

Interactive comment on “Changes in flood frequencies in Switzerland since 1500” by P. Schmocker-Fackel and F. Naef

Anonymous Referee #1

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1. General comments:

This is an interesting paper on flood frequency variations during the last 500 years, providing results from 14 Swiss catchments and thus extending our knowledge on European flood history by a further regional component. In particular the comparative results on spatial patterns of European flood frequencies are especially important indicating that Swiss periods with frequent flood events are often in phase with those in the Czech Republic, Spain and parts of Italy, but less often with those in Germany. However, the paper needs some improvements which are specified below in terms of two major comments and a list of minor modifications to be done.

2. Major specific comments:

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a) You only make a difference between “floods” and “large-scale floods” (page 533, line 1). Is it impossible to derive a more detailed intensity classification according to damage descriptions (as for example done in Sturm et al. 2001)? Furthermore, documentary data from Central Europe often allow to distinguish between different trigger mechanisms like high amounts of precipitation (long-lasting or highly intensive), rapid snow-melting, or barrier effects by drift-ice. Do you have insufficient information in your data about these aspects, or what are the reasons to refuse their consideration? Please clarify this in a particular paragraph!

b) The authors suggest that changes in large-scale atmospheric circulation patterns on a decadal time scale might be responsible for observed changes in flood frequency (last sentences of the Abstract and of section 3.4). However, this important aspect has not been studied in explicit terms, the last paragraph of section 3.3 only gives some general statements leading to the conclusion that “it might . . . be more difficult to find a clear relationship in Switzerland since atmospheric circulation patterns associated with floods in different regions in Switzerland (e.g. westerly flow, southerly flow, Vb tracks) differ greatly.” This is a poor discussion of dynamic aspects of historical flood frequencies, and even if the authors might be unable to provide own results on this important issue in context of this paper, they should at least specify in more detail what kind of changes in circulation dynamics have already been identified on a historical time scale (further papers additionally to some of those included in the References are indicated below) and to discuss whether or not these changes might also be important for the observed flood frequency variations in Switzerland.

3. Minor comments:

Abstract, line 8: the four periods of frequent flooding should be specified

Abstract, line 12: a test whether flood frequency fluctuations could be explained . . . has not been done in this paper with respect to “atmospheric circulation patterns”, only with respect to the NAO!

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Abstract, line 14: "was" (instead of "were"); don't start a sentence with "nor"!

Page 531, line 3: please specify the period with relatively few floods!

Page 531, line 6: why do you focus just on the last 500 years?

Page 531, lines 17 and 26: after starting with Northern Switzerland, you now mention Central and Northern Switzerland, and later on (line 26) you talk about Swiss flooding frequencies. You should clearly define your study area: is it Northern Switzerland, or Central and Northern Switzerland, or the entire Switzerland?

Page 531, line 19: it sounds somewhat exaggerated to speak about "a new approach".

Page 531, line 24: delete "them"!

Page 532, line 6: the climate south of the Alps is mostly at first sub-Mediterranean; the number of 14 Swiss catchments: is it the maximum or due to data availability?

Page 533, line 3: delete "were"!

Page 533, line 7: it is "Stangl" (not "Stangle").

Page 533, section 2.3, first paragraph: I think this paragraph has to be shifted to the end of the preceding section 2.2.

Page 534, lines 16-18: you should discuss a little bit why higher thresholds sometimes occur for HQ10, sometimes for 'same frequency'. Is it by chance or is it possible to identify systematic variations?

Page 534, line 19: move "how" to the next line behind "2007"!

Page 535, line 1: please specify how you have considered the effect of flood protection measures and reservoir construction!

Page 536, lines 10-11: I wonder that spring floods are of minor importance. Is there no substantial melting influence?

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Page 537, line 17: it is "low 2" (instead of "low 1"); why do you not refer to the period 1590-1730 as in Figs. 5 and 6?

Page 538, line 7: it is "low 3" (instead of "low 2").

Page 538, line 18: "available" (instead of "availabel")!

Page 538, line 20: it is "low 4" (instead of "low 3").

Page 539, line 1: add "(peak 4)"!

Page 540, lines 1-2: solar activity can hardly cause flood frequency oscillations in a direct way, it may (at the most) induce meteorological variations which might be linked to flood frequency oscillations.

Page 540, line 19: Trouet et al. (2009) are not included in the References and in Fig. 5c.

Page 541, line 5 and Page 545, line 7: this paper from Jacobeit et al. (2003) deals, in fact, with circulation variability on a historical time scale, but relationships to varying flood frequencies are not discussed in this paper. This is addressed in other papers from the first author or from other authors as for example

- Jacobeit, J., R. Glaser, J. Luterbacher & H. Wanner (2003): Links between flood events in Central Europe since AD 1500 and large-scale atmospheric circulation modes. *Geophysical Research Letters* 30: 1172-1175. - Jacobeit, J., R. Glaser, M. Nonnenmacher & H. Stangl (2004): Hochwasserentwicklung in Mitteleuropa und Schwankungen der atmosphärischen Zirkulation. *Geographische Rundschau* 56: 26-34. - Wanner, H., C. Beck, R. Brazdil, C. Casty, M. Deutsch, R. Glaser, J. Jacobeit, J. Luterbacher, C. Pfister, S. Pohl, K. Sturm, P.C. Werner & E. Xoplaki (2004): Dynamic and socioeconomic aspects of historical floods in Central Europe. *Erdkunde* 58: 1-16.

Page 541, line 10: "have" (instead of "has").

Page 541, line 12: "circulation" (instead of "circulations") and "associated" (instead of

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“assisiated”).

Page 542, line 23: this period for peak 1 is in contradiction to page 537.

Page 543, line 1: add “in” before “Europe”!

Page 543, line 2: according to Fig. 7, few floods during the 1740-1790 period only occurred in the Main area!

Page 543, line 3: but in the Po catchment high flood frequency is also indicated in Fig. 7 for the 1640-1690 period!

Page 543, line 19: delete “between”!

Page 543, line 21: “Republic” (instead of “Republik”)!

Page 544, line 4: “European” (instead of “Europe”)!

Page 544, line 20: the sentence is wrong.

Page 545, line 10: “Analysis of flood . . .” (instead of “Analysis of food . . .”)!

References: I think you should also cite the book of R. Glaser (2008): *Klimageschichte Mitteleuropas. 1200 Jahre Wetter, Klima, Katastrophen*. 2nd edition, 272 pp.

Fig. 1: instead of “Rhine basin” I would prefer “Swiss part of Rhine catchment”.

Fig. 2: the high annual flood discharge immediately after the ninth “star event”: was it really without damage, due to J1? And J2 means second Jura water correction?

Fig. 3: obviously this is Fig. 6 and not the right figure described in the caption.

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