

## ***Interactive comment on “Extreme droughts/floods and their impacts on harvest derived from historical documents in Eastern China during 801–1910” by Zhixin Hao et al.***

### **Anonymous Referee #2**

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This is a nice piece of paper, well-structured with clear scoping and good delineation. It investigates the time evolution of extreme drought/flood events and the correlations of those extreme events with crop harvest in cold/warm epochs. In general, this paper provides very knowledgeable information on the drought/flood and harvest reconstruction method derived from documentary records, very comprehensive literature review in sections 1 and 2.1. However, there are still some points that I would suggest for authors to further improve the scientific quality and literacy of the paper.

Data used for analysis in this study is based on the previous analysis. The rationale for deciding the drought/flood (Zheng et al. 2006 and Hao et al. 2016) and harvest

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grades (Su et al, 2014; Yin et al, 2015) seemed promising however readers need to trace back those papers for more information on the source and profiles of data. There thus exists an ambiguity about how those records were collected for building the data sets, the characteristics and amounts of records, and data reliability evaluation. At this point, I can only assume that the data are reliable for the following analysis. It can be helpful if the authors provide some basic statistics (as appendix maybe, e.g. number of records per year, min, max etc for variables) of the data profile.

Based on the data, methods used for analysis is relatively simple. The authors used 50-years moving average (they term it as moving window) to smoothen extreme drought/flood trend, used Wilcoxon rank test to examine/compare median values of every intervals, and used contingency table to examine the effects between extreme drought/flood and harvest and between them and cold/warm periods. For this section, I suggest the authors to add a short paragraph giving readers some concepts about the method structure before going into details. Also there are some unclear parts: what do you mean by saying ‘moving-window of 50 years and step of 10 years (line 24-25, page 5, and figure 3 caption, page 18)’? Please provide explanations. For the same figure 3 caption, please use real number to replace full confidence, high confidence, medium or low confidence. It is unclear what those mean. Also, I don’t quite understand the sentence in line 26-28 page 5 “This is because the mean of rank series in an interval was equivalent to the frequency of . . .by labeling the extreme drought/flood years as 1 and non-extreme years as 0”. Please provide more explanations.

The research results are clear and straightforward. The drought, flood and harvest trends and their descriptions are clear. However some trends are inconsistent with previous studies. For example, the authors mentioned that “there was an evident jump around 1640s with increase of years of (harvest) grade 4. . .” (line 12-13 page 7). I admire the following sentences on the discussions of the records in Qing and previous dynasties to clarify the discrepancies of the historical books. However, after removing grade 4 (average harvest), there still existed an obvious jump of grade 5&6 (bumper)

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after 1640 which was commonly recognized in previous literatures as having poor harvest and famine in this coldest interval of little ice age. There might be some reasons including suddenly increasing number of local chronicles in Qing dynasty that could dilute the drought magnitude based on your grading method or the 50-years moving average can further smoothen the trend. In a word, it will be extremely valuable if the authors can compare the present analysis with previous studies and provide explanations or new perspectives.

Overall, this paper provides new and important insights into the correlations among extreme event, harvest and cold/warm climate. Data statistic is suggested to provide, and since missing data especially for harvest is prominent (35%), it is suggested that authors are more careful to claim their conclusions. Some inconsistency is also found between text and tables, e.g. 49.4% (line 23) and 24.0% (line 24) on page 8 are different from those shown in table 4. Further English editing is strongly suggested to improve high quality writing style of this nice paper.

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