Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-625

Anonymous Referee #1

Referee comment on "On the links between sub-seasonal clustering of extreme precipitation and high discharge in Switzerland and Europe" by Alexandre Tuel et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-625-RC1, 2022

General comments

The manuscript displays an interesting analysis of the impact of precipitation clustering on the duration and frequency of high discharge events in Switzerland and Europe. It uses appropriate data sets and makes a courageous attempt to stratify the analysis along the large number of degrees of freedom that govern the relationship between (clustered) extreme precipitation and high discharge. Overall this analysis and stratification are useful, but the authors seem to address the topic from a pretty methodological point of view, thereby presenting quite a large number of figures and results that are not always directly meaningful to the reader. In particular the large number of spatial maps don't convey a very clear message of spatial structure in the findings, and some reduction in figures and a more concise display of results would be appreciated. On the other hand, some potentially relevant physical processes are discussed somewhat in the discussion section and annex figures, and some of these would have been interesting to elaborate in somewhat more detail. Particularly the notion of (seasonally dependent) soil moisture memory and the impact of catchment size deserve a more explicit discussion and interpretation of the results.

The paper is very well written and (most of) the statements are well supported by the results shown, but a small change in the emphasis on the presentation of results would probably make the paper even more informative for the audience. So this leads me to recommend to accept after minor corrections.

Specific comments

- L30-31: also Khanal et al (2019) address the role of atmospheric clustering and soil moisture memory on Rhine discharge explicitly

- L49-50: Kew et al (2013) looked at the effect of clustering on the probability to have compounding discharge and coastal surge peaks for the Rhine river. This is an interesting application domain of studying temporal clustering/compound events in this context
- L81: given the relatively small effect of removing this baseflow component (L265-269), and the question of whether the resulting runoff data can be interpreted well I would suggest to leave out this baseflow correction and work with total discharge instead
- L101-102: maybe add explicitly that these factors display a seasonal cycle
- L116-117: the fact that discharge impact is characterized more by absolute than anomalous discharge also applies to the impact of clustered precipitation on discharge. So I find this methodological inconsistency of using absolute or anomalous values not convincing
- L117: "smaller" à "lower"
- L126: the 30 and 60 days are not clear to me, I compared them to the max 8 weeks of clustering and couldn't find the logical match. Please explain somewhat better
- L147: what motivated this combination of N and L? It came somewhat unannounced
- L166: "less variability": less than what?
- L208: please refer forward to discussion section when introducing "karst effects" (and in the discussion section: please explain in some detail what this effect is about)
- L222-224: this should be discussed in the section on Swiss results, not here
- L225-228: also this feels that it belongs to the methods section, not to the results section
- L236-237: "Cumulative precipitation … periods.": I don't know what you want to convey with this statement
- Fig 11: the set of panels don't convey a very clear message of a spatially meaningful structure. Also it takes me a long time to make up my mind of what is actually shown in the different rows and columns. Also: what does "non-significant" (grey shading) mean in these panels? I don't really understand the grey shading in all basins of panel 11-d. I feel this display of information is too extensive.
- L237: "increase": of what relative to what?
- L245: events are classified by percentile, by persistence, by significance. It's not easy to disentangle all these attributes. What's the key point you want to convey here?
- L246: "often result from TCEP.": how can I deduce this statement from these panels? They look quite similar to panels 11d-f. And how does "cluster frequency" shown in Fig 11 translate to TCEP?
- L249: "Overall, the connection to TCEP is weaker for less persistent high discharge periods.": how can I see this from the figure? What should I compare to what to understand this statement? Same for statement in L254
- L272-273: I didn't read the Bevacqua reference, but doesn't this combination of arguments imply that it is the change of the wet-day frequency and R95p that is responsible for this, without a significant change in clustering?
- L274-275: this soil moisture memory plays a smaller role in winter/spring time, where the highest discharge occurs, I would reckon. A seasonal instead of a spatial analysis would have been more interesting (see also statement in L306)
- L282: figures 11 and 12 don't show soil moisture impacts
- L307: "largest events": discharge or precipitation events?
- L317: double use of "high"
- L324: 1000 km2 is pretty small. I would assume that clustered precipitation extremes can give high discharge in much larger basins
- L330: "vary" à "varies"
- L336: this seasonal signature is of great interest and could be promoted to the main text
- L351-352: both "antecedent soil moisture" and "timing of precipitation" refer to (temporal and spatial) clustering, so are attributes that are within scope of the current analysis
- L355: do "cross-catchment analyses" imply that you would show more results like fig

14? That would be great!

References

Kew, S. F., Selten, F. M., Lenderink, G., and Hazeleger, W.: The simultaneous occurrence of surge and discharge extremes for the Rhine delta, Nat. Hazards Earth Syst. Sci., 13, 2017–2029, https://doi.org/10.5194/nhess-13-2017-2013, 2013.

Khanal, S., A. Lutz, W. Immerzeel, H. Vries, N. Wanders and B. van den Hurk (2019): The impact of meteorological and hydrological memory on compound peak flows in the Rhine river basin; Atmosphere 2019, 10(4), 171; https://doi.org/10.3390/atmos10040171