

## ***Interactive comment on “Historical changes in frequency and seasonality of extreme floods in Prague” by L. Elleder***

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Thank you very much for your thorough review, positive evaluation and stimulating comments. Point-to-point responses are in the text of your review below:

General comments: The article deals with the analysis of flood frequency on the Vltava River in Prague over 1118–2013 period. From the geographical, hydrological and historical point of view, this location seems well suited and representative of such study. Similarly as in his previous studies, by his results the author demonstrates very good knowledge of the issue relating to the historic floods in Prague. In this article, he aims to determine whether the current, more frequent summer occurrence of extreme floods on the Vltava River in Prague (4 floods in the last 15 years) has any analogy in the past

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and compares the situation determined for the Vltava River with other (mainly) Central European river basins. The results reached by the author greatly enrich the topic related to the historic floods with the new knowledge. Specific comments and technical corrections: The number of flood events, with which the author has worked, is high. However, this number varies in various parts of the article: on p. 1639 he mentions some 350 peak discharges in 306 years; on p. 1639 the author states that the time-series of measured peak discharges from 1825–1954 for Prague available Novotny (1960) was extrapolated by 187 flood events for the pre-instrumental period using the documentary data, on p. 1636 he writes that Novotny (1963) presented 121 peak discharges over 1825–1953 period; on p. 1634 (in Abstract) he states that 187 flood peak discharges derived for the pre-instrumental period (1118–1824) augmented 150 records for the instrumental period of 1825–2013; in citing Brázdil (2005) on p. 1635 (in Methods), 159 peak discharge records are mentioned from the period of 1118–1825; These numbers do not match the total number of floods (more than Q2) reported in Figure 2 (p. 1651), where a total of 163 of them are shown for the entire period (12th - 21st century). This discrepancy in the overall numbers of floods is not entirely clear to me. Similar situation exists with the second selected criterion AMF (a total of 306 years with floods are mentioned on p. 1639, while on p. 1640 those are about 300 AMF).

Response: Regarding the number of AMF and POTQ10 relevant for Figs. 2 and 3 it seems obvious after reading all the reviews that it is necessary to clarify my approach and I will do that in the revised version of my manuscript. The basis for my analysis was the data set from 1118–1825 covering the entire Vltava River Catchment, marked as “B set” (Brázdil et al., 2005), which included 159 flood events. For Prague, I added some events to this basic set based on deduction from other parts of the Vltava River catchment, and some floods, in contrast, were deleted from the set as they were not relevant for Prague.

The explanation of Qk abbreviation on y-axis, which can be seen in Figure 3 (p. 1652), is missing in the text. What discharge (Qk) does the author mean? I also propose to

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specify the title of this figure.

Response: I will replace it by Q (flood discharge). The title will be specified in revised version of the manuscript.

What does “B set” abbreviation mean in the text on p. 1638? (Brázdil set?)

Response: B set means Brázdil set published by Brázdil et al. (2005)

What is not entirely clear to me is the criterion for delineation of two sub-periods FRP4a, 4b (respectively FRP5a, 5b)? Is this to preserve a uniform period of about 30 to 40 years? In my opinion, based on Figure 3 (p. 1652) this could involve one longer period FRP4 (respectively FRP5).

Response: Regarding the FRP4 and FRP5. For FRP4 I considered suitable to delineate the two sub-periods as they differed in the flood character. FRP4a - 1780s were specific for major winter flood events and impact of Laki eruptions in 1783–1785. The FRP4b sub-period was in contrast characterised by significant drought (1811, 1823) and major summer floods (1804 and 1824). Similar reasons hold for FRP5, in which summer floods clearly prevail in FRP4b. I believe these reasons justify division to sub-periods. The reasons probably might be given in manuscript to clarify the subdivision.

Regarding the seasonality of floods, I was surprised to see that the winter floods do not play a more dominant role on the Vltava River in Prague. Given that there are not many references in the text to the change in the seasonality of floods, I would recommend leaving out this word (seasonality) in the title of the article.

