

Comment on “Moderate runoff extremes in Swiss rivers and their seasonal occurrence in a changing climate” by Regula Muelchi et al.

The article analyses climate change impacts on runoff regimes in 93 rivers in Switzerland. The study is based – like a companion paper by the same authors (submitted as hess-2020-516) – on the results of a large Swiss research project, which provided consistent downscaled local climate projections under three emission pathways. While the earlier paper presents seasonal and yearly changes in the mean discharge, this contribution analyses the same data (simulated daily runoff for the period 1981-2099) with respect to moderate runoff extremes, both high and low flows. The dataset is available in a publicly available data repository (Zenodo), and is described in a corresponding paper in Geoscience Data Journal, which is under review.

After some careful revisions, which refer mainly to a clearer and more consistent style, the article certainly deserves publication, also because it complements the previous companion paper.

My review is provided in 2 documents: 1) this document with rather general remarks and recommendations, and 2) detailed PDF annotations directly in the manuscript.

General remarks

Summer/winter: there are several “seasonal” analyses, referred to as “extended summer” or “extended winter”, which are actually half-years. In some places, just “summer” and “winter” is used. I suggest to use the terms “summer half-year” and “winter half-year” consistently throughout the text to avoid confusion with the common meaning of a season. This is important, because in the context of seasonality shifts, you also refer to the usual seasons, like “late summer” and “early autumn” (e.g. L 24). Please rewrite first paragraph in section 3 accordingly.

Low and lowest flows: In the results and discussion sections, there are frequent uses of the terms “low” and “lowest” flows, which most likely refer to the same. If that is true, use “low flow” consistently. Analogously, for the high and highest flows.

“alpine or Alpine”: lower case refers, in my opinion, to “mountainous”, while upper case Alpine means “within the perimeter of the Alps”. Since several of the north-western catchments (Jura) are outside the perimeter of the Alps, a clear distinction of the terms is necessary.

It may help to improve readability, if, e.g. in Fig. 1, you add a classification to the legend which indicates the “lower lying catchments”, the alpine and high alpine (Alpine?) catchments. (could be added to the mean altitude classification in the legend).

Abstract

Paragraphs 2 and 3 are difficult to read. L 14 says that annual low flows will increase in Alpine catchments. L 15-16 says that “... annual high flows are projected to slightly increase in most catchments but to decrease in high Alpine catchments.” Are the “high Alpine catchments” a clearly different subset of catchments than the “Alpine catchments” in L 14? L 16-19: the discussion on the contradiction between moderate extremes and extremes takes too much space in the abstract, since also in the text it is rather a side note (L 298-300).

Please consider reorganizing the abstract to discuss all effects of low flows (magnitude, time of emergence, shifts in seasonality) first and then analogously for the high flows.

Section 2 – Data

L 111-115: You should point out that RCP 8.5 is considered a worst-case climate change scenario, and therefore possible changes are most severe. The number of simulations is certainly the least important reason.

Section 3 – Methods

See first general remark above.

More remarks are given in the manuscript PDF.

Section 4 – Results

Please check for “Alpine” or “alpine”. Are all the lower lying catchments outside of the Alps?

I agree with the outline discussing low flows first and then the high flows. However, Fig. 2, 3 and 6 present both together, i.e., section 4.2 refers back to parts of a previous figure. Consider putting the sub-figures in a grid and label the columns clearly “low” and “high flows”. Fig. 2 might benefit if you also label the rows with “Reference” and “Future”. Since in sections 4.2 and 4.3 there is no direct confrontation of “low” and “high” with respect to these figures, it might have advantages to split them, i.e. put 2a and 2c in one Fig. to be discussed in section 4.2, 2b and 2d in a separate one to be discussed in section 4.3. Similarly, figures 3 and 6.

Section 5 – Discussion

Large parts of this section (at least 5.1) appear to continue the presentation of results rather than a “discussion”. Real discussion is the last paragraph of 5.1 (which could be enhanced).

Uncertainties (5.5): I am afraid, that this paragraph is not very helpful, since it is purely qualitative. Without having said anything about uncertainties before, you start “ ... are larger for moderate high flows than for moderate low flows”. I would appreciate a statement why you believe that the message of your results is valid, despite various uncertainties, whose quantification certainly would exceed the scope of this paper.

Section 6 – Conclusions

In my opinion, this is more a Summary than Conclusions. In fact, the only clear “conclusion” is from L362-365. I suggest to name the section “summary and conclusions” and add some conclusions also related to the high flows.

Evaluation of review criteria (more details are provided by annotations in the PDF manuscript):

1. Does the paper address relevant scientific questions within the scope of HESS?
Yes. The focus is on rivers in Switzerland, but methods and results are certainly of interest for other (alpine) countries.
2. Does the paper present novel concepts, ideas, tools, or data? Yes.
3. Are substantial conclusions reached? Yes.
4. Are the scientific methods and assumptions valid and clearly outlined? Yes.
5. Are the results sufficient to support the interpretations and conclusions? Yes.
6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? All directly used datasets are publicly accessible. Therefore, the reproduction of the specific results in this paper should be possible.
7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes.
8. Does the title clearly reflect the contents of the paper? Yes.
9. Does the abstract provide a concise and complete summary? See comments above.
10. Is the overall presentation well structured and clear? In general, yes.
11. Is the language fluent and precise? As in the previous paper, in my opinion, many paragraphs seem to be too closely translated from German, which makes the text difficult to read.
12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? N.a.
13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? See comprehensive PDF annotations, both to text and figures, directly in the manuscript
14. Are the number and quality of references appropriate? Yes.
15. Is the amount and quality of supplementary material appropriate? Dataset available at Zenodo.