

Interactive comment on “Understanding Hydrologic Variability across Europe through Catchment Classification” by Anna Kuentz et al.

Anonymous Referee #3

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This is a potentially interesting paper, but needs improvement in the way its methods and results are presented. My main points are as follows:

(1) The purpose of conducting a correlation analysis seems a bit unclear to me. Firstly, if reducing the number of variables (to be used for classification) was the goal, why is it that only physical descriptors were chosen for culling, and not flow signatures? It could easily be argued that some flow signatures (e.g., HFD, LowFr) which do not have high correlation with most physical descriptors can be removed as well. Secondly, as mentioned in Section 2.2, a PCA is performed anyways to reduce the dimensionality prior to classification. So why prescreen the variables with correlation analysis before applying PCA? Wouldn't PCA alone on the whole dataset (16 flow and 48 physical variables) do the job?

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(2) In Section 3.2, the geographical patterns of classification are briefly mentioned for the physical descriptors based classification, and not at all for the flow signatures based one. I think the authors have a huge opportunity here to explain the geographical context of the spatial patterns observed in Fig 3a and b. It is mentioned (Page 11, Lines 13 and 14) that the flow and physical descriptor based classifications lead to different patterns. Why is that? Any speculation on this aspect would be quite helpful here because it directly relates to the main questions asked in this study.

(3) It might be helpful to state the proportion of total area covered by each of the 10 classes obtained through CART (Figure 3c). It is mentioned later in Section 3.4 that the regression models used for predicting flow signatures across Europe perform poorly for classes 3, 6 and 8, and perform best for classes 7, 10 and 11. Knowing the % area of Europe covered by poor and good performing classes would clarify the ability of your classification to predict flow signatures in ungauged catchments. Based on a quick look of Figure 3c, it seems to me that your best performing classes are predominantly clustered around the Alps, and majority of the Europe is covered by the poor performing class 3 (and class 6 covers large areas too). Does this mean that after going through all the efforts of two classifications + CART + regression models, our ability to predict flow signatures at ungauged catchments is only limited to wet, mountainous systems (which we already know from previous studies to be simple and easily predictable hydrological systems)?

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