**Reply to the referees Inês Amorim (I.A.), Silvia Enzi and anonymous (A.3.)**

**Referee Inês Amorim (I.A.)**

**Page 2; line 4:  I.A.:**  **In what terms is useful? To avoid catastrophes? You explain just in conclusions.**

Reply O.W.:  Thank you for your remark.
The sentence according to your remark should now be changed to
"This paper aims to describe the potential of Historical Hydrology in Switzerland in terms of data availability, methodologies, reconstruction capabilities and usefulness for the scientific- and practical communities like Federal or Cantonal Agencies and private engineering companies by adding a longer term historical perspective to the spectrum of already existing risk and vulnerability assessments."

**Page 2; line 29: I.A.:**  **There is another target about the perceptions of hydrological evidence (the analysis of the production of information: informant's position, the fragility and, at the same time, the power of information is also a social construction.**

Reply O.W.:  Thank you for this remark. You are right, there would be a lot more to say about the societal- or cultural aspect of hydrological and climatological historical documentary evidence and related aspects as e.g. the production of these kinds of sources but this is explicitly not the goal of this paper as I tried to explain on page 2 lines 18-24. I instead try to evaluate whether the direct or indirect climatological or hydrological information within the documentary evidence can be trusted and if so if this information can be transformed in a more quantitative value like e.g. an index, a flood level or a discharge. According my experience this can be done in many (but surely not all) cases which I tried to demonstrate in the paper.

**Page 3; line 37: I.A.:**  **More than the absence of catastrophic reasons (it seems that Switzerland is a paradise in terms of war, fires, militar invasons) there is a much more important reason that must be take in account - the capacity of write, describe, select information through the ages. The literacy is a very important field to explore in terms os information impacts.**

Reply O.W.:  Thank you for this remark. You are right. Literacy is an absolute prerequisite for the creation of historical documentary evidence. Without literacy there is no evidence. For a long time, literacy in Europe was primarily given in nobility-, municipal- or church related contexts, but as this paper is discussing the potential of historical hydrology in Switzerland I wanted to focus on specifics that are probably more unique and might give an explanation for the overall good documentary evidence situation in Switzerland.

**Page 5; line 34: I.A.:**  **I agree with this evaluation. However,the non-contemporary information about past events could inform us about the power of memories to distinguish intensity of impacts.**

Reply O.W.:  Thank you for your remark. In my opinion it is very difficult if not impossible to quantify the intensity of an "impact" or a hydrological extreme event based on the "power of memories". How do you reliably quantify the power

of memory? According to the number of "quotes" of non-contemporary events in different chronicles? This would be very difficult to quantify and at the same time dangerous because chroniclers used to copy quite uncritically from predecessor chroniclers about the time they did not report themselves. Generally they uncritically copied what was available to them and the availability of their sources does not necessarily represent the intensity of an impact or an extreme event.

**Page 6; line 33: I.A.:** **A good methodology to apply in other case studies.**

Reply O.W.: Thank you. This methodology was already successfully applied in several contract as well as scientific research studies.

**Page 7; line 9: I.A.:** **The conception of intergenerational risk communiciation is interesting but is also a social process, a memory selective process and is not only in terms of buildings.**

Reply O.W.: I agree.

**Page 8; line 13: I.A.:** **it must be improved the quality of images and yelow isn't the best color. The other problem is that images arent contemporary of data (18th century).**

Reply O.W.: I tried many different colours like red, white, black, blue, green, orange and clearly found that yellow was the most visible on these images. I could improve the visibility a little bit by changing the type of line (see below). It is true that these pictures are not contemporary to the described flood events but they are rated by the Schweizerisches Künstlerlexikon as most accurate towards the depicted topography. The city wall was not altered over time so that its depiction on the image of Büchel should be representative for the situation in 1480, whereas the guild house of the fishermen indeed was altered several times. It was first built in 1402/03, destroyed by a fire and rebuild in 1533. In 1700 it was replaced by a new construction which is depicted on the image of Büchel.[1] We can indirectly conclude that the construction of the three guild houses must have been quite similar by comparing its height of the windows with the height of the bridge. The bridge was rebuilt several times after it was destroyed e.g. by floods but its height was never changed as it needed to fit to the height of the lithic ground surface of the city gate. The windows of the first guild house (1402/03) have been reached by the Rhine in 1424 (as was reported) and most probably must have reached the height of the bridge as well (as explained in the paper). If the Rhine would have risen to the level of the bridge the level of the windows of the 1700 guild house would have been reached as well. I thus think that a) the constructions of the three guild houses were very similar so that the depicted guild house (1700) is representable for the situation during the floods in 1424 and 1480.

