

Interactive comment on “Future streamflow regime changes in the United States: assessment using functional classification” by Manuela I. Brunner et al.

Florian Ulrich Jehn (Referee)

florian.u.jehn@umwelt.uni-giessen.de

Received and published: 15 April 2020

General evaluation: This paper proposes a new method to cluster catchment based on the temporal information in their hydrological regime and uses the found regime clusters to evaluate how climate change will change the regimes clusters. I think this is an interesting approach and yields good results, especially the changing of the regimes due to climate change. In addition, the paper is overall well written and has a good flow to it. I think it can be published after minor revisions. However, I have one larger points where I think clarification is necessary.

Main point:

C1

- Line 98: Why those five spline basis functions? How can you be sure that those are enough to represent diverse regimes? Is there a connection between using five spline basis function and finding five streamflow regimes? I think this part should be extended to make it clearer what those decisions were based upon.

Minor Points:

- Line 47: “The use of catchment characteristics can be problematic because there is often no clear link between these characteristics and streamflow indices (Ali et al., 2012; Addor et al., 2018).” I think this is worded a bit too strict. For example, Addor et al. 2018 indeed showed that there are differences between the link of catchment characteristics and streamflow indices, but they also showed this connection can be relatively strong for some catchment attributes. Overall, I think this section should be less dismissive of the findings of the cited papers.

- Figure 2 and its discussion: As you are already citing my paper, I hope it is appropriate to mention that the final version is now published in HESS (<https://www.hydrol-earth-syst-sci.net/24/1081/2020/hess-24-1081-2020.html>) and discusses the different flow regimes in CAMELS in more depth than before (Figure 6). I think the results are very similar to the ones in this paper, but also show that the flow regimes found here can be split in more distinct groups. However, this might be more of a question of the desired granularity.

- Line 85: How is satisfactory model performance defined?

- Line 90 and following, code availability: I did not see any link to a code repository for this paper (my apologies if I missed it). I think in a paper that does propose a new method, it is important to provide the code used. While the method section explains the idea well, it is still a non-trivial task to recreate the method of this paper without any code examples to work with.

- Line 226: I am unsure if avoiding small clusters is a sign of a good clus-

C2

tering. As river behavior is a natural process, I would expect it to follow some kind of normal distribution, which would result in some bigger clusters and some smaller, more extreme clusters. For future research, it might be a good idea to explore a continuous classification as done by Knoben et al (<https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018WR022913>) or a fuzzy clustering approach to avoid the arbitrary cut-off points of clusters.

- Line 256: The difference here might again be a question of granularity. Especially the catchments in Florida behave very uniquely.

- Figure 5: It is very difficult to distinguish the lines from each other here. I think it might be a good idea to increase the size of this figure. Also, I would recommend to use more easily distinguishable colors.

Kind regards, Florian Ulrich Jehn

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-54>, 2020.