

Flood triggering in Switzerland: the role of daily to monthly preceding precipitation

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General remarks:

This paper is an example of intelligent data harvesting exercise. Of course such analyses are only possible if adequate data-sets are available as in the case of the manuscript by Froidevaux et al. This makes this manuscript a very interesting and novel piece of work that surely deserves to be communicated by HESS. I miss a link to the “Large sample hydrology” literature and a sound discussion on applicability of the methodology in other areas and using alternate (e.g. European or global) datasets.

The style of the manuscript is in some parts quite unusual. It seems that the authors seek the dialog with the reader by asking many questions and stressing several times which plot and which line and which feature of a graphs is meant to answer a specific question. I know that science is driven by questions, but I have the feeling that this manuscript make way too much use of the “question style”.

Issues to be addressed:

In general. This study addresses many questions. I would be interested to have an assessment by the authors on how their findings now deviate from their a-priori perceptions. E.g. Figures 5 and 6 are no real surprise with respect to my gut feeling.

Abstract: The authors make large use of the “we” formulation. I think this should be avoided in an abstract.

Introduction: I find the introduction well formulated but I miss links to the “Large sample hydrology” literature, which is one very active community that contributed to PUB and is now contributing to the IAHS Decade “Panta Rhei”. See Gupta et al. (2014) and references therein.

Concerning your goals and changes in floods and streamflow you could integrate a discussion including the works of Schmocker-Fackel and Näf (2010) and Birsan et al. (2005).

Concerning future floods there is a very recent paper by Alfieri et al. (2015) with an analysis at the European scale.

I would also welcome a more detailed elaboration of the different response time between small and large rivers. Do you think it would be possible to include these effects in a dynamic formulation of PAP and API?

Discussion: do you think it would be possible to make such evaluation at the European-Alp scale using the data set by Isotta et al. (2014)?

3249 – 13,15: Not in Switzerland, and in other countries?

3250 – 7,8: Which studies, please provide references.

3251-12 : Do you use the HQ5 values and HQ20 values published by the data provider or have you completed own estimations of return periods? In any case shortly describe how the return periods re computed.

3255-13: I think you do not define “n” of Equation 1.

3259-9 (an Figure 3): I think you do not clearly declare which API (API2 or API4) is now shown in Figure 3. Please update this in the text and in the caption.

3259 – 24,25: Maybe you could also include the PRE-AP terminology in Table 1.

3260-1,5: In Figure 4 & 5 you display the return periods of rainfall in days. This is not usual. Would it be possible to put on the left side of the RP scale also the ticks for return periods of let's say 2, 5 and 10 years? I would also remove the word “Extreme” at the beginning of the sentence “*Extreme or very intense precipitation (return period > 100 days) is frequently associated with floods*”. If you would use the same scales in Figures 4 & 5 would you decrease the readability of one of the two plots? You could merge the two Figures to have a left and right part of them. I suggest you to publish them so that Figure 4 is just left from Figure 5.

3260 – 8,9: “*There are more floods without intense D0-1 in Nival and Glacial regimes as compared to then Pluvial regime.*” Do you think this can be attributed to rain-on-snow occurrence (see Wever et al., 2014) or this is just because high altitude areas have more shallow soils and thus the triggering event has more weight since less rain is needed to saturate the contributing areas?

3261 – 1,2: “*We will now move on to further quantify these qualitative observations.*” Unnecessary sentence.

3261 – 23-25: Nice, please discuss this. Sometimes floods at lake exits can be also triggered (or damped) by lake regulation. Maybe you should also look at the “antecedent lake level”.

3281: Please consider to either reduce the range from day -20 to day +20 or to make steps by 2 days. I think this would increase the readability of this figure. Or after day 15 you could make jumps in 5 days steps. Just a suggestion.

3286: Suggestion for a reduced caption: “Figure 7. The relevance of the different precipitation periods for the occurrence of annual floods is tested using logistic regression for each precipitation period and each catchment (a) D0-1, (b) D2-3, (c) D4-6, (d) D4-14, (e) D4-30, (f) D0-30, (g) API2, and (h) API4. Several thresholds are tested (P50, P75, P90, P95, P99) and the most significant P value is displayed symbolically (squares, dots and triangles indicate a non-, weakly-, and strongly-significant influence, respectively). The colors of the symbols refer to the hydrological regimes of the catchments. Circles denote a negatively significant correlation, i.e. the exceedance of a given precipitation threshold significantly reduces flood probability.”

“Negative correlations are almost exclusively found in Glacial catchments.” Belongs in the main text.

How do I see that different thresholds (P50, P75, P90, P95, P99) are tested? AS far as I understand here it can be that for one station the symbol is allocated by P95 in in another station by P75? Can I ask you to make this Figure only with one threshold and avoid mixing? Or does it help you to have a mixed-plot?

3265: Section 4.5 and Figure 8 are really nice and interesting. Again, how much deviate these findings from your expectations?

3267: Your open question “*Regarding flood forecasting, it would be interesting to define a minimum threshold: what amount of event precipitation is required to trigger a HQ5 given that PRE-AP is known?*” reminds me the definition of the flash flood guidance. I think it is appropriate to elaborate on this here (http://en.wikipedia.org/wiki/Flash_flood_guidance_system).

Best regards

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13.05.2015

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