

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1  
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## **Comment on hess-2021-548**

Anonymous Referee #1

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Referee comment on "Declining water resources in response to global warming and changes in atmospheric circulation patterns over southern Mediterranean France" by Camille Labrousse et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-548-RC1>, 2022

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The manuscript by Camille Labrousse et al. investigated the relationship between the atmospheric circulation patterns, water discharge, and drought indices from both the past and future perspectives for six coastal river basins in southern France. I can see the potential implications of this study, while there are some concerns from my perspective. This manuscript conducted the statistical analysis, including k-means clustering, wavelet analysis, and correlation analysis, and the results are largely dependent on such statistical analysis. However, the description of how such statistical analysis is used for this case is not well elaborated. It makes it hard to assess the quality of results. Moreover, to what extent the results from the statistical analysis can be explained from our physical-based knowledge and corroborated with other references? I think it is better to elaborate on this perspective to get the results more convincing. On the other hand, the focus of this manuscript is not clear and thus it is somewhat difficult to follow. Please find below my specific comments.

### Abstract

As the authors state "...little is known about the relationships between these indices, water resources and the overall atmospheric circulation patterns.", I am assuming that the authors want to present the readers something about this knowledge gap. From the current form, however, it is now quite well organized and clear to me. I understand that the authors can be aware of the potential uncertainties and limitations of such kinds of studies, while it is not well elaborated from my perspective. It seems to me that the authors want to highlight such relationships and the decrease of water discharge under the future climate scenario conditions. While the projection of the future is with uncertainties and is dependent on how well we can reproduce the historical hydro-climatic

evolution results. Thus, please consider making a balance and linkage between the results from the past and future.

## 1 Introduction

Line 45-51: The authors state that the specific evolution of future surface water resources in response to climate change may strongly depend on morphology. However, to me, the factor "morphology" is not well investigated compared to the air masses of origins. Please consider making a clarification regarding the morphological effects of this study.

## 2 Materials and Methods

Figure 1: from my current understanding, there is rarely a whole catchment belonging to the Western/Eastern cluster. please explain how did you do to conduct the correlation analysis between teleconnection patterns and water discharge, with the Western and Eastern clusters separately considered, e.g., in Figure 3. How the water discharge is determined for the Western/Eastern clusters? Are there relevant measurements?

### 2.3 K-means clustering

Line 115: please consider making an explanation of the dependence of K-means clustering on the initial conditions and how do you deal with it in this study.

Line 123: the words "see below" are not that clear to the readers, please consider making clarifications.

### 2.5 Wavelet analysis

This section, to me, only presents a general description of the wavelet analysis and does not detail how the authors did and the specific setups or considerations for this study.

I also feel confused about "wavelet analyses with a Morlet wavelet" and "univariate wavelet analysis", "cross-wavelet analyses" in Section 3.2. please consider making the clarification or make it consistent.

Table 2: it is said that there are 6 regional climate models (RCMs), while only 5 RCMs are presented in Table 2. Please have a check or explanation.

### 3 Results

Line 210: is there necessary to elaborate on the words "more complex"? what are the complexities for Mediterranean TPs and coherence with water discharge?

Figure 4: the x-axis and y-axis are missing, please add.

Line 282: please explain "Although the models did not catch the strong decrease of WeMO in the past,

they nevertheless predict that the general evolution towards lower values of this TP will persist in the future.". what are the underlying rationales?

### 4 Discussion

Please consider using subtitles to make it more organized and readable.

Table 4: it seems that "REMO2009" is not explained before. Please check.

Please have a check about the unit of the annual water discharge.

## 5 Conclusions

The conclusions, to me, want to stress the results from the future perspective. However, as the authors said, the representation of the Mediterranean TPs is not satisfactory based on the observation. I am not that convinced by the conclusions regarding the future simulations. Please consider making a more solid explanation or elaborate on the limitations in more detail.