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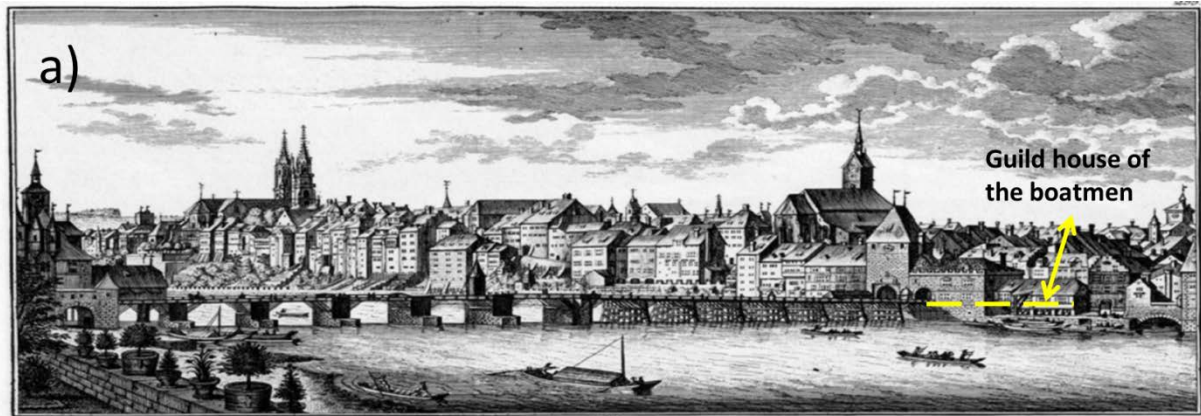
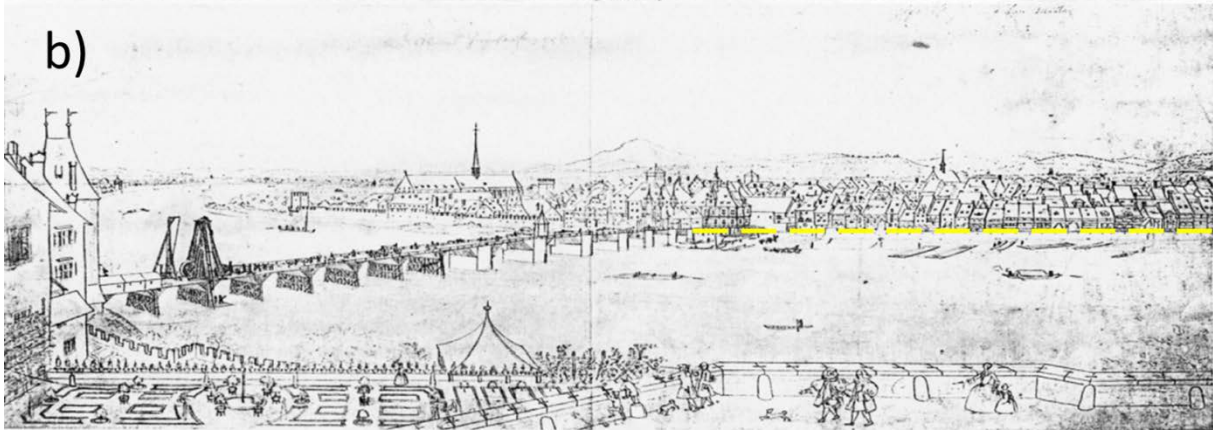
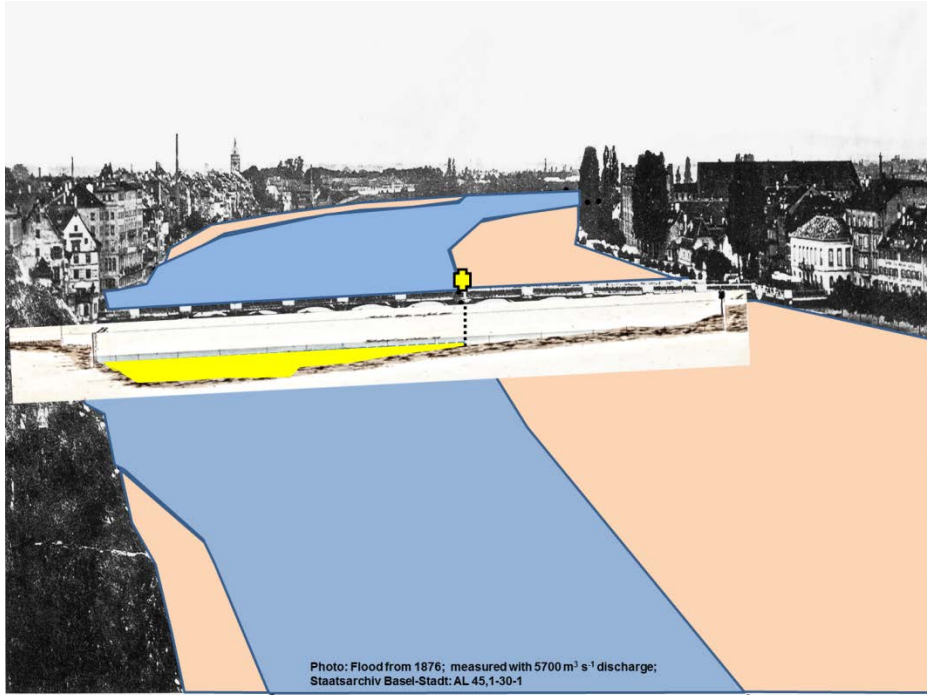
[1] Helmig, G.; Matt, C. P.: Inventar der Basler Stadtbefestigungen – Planvorlage und Katalog. 2. Die rheinseitigen Grossbasler Stadtbefestigungen. In: Jahresbericht der Archäologischen Bodenforschung des Kantons Basel Stadt. Basel 1996. S. 209.

