

Interactive comment on “Specific Climate Classification for Mediterranean Hydrology and Future Evolution Under Med-CORDEX RCM Scenarios” by Antoine Allam et al.

Christophe Cudennec (Referee)

cudennec@agrocampus-ouest.fr

Received and published: 30 April 2020

The draft paper is promising as it addresses important hydroclimatic questions, with innovative approaches over the whole Mediterranean basin. Methodology and results are convincing and of high quality. The presentation and discussion can be improved.

Perspectives are strong for follow ups on the hydrological aspects as announced in the conclusion. Yet it is here essentially dealing with climatic aspects and the links and orientations to hydrology are claimed with few justification. These should be made more explicit: how are the chosen climatic indices "hydrology driven" (section 3.1)? And how are the indices dealing with precipitation seasonality specific to the Mediterranean

C1

hydroclimatic/hydrometeorological context (L203)?

The main hydrological perspective is the catchment approach but this remains an analysis of climatic indices.

This catchment based approach is announced to be the principal objective and then the grid based approach is developed for comparison ; and monitoring stations are used for verification. The major conclusion is that there are some shifts between the catchments' mapping and the grid mapping from one class to the other. I would definitely suggest to reorganize sections 3 to present grid and station approaches first before presenting the catchment approach. Indeed the approaches with higher resolutions are the references away from which the space-averaging catchment approach shifts - not the opposite. This would further allow to have a stronger discussion of the catchment approach: averaging of indices' values over the catchment area (much simplifying vs. hydromet/hydroclim space-time dynamics in such contexts), induced clustering, effect of the catchment size, under-consideration of intra-catchment heterogeneity and eventual gradients....

One conclusion is the "continuity" of climate indices and classes, essentially North-South. This needs elaboration as continuity is not unique across the spectrum of climate classes and as the geography of climate is known to depend on both latitude, distance to the sea, and relief; and structures of gradients are season-dependent (see for instance Slimani et al., 2007; Baccour et al., 2012 and Feki et al., 2012 about geographic-seasonal structures across North-South elongated Tunisia from subhumid context to Sahara / and Vicente-Serrano et al., 2004 and follow ups in Eastern Spain)

A major question here is the boundary of the Mediterranean region. The hydrographic choice is well justified and compared to other approaches. Merheb et al. 2016 is referred to in Figure 1 but should be more strongly mobilized in section 2.1 as the antecedent study using the hydrographic definition and delineation of the region.

In that studied Mediterranean region, the climatic heterogeneity is introduced via the

C2

Köppen classification. Yet only Köppen C classes are introduced and mapped in Figure 1 whereas part of the region falls under Köppen B classes. See the Peel et al 2007 world mapping of the Köppen classification. Figure 1 and the corresponding text should be completed to display and define all the climatic classes present in the study region. Further, the text is ambiguous at some places, suggesting Köppen identified some mediterranean climate, which does not appear in Peel et al 2007. This should be clarified.

Concerning hydroclimate classification, a further reference to the PUB body of literature could be made, such as e.g. Wagener et al., 2007; Hrachowitz et al., 2013

Details - L7: Mediterranean ... Region, basin?

- L11: convoluted sentence

- Figure 1: country boundaries are not visible. Names of countries are not all displayed (and inconsistently with other figures). See comment on mapping of other Köppen classes in the studied region.

- L114: etymology of "Mediterranean" does not mean "middle land" but "in the middle of lands"

- L13 and 123 are redundant. Some parts of Australia are also considered as "Mediterranean climate"

- Some mediterranean references about the mediterranean ground of the Turc formula should be more relevant than the Diouf et al one dealing with Senegal

- section 4.6: figure 7 and table 7 should be announced earlier in the section

- Peel et al., 2007: the final paper in HESS shall be cited, not the discussion version in HESSD

References Baccour H. et al., C, 2012. Etude synoptique conjointe des structures spatiales de l'évapotranspiration et de variables climatiques corrélées en Tunisie. Hy-

C3

drological Sciences Journal, 57, 4, 818-829, DOI: 10.1080/02626667.2012.672986.

Feki H. et al., 2012. Incorporating elevation in rainfall interpolation in Tunisia using geostatistical methods. Hydrological Sciences Journal, 57, 7, 1294-1314, DOI:10.1080/02626667.2012.710334.

Hrachowitz et al., 2013. A decade of Predictions in Ungauged Basins (PUB) – a review. Hydrological Sciences Journal, 58, 6, 1198-1255, DOI: 10.1080/02626667.2013.803183.

Merheb et al., 2016. Hydrological response characteristics of Mediterranean catchments at different time scales: a meta-analysis, Hydrological Sciences Journal, 61:14, 2520-2539, DOI: 10.1080/02626667.2016.1140174

Peel, M. C. et al., 2007. Updated world map of the Köppen-Geiger climate classification, Hydrol. Earth Syst. Sci., 11, 1633–1644, <https://doi.org/10.5194/hess-11-1633-2007>. Drought patterns in the Mediterranean area: the Valencia region (eastern Spain)

Vicente-Serrano, JC et al., 2004. Drought patterns in the Mediterranean area: the Valencia region (eastern Spain). Climate Research.

Slimani et al, 2007. Structure du gradient pluviométrique de la transition Méditerranée–Sahara en Tunisie: déterminants géographiques et saisonnalité. Hydrological Sciences Journal, 52, 6, 1088-1102, doi: 10.1623/hysj.52.6.1088

Wagener et al., 2007 Catchment classification and hydrologic similarity. Geography Compass 1/4: 901–931, DOI: 10.1111/j.1749-8198.2007.00039.x

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-71>, 2020.

C4