Comment on: “A climatology of sub-seasonal temporal clustering of extreme precipitation in Switzerland and its impacts”

Dear Alexandre and Olivia,

I think that analyzing the link between temporal precipitation clustering and flood occurrence and duration is important because it helps to improve our understanding of important flood drivers. The establishment of such a link is an interdisciplinary research effort involving analyses of climatological and hydrological data. While I generally appreciate the analyses presented in this paper, I think that the consistency and link between the climatological and hydrological analyses could/should be improved by unifying methodology across variables and by better embedding the study’s findings in the hydrological literature. I would like to highlight a few points, which I consider to be important from a hydrologist’s point of view:

1. Threshold choice: You use a seasonally varying quantile threshold for precipitation while they use a fixed annual quantile threshold for streamflow. I think that threshold choice should be consistent and that the use of a fixed instead of a variable threshold would be more sensible for the given application as the occurrence of high-flows might be more directly related to absolute than relative exceedances. The results might substantially depend on this important methodological choice. Mixing variable and fixed thresholds does in my opinion not make sense. In any case, assessing the sensitivity of the results to the choice of threshold type (variable vs. fixed) would be highly desirable and facilitate the interpretation of your results. In addition, some of the precipitation-related results also seem to refer to exceedances of annual 99% quantiles (e.g. Fig. 2).
2. Region definition: The precipitation analysis is performed for a different set of regions than the catchments selected for the high-flow analysis (at least partially from Fig 4). In order to allow for a direct comparison of the results obtained from the two analyses (precipitation vs. discharge), it would be desirable to use the same catchment delineation used for the hydrological analysis also for the precipitation analysis. Such an analysis would be straightforward as areal precipitation sums for the 93 catchments could be derived from the gridded precipitation data set used for the analysis.
3. Catchment selection: The study is based on 93 selected catchments. It would be important to point out how and why this sub-selection was made (l. 95-101).
4. Persistent flood periods (l. 137): I would rather call these something like ‘high-flow periods’ as a period of 30 days is likely to contain several potentially independent events. Furthermore, L and N seem to be mixed up in the equation as L must be > N if the temporal resolution of the data is daily. If you would like to look at events, I would apply some event definition where a flood has a defined start and end.
5. Results: It would be valuable to link the results in addition to the climatological literature also to the hydrological literature about flood seasonality, flood generation processes, … E.g. l.165-167: literature on antecedent conditions and the interplay between different flood drivers; l. 282-290: literature related to rain-on-snow events; l. 288-289: literature on flood volumes and peak-volume dependencies; L. 267: literature to regime types.

6. Term flood risk: This paper only addresses the hazard part of risk and I would therefore talk about hazard rather than risk.
7. Flood recession timescales: how are they defined (l. 278)?
8. Figures: I would recommend to reconsider color choices for figures, i.e. use continuous scales for continuous variables and diverging scales only for data with a logical break point (e.g. decreases vs. increases). Furthermore, the figure captions are a bit too short and it would be helpful if you could provide more detailed descriptions of what is displayed in the figures (also what the subpanels refer to).

I hope that you find some of these comments helpful to strengthen the interdisciplinary aspect of your work.

Best regards,

Manuela Brunner

A few potentially useful references to strengthen the hydrological aspects:

Recently published report about floods in Switzerland: https://www.research-collection.ethz.ch/handle/20.500.11850/458556

Addor, N., Rössler, O., Köplin, N., Huss, M., Weingartner, R., & Seibert, J. (2014). Robust changes and sources of uncertainty in the projected hydrological regimes of Swiss catchments. *Water Resources Research*, *50*, 1–22. https://doi.org/10.1002/2014WR015549

Berghuijs, W. R., Harrigan, S., Molnar, P., Slater, L. J., & Kirchner, J. W. (2019). The relative importance of different flood-generating mechanisms across Europe. *Water Resources Research*, *55*, 4582– 4593. https://doi.org/10.1029/2019WR024841

Brunner, M. I., Hingray, B., Zappa, M., & Favre, A. C. (2019). Future trends in the interdependence between flood peaks and volumes: Hydro-climatological drivers and uncertainty. *Water Resources Research*, *55*, 1–15. https://doi.org/10.1029/2019WR024701

Merz, B., Nguyen, V. D., & Vorogushyn, S. (2016). Temporal clustering of floods in Germany: Do flood-rich and flood-poor periods exist? *Journal of Hydrology*, *541*, 824–838. https://doi.org/10.1016/j.jhydrol.2016.07.041

Merz, R., & Blöschl, G. (2003). A process typology of regional floods. *Water Resources Research*, *39*(12), 1340. https://doi.org/10.1029/2002WR001952

Oppel, H., & Fischer, S. (2020). A new unsupervised learning method to assess clusters of temporal distribution of rainfall and their coherence with flood types. *Water Resources Research*, in press. https://doi.org/10.1029/2019WR026511

Wasko, C., & Nathan, R. (2019). Influence of changes in rainfall and soil moisture on trends in flooding. *Journal of Hydrology*, *575*(May), 432–441. https://doi.org/10.1016/j.jhydrol.2019.05.054