**Page 10; line 21: I.A.:** This is a very important contribution because add a special attention to minor flood events and the problems of assembing historical data.

Reply O.W.: Thank you.

**Page 13; line 3: I.A.:** The image needs some improvement. I understand that it is interesting to keep the original legend (made by Adelberg Meyer) but it is unclear in the picture

Reply O.W.: See below:

Photo: Flood from 1876; measured with 5700 m$^3$ s$^{-1}$ discharge; Staatsarchiv Basel-Stadt: AL 45,1-30-1

**Page 17; line 2: I.A.:** **To much information in this figure but I understand the aim of the figure: to combine the quality of information with the information by it self during to periods (pre and intrumental)**

Reply O.W.: I agree that there is a lot of information but anyhow would like to keep it this way.

**Page 20; line 23: I.A.:** **This part, 4.4, is a very important contribution in terms of cross-inforation methodology.**

Reply O.W.: Thank you

**Page 23; line 21: I.A.:** **The potentiality and the limits of institutional sources are very well presented and the importance of "normal events" (see below on page 25).**

Reply O.W.: Thank you

**Page 29; line 10: I.A.:** **I believe that for a non Switzerland inhabitant it is important to describe the river regime model and the hypothetical consequences in floods occurrence.**

Reply O.W.: I agree. See below the new Figure and its figure captions.

