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Interactive
comment

# *Interactive comment on* "Coherence of Global Hydroclimate Classification Systems" *by* Kathryn L. McCurley Pisarello and James W. Jawitz

**Anonymous Referee #1**

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The submitted manuscript suggests an innovative and parsimonious climate classification system for hydrological applications. A detailed comparison of system coherence obtained from four established and four proposed climate classification systems is provided. The proposed classification looks interesting and promising for several hydrological applications, although the paper needs some improvements before publication. In what follows, the authors may find key and minor comments.

Page 3, l. 83: How did the authors perform this? By subtracting long-term mean annual from annual values? Please add more details on this.

Page 3, l. 89: KPG - please define acronym at first occurrence.

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Discussion paper

Page 4, eq. (1): is it correct to have y over-bar, or is it y_m over-bar (see "monthly mean" as reported in l. 95)?

Page 4, l. 106: "established" rather than "veteran"?

Page 4, l. 107: I would suggest to add citations immediately after KPG and HDL.

Page 5, l. 136-137: I recommend the authors to show this uniform CDF in Figure S1, or, better, add a new figure in SI showing the comparison between empirical and analytical CDF

Page 5, l. 147: select between "means" and "k-means" and apply it consistently

Page 5, l. 150: "CV of mean annual ET" instead of "ET mean CV"

Page 5, l. 151: "system" instead of "systems"

Page 6, l. 158: Referring to zone complexity, more details on thresholds are needed. I suggest the authors to move this part from SI to the main paper and add a discussion.

Page 6, l. 159: in SI, coherence is multiplied by 1.50. Are the authors assuming that coherence in WCE system can be larger or equal than KPG plus 50% KPG? If this is the case, please clarify this in the main text and also in SI. In SI, numbers in squares are not clear. If it is a product, simply add a dot between numbers.

Page 6, l. 162: From SI: "Hierarchically, water budget coherence and number of zones were given highest priority. Therefore, the P,PET clustering system with 22 zones (denoted Water-Energy Clustering), was chosen for comparison against the other climate classification methods." How do the authors choose this? The authors should better explain this fundamental part in the main paper and also add more details on the sensitivity analysis performed for the number of zones.

Page 8, ll. 197-203: only the last sentence seems to be reasonable. Other comments try to justify the definition of ETA and ETC systems and support their performances, but both ETA and ETC show similar performance as MHR and KHC. Actually, except

for CV(ET), even the proposed systems show similar performance compared to established systems MHR and KHC. This was somehow expected since the authors defined ET-based systems. I would suggest to improve this discussion by highlighting that WEC is the best model from the new ones. "similar P coherence to KPG": I cannot see this from Table 1, where CV(P) for KPG=0.38, ETA=0.56, ETC=0.47.

page 8, l. 215: please explain what phi over-bar means

Page 8, ll. 216-217: the authors are invited to show this in SI. Actually R2=0.25 is very low.

Page 10, l. 235: "Discussion and conclusions" instead of "Discussion"

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