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Interactive comment on "Uncertainty analysis of hydrological return period estimation, taking the upper Yangtze River as an example" *by* Hemin Sun et al.

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Thank you for the review and constructive comments. We have responded item by item as below to your comments.

This paper introduces and describes a quantitative way to assess the uncertainty in estimating return periods by considering different data sampling methods, distribution functions and parameterizations estimation methods. The topic of this manuscript had practical value for the engineering design or the flood risk assessment. In generally, I found this manuscript interesting, technically sound, and well organized. Nevertheless, I think this paper needs some revisions in order to clarify the novelty of the methods. I also suggest the authors to carefully review grammar and spelling throughout the entire

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Discussion paper

manuscript. I have provided some editorial suggestions at the end of this review, but I may have missed some.

Q1, The conclusion “SM is the main source of uncertainty for the stations with significant trend, while the DF contributed most to the uncertainty for the stations without clear trend” only basin on two hydrological stations. I think this kind of conclusions should be based on statistical results. Therefore, I strongly recommend either presenting a strong argument in favor of only two stations or better using higher-number stations. Answer 1: We prefer to add more theoretical analysis in conclusion and discussion parts. Section 3.1 shows that the data series is very sensitive to the return level estimation, especially for the series which have significant trend. Both of the variations of skewness and kurtosis between three sample series are larger for the series with significant trend than those without. That is to say, return level of three sample series have lager range for the series with significant trend than those without. In revised manuscript, we conducted a sensitivity test to figure out whether the results from this study transferable to other stations under different climate conditions. By using a detrend method, we generated a new discharge series, and found that the main uncertainty to the estimation of return levels is from distribution functions.

Q2, Also, the method of DPOT is not explained clearly, I do not understand why the authors choose only the station with significant downward trend, what if the series have a significant increasing trend? Wound the DPOT also be a better sample method to reduce the uncertainty? Answer 2: We know that there is periodicity for a discharge series usually. If the observed record was in a peak or positive period of the periodicity, return levels might be heavily overestimated. The alternative is the DPOT sampling method introduced in this study. Of course, we will describe the DPOT method more clearly and understandable.

Q3, The authors should clarify why the Chi-squared method was selected for fit test. Answer 3: Chi-squared is a most commonly used goodness of fit test. The advantage and applicability of this method will be added in the method section.

Q4, The abbreviations of distribution are inconsistent in the manuscript. Please check and correct. Answer 4: Sorry for our carelessness. We corrected all abbreviations to make sure acronyms are consistent throughout the paper.

Q5, In the abstract: “But uncertainties...” should replace by “though uncertainties”. Answer 5: We have corrected this sentence.

Q6, There lots of mistakes in the superscripts of units in section 2 Answer 6: We have checked and corrected all of them.

Q7, I suggest the authors provide further practical interpretation of the results presented in the last section. Answer 7: We will enrich the practical interpretation of our results in the discussion parts. In fact, we analyzed the uncertainty sources of return level estimation, and delivered the possible way to reduce the uncertainties in this paper. Our results could be useful for appropriate assessment of disaster and the construction of hydraulic projects such as dams, bridges, and pipelines (Rosbjerg and Madsen, 1998; Milly et al., 2002; Cooley et al., 2007; Salvadori et al., 2011; Rootzén and Katz, 2013).

Q8, All the references should be edited according to the format of HESS. The reference listed below was not cited in the manuscript. Kianfar, B., Fatichi, S., Paschalis, A., Maurer, M., and Molnar, P.: Climate change and uncertainty in high-resolution rainfall extremes, Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-536, 2016 Answer 8: We corrected the reference format.

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