

Interactive comment on “Estimation of peak discharges of historical floods” by J. Herget et al.

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Reply to the anonymous referee #2

Even though the referee recommends the paper for publication, the introductory statement "I [...] can not image replication of the method by another engineer" is fundamental. We tried to document the application of the approach step by step based on own experiences from previous key studies frequently quoted throughout the manuscript for illustration. For a rather short scientific paper suitable to be published in a high scientific level journal like HESS, a specific level of abstraction cannot be avoided. Consequently we assume, by answering the questions of the referee the approach becomes more clear and easier to be applied. Probably, carrying out an own individual key study following the generalized outline summarized in the manuscript is easier in practise than the impression by the referee suggests if each factor step by step gets

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quantified according to evidence in the field. Beyond spelling mistakes, most questions mentioned by the referee rather seem to go into further details than focusing on uncertainties within the manuscript itself. Probably it is useful if the editor decides if and which question should result in a specific improvement of the manuscript in addition to the explanations made and references given below.

p. 5468 r. ~10: reasons and numbers of different scenarios

If different scenarios are required at all depends if any distinct (!) uncertainty arises, e.g. two different peak flood levels for the same event at the same place are handed down. As mentioned in the text, the problem whether remnants of a destroyed stone bridge filled the locally narrow river channel and therefore significantly decreased the cross-section area illustrates another example requiring consideration of different scenarios. If they are actually needed and how many cannot be answered in general but depends of evidence at specific locations. Note, that in worst case numerous scenarios might be considered, but if no contrasting reliable data exist or case studies are obviously needed, no differentiations are necessary (and useful) at all. If case studies are obviously needed and how they can be quantified is the decision of the investigator in each individual case study (like for any modelling approaches in general, I think). As these aspects seem to be sufficiently explained in the manuscript already (p. 5468 l. 7-15), no modifications seem to be necessary.

p. 5468 r. 25: backtracking archaeological layers

Different layers of sediment or urban debris in floodplains reducing the cross-section area can be differed based on previous archaeological or soil-scientific studies. As mentioned in the text, the previous studies might be used to get information on the age, thickness and expansion of cultural layers. Further details depend on the individual locations, e.g. filled river channels for the expansion of settlements or shore stabilisation to ease harbour activities. As these aspects seem to be sufficiently explained in the manuscript already (p. 5468 l. 20-28), no modifications seem to be necessary.

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p. 5470 r. 10-20: (changing layout, narrative character)

Sorry, but we cannot follow how and why the text explaining principally the potential influence of the natural incision rate of a river should be transferred in its layout towards a space-consuming list. Also an (unqualified?) narrative character cannot be identified as we are just explaining the resulting minor river channel incision amount since historic times for an unrealistic high annual incision rate. Background are frequent comments during oral presentations of the quoted previous key studies that natural incision of the river channel (and accumulation on the floodplain) should result in significant errors of the historical cross-section area, which is shown to be less significant. As these aspects seem to be sufficiently explained in the manuscript already (p. 5470 l. 5-20), no modifications seem to be necessary.

p. 5472 r. ~20: "this" = quantification of roughness elements

The quantification of roughness elements is based on previous experiences gained by other scientists published in the mentioned references. It might appear challenging to quantify the several parameters involved for historic times, but by a closer look (into the references mentioned above) the quantitative variation is less than it might be expected. Note further on, that in the context here, the roughness elements n_1 - n_5 are of different importance for the different units of the cross-section area. As further details require lists that are rather space-consuming we can only refer a) to the quoted key studies with all variations listed in detail and b) the quoted reference publications on roughness quantification in general. As these aspects seem to be sufficiently explained in the manuscript already (p. 5472 l. 4 – p. 5473 l. 8), no modifications seem to be necessary.

p. 5475 r. ~20: relation and reliability of Q_{min} – Q_p – Q_{max} – Q_{gauge}

As illustrated in Fig. 3 and explained in the text (p. 5473 l. 7f), Q_{min} and Q_{max} result of maximum respectively minimum values of hydraulic roughness values of n . To be able to deal with a distinct single value for comparisons, a plausible (occasionally

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mean) value of n is estimated resulting in Q_p . Due to algebraic reasons, Q_p is not necessarily the mean value between Q_{min} and Q_{max} . As explained on p. 5475 l. 13-14, the estimated Q_p -values are derived by the application of the approach on water levels of recent flood events which are compared with gauge data of the recent events to validate the reliability of the Q_p -data in general. The reliability of recent gauge data cannot be quantified (by us) in general due to the reasons explained p. 5475 l. 23-25. Therefore, the gauge data are taken for "real" and representative. As these aspects seem to be sufficiently explained in the manuscript already (p. 5473 l. 19-22 and p. 5475 l. 13-14), no modifications seem to be necessary.

p. 5476 r. 6: accuracy of +/-10%

As explained on p. 5475 l. 13-14 and table 1 (head of the last column) the "accuracy" is the difference between estimated Q_p -data and measured Q_{gauge} -data of recent flood events expressed in %. Note, that we are not talking about accuracy as for historic flood events no related "real" value is available and alternative approaches only can provide other estimations. As mentioned above, gauge data of recent floods are considered to be representative even if they contain errors (p. 5475 l. 23-25). (Unfortunately,) The excellence of our results has to be put into perspective. As these aspects seem to be sufficiently explained in the manuscript already, no modifications seem to be necessary.

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