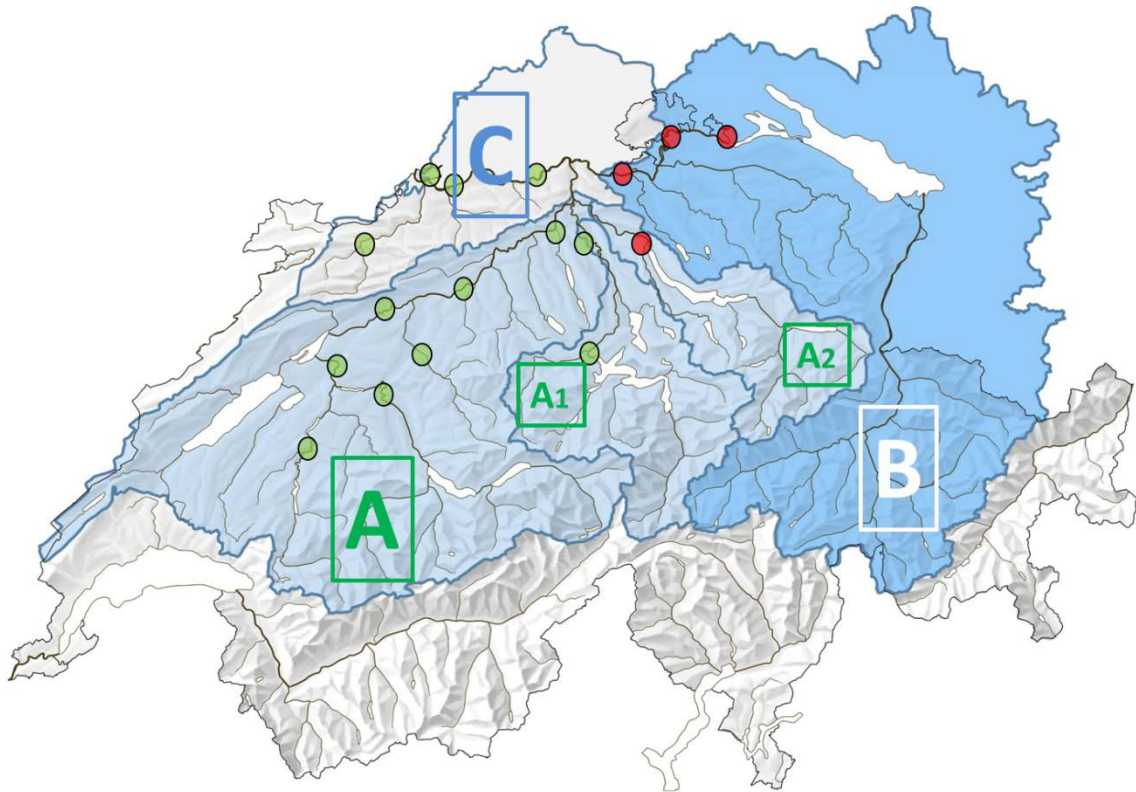



**Figure 21:** Contribution (green dots) and non-contribution (red dots) of rivers to particular pre instrumental minor flood events.

| | | |
|---|---|---|
| **A:** | **Aare catchment** | |
| **A1:** | **Reuss catchment** | |
| **A2:** | **Limmat catchment** | |
| **B:** | **High Rhine catchment** | |
| **C:** | **Jura catchment** | |

**Referee Silvia Enzi (S.I.)**

**Page 7; line 40: S.I.:** **the sentence quoted (wash the hands in the river) can be formulaic, so to be assumed with criticism; its recurrence could furthermore point out a connection between the chronicles ('stemma'). It's just a suggestion, because I have not seen the texts. Anyway, a very interesting recontruction.**

Reply O.W.: I am aware about possible formulaic descriptions of flood events but I believe that this is not the case because **A)** the description of people washing their hands on the bridge is not used frequently or repetitively - it is only used for the floods in 1424 and 1480 – but **B)** the references to the windows of the guild house or the city wall which correspond to the height level of the bridge (as was demonstrated in the article) indirectly make it plausible that people could indeed have washed their hands while they were on the bridge. The chronicler reported as a local and contemporary from 1474 to 1525 and thus can be seen as an eyewitness. The chronicler underlines this assumption by reporting that he washed his hands himself.

**Anonymous referee # 3 (A.3.):**

A.3.:  A well researched and written paper that includes extensive detail and review of historical flood record use and application in Switzerland. The paper has considerable value contributing to the international literature. Excellent use of images. Below are several points I would encourage the author to consider addressing in revising the paper, in addition to the annotated version.

1. I would encourage the author to support further the statements that are made through reference to the wider international literature. For a paper of this length I felt a broader literature base could and probably should be presented, with some papers missing that I would expect to see e.g. Kjeldsen et al. (2014)

2. I understand why you make several of the statements that you do concerning Fig.12, but I am a little uncomfortable that you need further evidence of a reduction in the flood magnitudes nearing the present, why is this not just a flood poor period comparable to 1375-1500, further justification needed.

3. Take care with the images, ensure all figures have clear axis labels and are aligned – e.g. Fig17 requires careful alignment of the various sections of the figure. I would remove the curves from Fig17, I think it is more powerful without these and have reservations about how they are derived/presented.

