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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate change effects on the hydrology of the headwaters of the Tagus River: implications for the management of the Tagus-Segura transfer" *by* Francisco Pellicer-Martínez and José Miguel Martínez-Paz

Anonymous Referee #2

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The paper proposes a methodology for study the effect of climate change and its repercussions on one of the most important water transfers between basins in Europe. To do this, a simple hydrological model (ABCD) is used in the donor basin to analyze the behavior of its components, trying to improve some problems (such as spatial aggregation or incorporate a snow model); after calibrating the model with the algorithm SCE-UA, they simulate and predict the behavior of the system from an ensemble of AR5 models regionalized by the AEMET, observing important reductions in the snowfalls and snow covers, the recharge of aquifers and the available water resources.

a) GENERAL COMMENTS:

I think it's a very relevant topic in semi-arid environments. In these areas, water resources play a very important role, affecting all economic sectors. In this sense, transfers in the Iberian Peninsula have become a factor of territorial disputes over water, and science must have a relevant and objective role, and ultimately, as an impartial arbiter.

Therefore, it is important to carry out this type of study. I believe that the results obtained are very relevant, but I also want to highlight the proposed process. The reproducibility of the process to other basins is very important because it can be used as part of integrated water resources management.

Regarding the scientific evaluation of work, I believe that the paper address relevant scientific questions within the scope of HESS. I believe that the topic is of significance with some degree of originality, and it is relevant to Hydrology and Earth System Sciences. The authors make a clear and concise description of the research problem considered. The introduction and the state of the art were selected correctly, covering current references. They justified the choice of method and the clear connection with the framework. The information sources were collected correctly. As a result, the research objectives are met, obtaining interesting and relevant results for the problem addressed (transfers between basins and their behavior in the future) that can have a significant impact on the topic.

However, the paper presents some aspects that must be reviewed. I will state the improvements that the authors must attend to.

SPECIFIC COMMENTS:

C.1.- First page: Change Fancisco by Francisco.

1. Introduction C.2.- In introduction, the authors introduce the reader to the problem in an appropriate way. However, I believe that the work process is also relevant. After reading the methodology I deduce that they have used Open Source tools. It may be

interesting to include this aspect in the objectives: use of Open Source and free tools to obtain a reproducible process.

Alternatively, they can include this aspect in the conclusions. I believe it is a significant improvement of this work.

C.3.- Figure 1: Do the authors generate the information? If not, they should refer the source in the title.

C.4.- Figure 2: Include the source.

C.5.- Page 6: I think the introduction to this section and Figure 3 are right for a better understanding. However, it should be completed with a paragraph on the implementation of the process: Tools used and interoperability between them, is the process reproducible? They should comment on the programs used (GIS, program for data analysis, etc.)

C.6.- L.8, page 6: I deduce that the authors use ABCD because it is a model that simplifies the process, allowing its understanding with good performance results. I think they should say it in this paragraph, before citing the improvements they make; I agree, it is a model with some problems, such as spatial aggregation.

C.7.- L.3, page 9: The authors use the DEM but they do not explain why. I think they have used it to generate the sub-basins. They must explain it and cite the method used. For example, the D8 algorithm (O'Callaghan et al., 1984).

C.8.- L.11-18, page 9: Why do they use the period 1980-2009? The authors must justify it in the text.

C.9.- L.11-18, page 9: Why use Spain02v5 ?. The authors must clarify it in the text.

C.10.- L.19-29, page 9: The authors have done ensembles based on different models. If so, they must include some agreement metrics of the ensemble.

C.11.- L.19-29, page 9: The authors perform an interpolation of point data to improve

their spatial representation. Although it is not the objective of this work, they should briefly describe this process.

C.12.- L.33, page 9: "... no significant differences ...." Is a statistical test performed to evaluate the significant differences? If not, you should change this phrase to: "...relevant differences..."

C.13.- Figure 6: The caption is incorrect, this figure represents the SIMGES scheme. Change the caption.

C.14.- Table 1: The caption of the table and the title of the first row are the same. Authors can shorten the title to improve the presentation of the table. 5 Results

C.15.- Table 2 and paragraphs related to it: I believe that the result of the adjustment is sufficient at the outlet from the basin to use the model with the RCP scenarios. However, they should comment, when describing the behavior of the components of the model, that a greater uncertainty in some sub-basins should be taken into account (it is observed in the agreement in the validation). I believe that there is greater uncertainty in the headwater basins, probably derived from errors in the validation data (the validation series starts in 1985). This fact can explain the agreement of the calibration against the validation in these basins, while in the output the adjustment is greater. In this period it is probable that the data observed in the output have higher quality compared to the intermediate stations, due to the importance of monitoring at the beginning of the Tajo-Segura transfer. In this period, the data observed are probably more reliable in the output compared to the intermediate stations, due to the importance of monitoring the Tajo-Segura transfer (initiated in the 1980s). However, the reliability of monitoring stations has improved today.

C.16.- Figures 8 and 9: Authors should consider improving the quality of figures. 7 Conclusions

C.17.- L.4-6, page 19: The authors could include in this paragraph the recommendation

in commentary C.2.

References:

C.18.- The authors should review the format of the references, there are some problems. For example, capital letters in the name of some articles. c.19.- Reference Gomariz-Castillo et al. (2015): The authors should change this reference with: Gomariz-Castillo, F., Alonso-Sarría, F. & Cabezas-Calvo-Rubio, F.: Calibration and spatial modelling of daily ET0 in semiarid areas using Hargreaves equation, Earth Science Informatics, 15, 1–16, https://doi.org/10.1007/s12145-017-0327-1. 2017

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