through a rainfall-runoff model those inputs are the bias-corrected RCM meteorological data, the RCM models are classified, and lastly, local future climate scenarios are generated with the best RCM models and results are analyzed. The originality of the paper, as well as the scientific soundness, is suitable for *Nat. Hazards Earth Syst. Sci.* The paper is well-written and well-organized. I recommend the publication after some minor changes.

We thank the Reviewer for recognizing the quality of the paper and for the recommendation of publication. We have taken into account all the comments raised by the Reviewer below.

2 Observations

My main observations are:

- Eq. (1). The equation should be written as follows:

$$SE = \frac{1}{\left(\frac{1}{N} \sum_{i=1}^N S_{h,i}\right)^2} \frac{1}{N} \sum_{i=1}^N (S_{c,i} - S_{h,i})^2$$

Done.

- The Case study is the Cenajo basin. The authors should indicate whether there are dams in the studied area since dams must be taken into account in the rainfall-runoff model. If there are any dams, the authors should explain how they are taken into account.

Thanks to the reviewer comment we have realized that we did not explain well this point. The rainfall-runoff model provides runoff series in natural regime. We have used historical runoff data in natural regime by using the streamflow series from the SIMPA model to calibrate the Temez model. SIMPA is the model used by the water authorities in Spain for water planning. It was calibrated previously by restoring the gauge stations to the natural regime. So we have assessed the impacts on the streamflow series in natural regime (available resources) in the basin, thus not having to take into account the dams in the basin. We have corrected the text in section 3:

We also used official monthly natural streamflow data within the Cenajo basin for the historical period 1972-2001 (adopted as reference). The SIMPA model streamflow series (Alvarez et al., 2005) were used as historical data for calibration, due to the highly altered flow regime measured in gauge stations within this basin. Note that in the studied basin there are several dams. SIMPA is the model used by the water authorities in Spain for water planning. It was calibrated previously by restoring the gauge stations to the natural regime. Therefore, we assessed inflow scenarios in natural flow regime in the basin. These data were taken from the available information from the Spanish Ministry for Agrarian Development and Irrigation.

And added reference:

Alvarez J., Sanchez A., Quintas L. (2005). SIMPA, a GRASS based tool for Hydrological Studies. Proceedings of the FOSS/GRASS Users Conference - Bangkok, Thailand, 12-14 September 2004. International Journal of Geoinformatics. Volume 1, no 1 march 2005. Association for Geoinformation Technology.

• *Line 191. Is the period 1972-2001, or 2071-2100?*

Corrected:

The model was used to propagate the impact of climate variables on the streamflow between 2071 and 2100, a 30-year horizon, which is a period of time usually used in climate change analysis.

• *Line 301. The authors state that they have demonstrated in a case study that the corrected... I do not totally agree with them on this sentence. They don't demonstrate that their methodology will provide the best results as they do not check their approach with many basins. I rather write the statement as they have shown in a case study...*

Done:

We have shown in a case study that the corrected RCM simulations that provide the best approximations of the meteorological statistics also provide the best approximations for the hydrology.

*This comment also applies to line 348.*

Done:

We have also shown that the corrected RCM simulations that provide the best approximations of the meteorology also provide the best assessments of the hydrological impact.

### 3 Typos

Thank you. All the typos were corrected in the new version of the paper

There are some typos in the paper. Some are:

- Line 42. *Although in the recent years.*
- Line 43. *please, add a space between “increased” and the parenthesis.*
- Line 136. *Please, remove the s at the end of “respect”.*
- Line 147. *Please, change “to” for “with”, i.e. “in accordance to with this total”.*
- Line 233. *Please, add a hyphen between “best” and “corrected”.*
- Line 243. *Please, rewrite “the impact of climate variables to on streamflow”.*
- Line 245. *Please, rewrite “an increase of in”*
- Line 248. *Please, add a space between “in” and “the”.*
- Line 251 *Please, rewrite “decreases of in”.*
- Line 284. *Please, add an article to the sentence: “It is accepted in the scientific community ...”.*
- Line 297. *Please, add an space between “up” and “in”.*
- Line 322. *Please, rewrite “could be important for analysing to analyse”.*
- Line 340. *Please, rewrite “the performance for of”.*
- *Reference. Please, revise the list of references. The journal names of some references are missed. For instance, references in lines 383, 393, 403, 405, 436, 437, 441, 470, 484, and 491. moreover, doi link in the reference of line 405 does not work.*