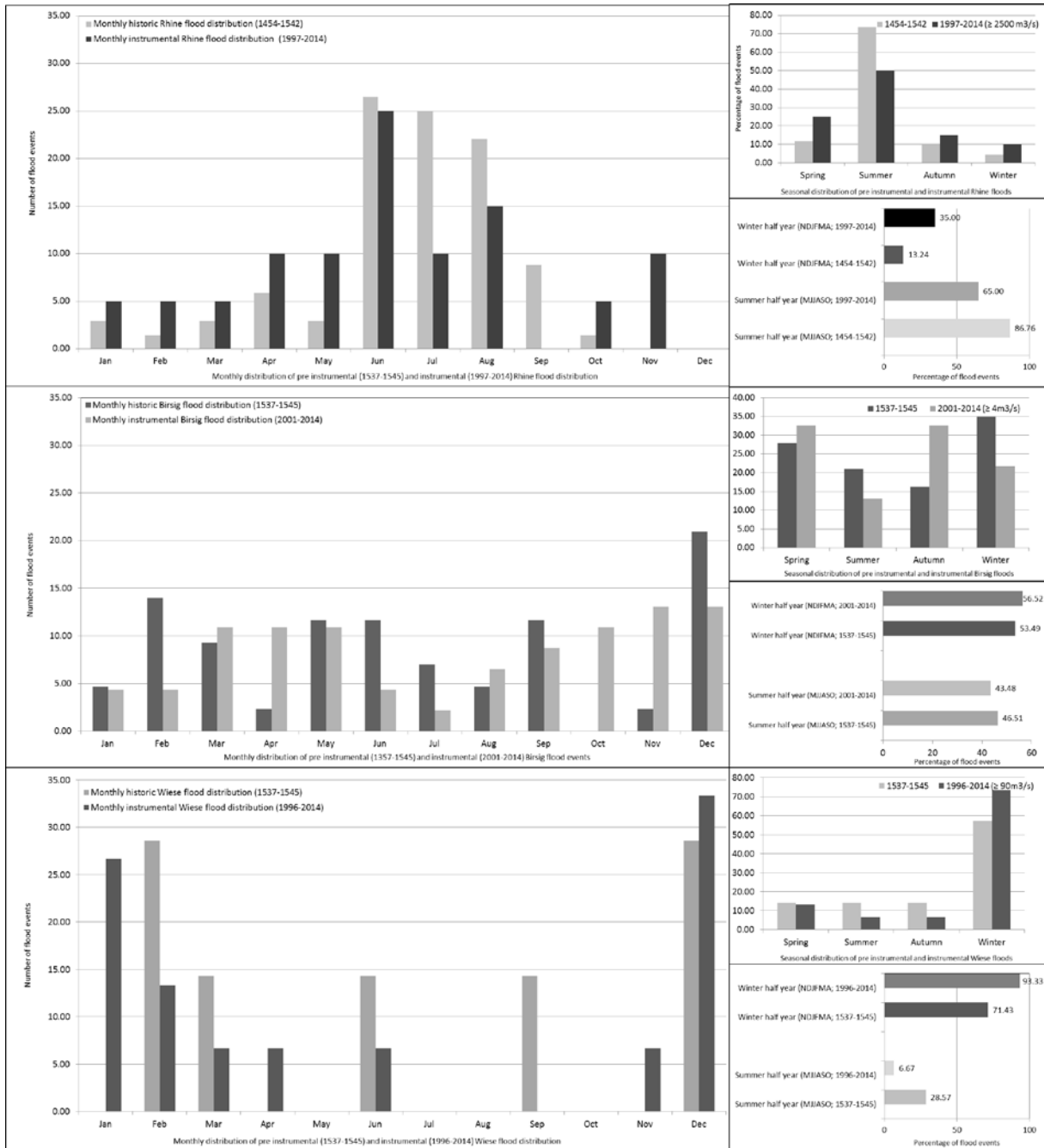
4. I felt that the conclusion could be more powerful, if it linked back to how this work could improve understanding of flood risk and possibly related back to the drivers for the funding outlined at the start of the paper. Please find attached an annotated version of the paper with extensive improvements to the English language which will help the flow of the paper. I hope the author finds this helpful. If the scanned version presents any problems please let me know.

Kjeldsen T.R. et al., 2014, Documentary evidence of past floods in Europe and their utility in flood frequency estimation, Journal of Hydrology, 517: 963-973 DOI: 10.1016/j.jhydrol.2014.06.038

Reply O.W.:  Thank you very much for significant the English language improvements. I will include them in the revised version

1.) I agree that further references like Kjeldsen et al. (2014) should and will be included in the revised version.

2.) I completely agree. Thank you for this statement. I indeed think that there is no trend of decreased flood magnitudes for Lake Lucerne and river Reuss. The sentence will thus be altered to this: "Figure 12 demonstrates the flood level development of extreme events in Lucerne for Lake Lucerne and Reuss River showing **either** a weak trend towards slightly smaller flood levels **or simply a poor period of extreme floods**, if the flood event from 1817 is excluded from the analysis.

3.) I agree to remove the curves of figure 17 and aligned the different sections better (see below). But I would like to keep this style of presentation because it shows briefly the different correlations between the historical and the instrumental period on monthly, seasonal and half yearly resolution basis.

4.) I agree. I plan to demonstrate the benefit of the different historical hydrological analysis more often in the revised version. Thank you again for your effort and help with the English language improvements. This is indeed very helpful.