

## ***Interactive comment on “Mediterranean Specific Climate Classification and Future Evolution Under RCP Scenarios” by Antoine Allam et al.***

**Anonymous Referee #2**

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**\*\*General comments\*\***

This article attempts a new classification of the Mediterranean climates using the most recent WorldClim dataset. It also attempts to study how climate change will change the climates of the area of study. This is an interesting object of study, but the article cannot be published without a complete rewriting and improvement of the methods used. Thus, I recommend it to be rejected and resubmitted again in the future.

The main problems of the article are:

1. Incomplete introduction.
2. Insufficient literature review.

C1

3. Messy document structure. Many paragraphs are in the wrong section and/or are incomplete.
4. Methodology insufficiently explained.
5. The article proposes its classification for hydrological purposes, but I do not see any hydrological specificity in the indices and methods used.
6. The catchment based classification seems unnecessary. Its utility should be justified or it should be removed.
7. Some decisions are not well justified (index selection, use of delta change approach, etc.).
8. Insufficient discussion of the results. A Discussion section is necessary.
9. The classification is not sensitive to climate change (the scenarios are very close to the baseline map). Is this a sign that climate change won't have much impact? Or that the method is unable to represent this changes?

**\*\*Specific comments\*\***

In my specific comments I will only comment the structural problems. I will not mention the many language issues, such as missing commas or orthography.

Introduction

- Expand the introduction to provide more context and better describe relevant literature.
- P2L13: You should mention that MED-CORDEX is a HyMeX initiative.
- P2L15: Start new paragraph when discussing RCP.
- P2L15-L29: This should be moved to the dataset section, where you describe the Med-CORDEX simulation.

C2

- P2L30-P3L2: Expand. Explain the methodologies that are used, their pros and cons, etc.
- P3L7-L10: Move to datasets section.
- P3L11-L21: Move to Methodology section.

#### Study area and database

- You describe the different methods to determine the geographical extent of the Mediterranean area, but you do not justify your choice.
- P3L29: Are you sure that "Ecumune" is the right word in this context? To my knowledge Ecumene is the "known world" of the Romans. It seems a more historical term that a geographical one.
- P4L16: "a personal way" is not correct here.
- In "Climatic data" you must justify that WorldClim is appropriate in the Mediterranean. Is the number of stations used by this dataset high enough all over the area?
- P4L31-L32: Move to methodology.

#### Methodology

- This section is insufficient as it is. You spend more time explaining the history of the methods than describing how you applied them. You should explain all the details so anyone can reproduce your work. You should remove text about the history of the methods and add text detailing you own implementation details. This applies mainly to PCA and K-Means clustering. How do you apply the PCA? How do you normalize the variables? ...
- Some text that should be in this section is found in other sections and vice-versa.
- P5L13: there is no need to talk about taxonomy.
- P5L18-L29: This belongs to the Introduction. You should explain and compare the

C3

#### methods.

- P5L30-L32: This belongs to the Introduction.
- P6L5-L6: delete the titles of the books. You already provide the citation in the bibliography: "... we advise to consult Krzanowski (1988) and Jolliffe (2002).
- P7L6: can you better explain the part about kernel 1? I don't fully understand.
- P7L10: Here you talk about validation. There should be a subsection in Methodology about the validation method.

#### Section 4

- You should rename this section "Results".
- P7L22-P8L7: you should move this subsection to the Methodology section. Furthermore, you must justify your selection of indices. Why did you choose these indices? Why are they relevant in the Mediterranean? Why are they relevant for hydrology? Did other studies use these same indices?
- P7L22: what do you mean by "subjectively developed"?
- P8L9-L10: You should explain the reduction of indices by means of the correlation matrix in the Methodology section.
- P8L11-14: These results are for catchments or for the grid?
- P8L23: Change subsection title to "4.3. Catchment based classification".
- P8L24: how did you choose 5 classes? Is this arbitrary?
- P8L31: "from the southern tip of Spain to Syria".
- P9L13: Remove 4.4 subsection title.
- P9L14: Change title to "Grid base classification" and change numbering from 4.4.1 to 4.4.

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- P9L21-L29: There are many problems here. First, in the data section you don't mention where you obtained the data on the limits of the olive tree geographical domain. Also, I don't see how you conclude that the comparison between the olive domain and your classifications validates the classification. Looking at the maps I don't see that they match well. The olive tree distribution also depends on geology and human practices. I don't see that you can predict the olive tree area using your classification map.

- P9L20: promote the heading one level to 4.5.

- P10L6: How did you divide the data into two subsets. Randomly?

- P10L5: Promote the heading one level to 4.6

- P10L12: Integrate these results into the Results section (4.7).

- P10L13: The delta change approach must be explained in the Methodology. Also, you need to justify that this is the right approach, as you are using percentiles and the delta change approach may produce unrealistic percentiles, such as P75%. Don't forget that the delta change approach only changes the mean of the distribution, but climate change may change the mean and the extremes differently.

- P11L3-L5: I don't understand what you are trying to convey with this paragraph.

- The main result I see in the climate change part is that there is almost no change. This may mean that your method is not sensitive to climate change, or that there is almost no impact of climate change. I guess the right answer is the first one, which means that maybe your classification is not good enough. You should elaborate on that.

A Discussion section is missing before the conclusions.

Conclusions

- Re-write once the other issues have been solved.

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Figure 1

- I don't understand the existence of non Mediterranean enclaves within the Mediterranean area. Look at the "islands" found in, for example, Tunisia or Libya.

- Is this Köppen classification made using WorldClim data? You should mention the data source in the datasets section. Same for the Olive Cultivation Boundary.

Figure 4

- I don't find this catchment based classification interesting. Why is interesting to have the whole Rhône, Ebro or Po with the same climate classification when they have diverse climates?

- I cannot see the blue line. What does CAT mean?

- I can't see the green olive domain line.

Figure 5

- I don't understand why the Ebro basin is class 4, as is the coastal area. If you look at the Köppen classification you'll see that the coastal area and the Ebro valley are classified differently, as they have different climates and vegetation types. The same happens with the Rhône and the Po.

- I can't believe that the Alps have the same climate than the Po valley. Your method does not take into account the different climates found at different altitudes.

- I don't understand the yellow area close to Austria, in Italy. You should explain and discuss these missclassifications in the results and discussion sections.

Figure 6

- I see two yellow points in NW Spain. That area has an Köppen classification Cfb. Their climate is very different to the climate of Sicily, for example! I guess this results is due to the fact that you trained your method with data in the Med basin and, thus, the

C6

method cannot deal well with climates situated outside the domain. If you want to use stations outside the domain, you must train your method with data outside the domain.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-381>, 2019.