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Discussions

Interactive comment on "Reassessing flood frequency For the Sussex Ouse, Lewes: the Inclusion of historical Flood Information since AD 1650" *by* N. Macdonald et al.

Anonymous Referee #2

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I did review the manuscript before its publication in NHESSD. What could be easily improved in the original version has been modified by the authors.

The manuscript presents an example of a flood frequency analysis accounting for historical records. The selected stream is a small coastal river with a watershed area of about 300 km2, located in Sussex (UK). The computation of the standard deviation for the estimated 100-year design flood helps evaluating the added value of the historical floods, recorded over a period of 200 years, when processed along with 50 years of stream gauge records. Their inclusion in the flood frequency analysis leads to divide by around two the estimation standard deviation. Two different approaches for

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the inclusion of historical data are compared: 1) the magnitude of historical discharges exceeding a given threshold is supposed to be perfectly known or 2) it is supposed to be unknown (censored data). The provided results gives an additional example of what has been shown in previous studies (especially Payrastre et al., 2011): i.e. the historical peak discharges do not have to be precisely known. A sensitivity analysis on the historical so-called "perception threshold" reveals little influence on the maximum likelihood estimate as long as the historical record can be considered as exhaustive, which can not be ensured if this threshold is too low. Computations of the 100-year quantile standard errors, unfortunately not provided in the manuscript, would have certainly also revealed little influence of the perception threshold which has also been shown in previous studies. By the way, historical information could have been included in the flood frequency analysis even with a threshold exceeding the largest reported value (top of page 7631). The fact that the threshold has not been exceeded over the considered historical period is an information thta can be included in the computation of the likelihood (equations 6 and 7 with the two first terms). The binomial factor should also be removed from equations 6 and 7 for consistency reasons (no influence on the results): the likelihood of the observed series with known dates of threshold exceedances is computed, no the probability of k exceedances of the threshold over the historical period.

This manuscript does not provide a particularly new insight in the question of the value of historical information in flood frequency analyses.

1) It is based on a single case study, which by the way not the most simple one: the selected location is under tidal influence and is also exposed to flash floods of a small tributary, the river bed has been significantly modified during the historic period with a possible influence on the local stage-discharge relation, and moreover the considered location is not equipped with a stream gauge and the analysed discharge series is build from the sum of discharges measured in two upstream sections. A simpler, less questionable case study or even more than one example could have been selected as

an illustration.

2) The inference methods used are standard (maximum likelihood estimation) and not up to date (evaluation of the confidence intervals based on a linear approximation of the likelihood function and on the assumption of a Gaussian distribution). More rigorous inference approaches based on Bayesian-MCMC methods, that are now frequently used in hydrology (see the works of Kuczera, Reis and Stedinger, Gaume et al., Renard et al.) would certainly have been a better suited choice and helped to go further into the analyses.

3) The conclusions concerning the added value of historic data in flood frequency analyses depending on their nature (threshold level, accurate discharges or censored data) are also not new and have been presented in more generality in papers recently published by Stendinger et al. or Payratre et al. for instance.

Nevertheless, despite all these critics, the manuscript is well written, sound, and provide an interesting, well documented, illustrated and discussed example of the introduction of historical records in flood frequency analyses, that can be useful for the readers of NHESS. This is the reason why I would suggest its publication.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 7615, 2013.