Response: Originally I intended to address also seasonality in my manuscript, due to the length of the paper, finally, however, the chapter on seasonality was deleted. I will delete the word “seasonality” from the title. For the Vltava River extreme floods prevail truly in summer, particularly August.

25 sources are found mentioned in the text, which are missing in the list of literature (references) on pp. 1645-1647. Those are the following citations: Hladny et al.,

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2005, Elleder 2013, Novotny 1963, Novotny 1960, Richter 1892, Kašpárek et al. 2005, Hladny et al. 2005, Hladny 2005, Danhelka 2012, Elleder and Kotyza 2007, Elleder et al. 2014, Munzar et al. 2014, Munzar 2000, Kakos and Kulasová 1895, Elleder et al. 2012a, Elleder et al. 2012b, Kakos 1990, Hrdlicka 2001, Elleder 2012, Fritsch 1850, Gyrgus and Strupczewski 1965, Böhm and Wetzel 2009, Böhm et al. 2014, Glasser et al. 2008, Rohr 2007. On the other hand, certain sources are mentioned in the list of literature, yet they are not cited in the text (Brázdil et al. 1999, Hladny 1998, Roggenkamp and Herget 2014). With some sources, the year of publication or composite authors differ in the text and in the list (Elleder 2004 on p. 1636 and Elleder 2003 on p. 1645, Fügner 2006 on p. 1635 and Fügner 2007 on p. 1646, Herget 2010 on p. 1640 and Herget and Meurs 2010 on p. 1646, Schmocker-Fackel and Naef 2009 on p. 1642 and Schmocker-Fackel and Naef 2010 on p. 1647).

Response: Thank you for raising this point, I will correct the references and citations in the revised version of the manuscript.

With the flood of 1658 (on p. 1641), Dresden should be referred to under CEF acronym (not WCEF) based on the definitions of these areas (on pp. 1640 and 1641).

Response: Thank you for this comment. Reference to the flood in Paris is lacking in the text, so WCEF is correct. I will add this in the revised version of the manuscript.

In my opinion, the abbreviations (SM), (A), (V), (L), (Ag), (N), (OS) are needless in Table 2 (p. 1649), if there is no more mention of them in the text or in the figures.

Response: This will be accounted for in the revised version of the manuscript.

I would also suggest comparing the time occurrence of historic floods on the Vltava River with the regions to the east of the Vltava basin (or to the east of the Czech Republic), as it might be possible to establish a possible correlation with this region. Although the reason for this absence is probably the fact that such studies are (so far) largely missing. The exception being the studies by, for instance, Kiss (2011)

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who studied the floods on the territory of the former medieval Hungary (until 1500) and by Pekárová (2011) who studied the past floods on the territory of the present day Slovakia. For instance, Kiss (2011) mentions the winter flood of 1374 and the winter flood of 1367 in Transylvania; Pekárová (2011) mentions the flood of 1568 in the Hornád River basin and in 1899 on the Hron River. According to my own records, there is a record on the great flood of 1675 on the Váh River in Opatová (Slovakia) although the author states about this particular year (p. 1641) that, except for the Czech lands, this summer flood has not been mentioned anywhere else. Recommended references: Kiss, A. (2011): Floods and long-term water-level changes in medieval Hungary. Doctoral dissertation. Central European University Budapest, Hungary, 323 pp. <http://www.etd.ceu.hu/2011/mphkis22.pdf> Pekárová, P., Škoda, P., Majercáková, O., Miklánek, P. (2011): Important floods of the past on the territory of Slovakia. *Acta Hydrologica Slovaca*, 12, 1, 65-73 (in Slovak with English summary). <http://www.ih.savba.sk/ah/>

Response: Thank you for your comment on association with floods in Slovakia and Hungary and for giving me the relevant references. They bring new information for me and I will be happy to enrich my paper with this information.

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