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Climate of the Past Discussions

Interactive comment on "Historical droughts in the Qing dynasty (1644–1911) of China and the role of human interventions" *by* Kuan-Hui Elaine Lin et al.

Kuan-Hui Elaine Lin et al.

khelin@ntnu.edu.tw

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GENERAL COMMENTS This article discusses historical droughts and the role of human interventions in the Qing Dynasty (1644-1911) of China based on the REACHES database, which was created using the "Compendium of Meteorological Records of China in the Last 3000 Years". The main purpose of this article would be an analysis of longterm variations of droughts and their impacts on human society in China during 1644-1911. Although the methodology used might be somewhat innovative, the results were not so new and interesting as compared with a lot of previous similar papers analyzing the changes in climate and natural disasters in China during the historical period. Also, another problem of this article is that four authors of this article are the same as those of the main referenced paper by Wang,P.K. et al.(2018) which

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introduced the construction of the REACHES database. For most of the readers of this article, the REACHES database might be unfamiliar and unrecognized. Therefore, authors should explain the REACHES database in detail at first using visual diagrams and charts, such as shown in Wang,P.K. et al.(2018). However, this article would be acceptable for publication after minor revisions. Response: We thank for the many constructive comments. We will surely add a description about the REACHES database in the paper to help readers familiarize with the database.

SPECIFIC COMMENTS I. Introduction P.2 Line 26: Studying past drought and humidity Âż Studying past drought and flood After this sentence, previous related papers should be referred to. Line 34: documented records Âż historical documents (e.g., ****,*****) P.3 Line 30-31: Three-, five-, âĂŤâĂŤâĂŤ- is the most commonly practiced method (previous articles should be referred here), so that âĂŤâĂŤâĂŤ Response: Thanks for the suggestions. We will correct those in revision.

2.Data P.5 Line 22: The data source of this study mainly comes from REACHES database âĂŤ> This is an ambiguous expression. "mainly" should be replaced by "mostly" or "basically". P.7 In Figure 1, the scale on the horizontal axis should be expressed as "1650 1660 1670 âĂŤ–", not as "1644 1654 1664 âĂŤâĂŤ". This is the same for other figures; Fig.2, Fig.3, Fig.4. Strangely, Figure 5 on P.14 has no time scales. As for the time scale, Figure 7, 8, 9, 10, and 12 are good, but Fig.11 should be corrected. Response: Thanks for the suggestions. We will correct those in t revision.

3.Methods P.9 Line 1 - 8: In this paragraph, the term "drought" is defined as divided into "meteorological drought" and "hydrological drought", but the distinction between the two is arbitrary and lacks objectivity. Authors should give some text examples of meteorological droughts and hydrological droughts in the "Compendium of Chinese Meteorological Records of the Last 3000 Years", by citing specific sentences. Response: This is very useful suggestion. We will do this in revision. P.1 Line 12 - 14:The term "Paoshan" should be defined; What's the difference between "Paoshan of Shanghai City" and "period of Paoshan" ? Response: Thanks for the careful review. Paoshan

is a district in Shanghai City. The latter one you mentioned here should be corrected as the frequency for the period ‘in’ Paoshan district. . . Line 23: "On very data" Âż "On every data"âĂİP.11 Line 31: (1832âĂŤâĂŤ) Âż (1833âĂŤâĂŤ) âĂİ 4.Results P.12 Line 15 - 17: In figure 4A, the authors mention that "If taken drought variable as a major concern, there is only one spike around 1720 in the earlier half of the 18th century and some increasing frequency around 1730-1750.", this expression is subjective and inaccurate, especially for the term 1730-1750. Response: We also agree that the description is a bit arbitrary and subjective, and will modify the description. Line 17 - 23: This paragraph includes serious problems concerning the comparison between the time series of multiple variables for droughts and the Northern Hemisphere temperature anomalies, as there exists a large difference of spatial and temporal scales between them. If the authors would discuss the relationship between the drought frequencies in China and the Northern Hemisphere mean temperature anomalies, reasonable explanations for the peak of drought frequency and the NH mean temperature anomalies in terms of anomalous atmospheric circulation patterns which might cause surface drought conditions in China. Response: We agree that the comparison of drought frequencies in China and NH mean temperature anomalies is scale inappropriate. The initial idea is to illustrate a general pattern of warmer temperature anomaly in the 18th century corresponding to less drought frequencies in our records. We will rethink about how to reorganize the paragraph and give reasonable explanations. P.14 The description of colored lines drawn in Figure 5 is not specified, except for Famine, Crop Failure and Socioeconomic turmoil. Also, the scale of the year on the horizontal axis of the graph in Figure 5. is completely missing. Response: Thanks. We will definitely deal with this critical issue!

P.14 Line 14 - P.15 Line 6: The description in this paragraph is arbitrary and less objective. For example, the authors identified six severe drought periods, but no explanations for the specific selection criteria can be found. In case of the period 1720-1740, the drought frequency in the 1730s was apparently lower than in the 1750s (Fig.4A) . So, please mention clearly the specific selection criteria for 6 severe drought periods. Re-

sponse: Although there are already some explanations about the selection of the six severe drought periods, we agree that the criteria can be more clear and quantitative. We will make revision about the criteria from both quantitative frequency and narrative analysis.

Figure 6 (P.16-18): The size of the legend on the left in figures is too small to recognize. These should be more expanded for the readable size. Response: We will modify this in revision. P.20 In Fig.7 and Fig.9, population changes should be shown as a line graph, not as a dotted graph. Response: The initial purpose is to show the original data. We can make it a line graph in revision. Line 19: The authors mention that "the population of Jiangsu showed a downward (Figure 8)", but no population graph can be found in Figure 8. Response: This one should be referred to Figure 7.

P.22 Line 19: expended Âż expanded P.26 5.Discussions and conclusions Line 18: metrological Âż meteorological Line 21: dry Âż dry conditions P.27 Line 22: while Âż which ? Line 23: between it Âż between them ? Line 35: drought though can be –Âż though drought can be – ? P.28: Line 30: in the 1665-1991 Âż in the 1665-1911 ? Response: We thank for all above corrections!

P.29: Line 11 - 13: In this paragraph, the authors pointed out that "Moreover, this illustrates the importance to separately deal with drought and flood events instead of integrating them into one single index as practiced in many previous studies". Probably, the authors did not read at least two important papers below; the former article analyzed the spatiotemporal variations of droughts and floods in China during the historical period based on statistical analysis, and the latter article reviewed historical climate records in China and reconstruction of past climates. The authors should discuss by citing and referring these valuable papers. Wang, S.W., and Z.C.Zhao, 1981: Droughts and floods in China, 1470-1979. in "Climate and History" T.M.L.Wigley, M.J.Ingram and G.Farmer (eds.), Cambridge University Press, 271-288. Zhang, Jiacheng and T.J.Crowley, 1989: Historical climate records in China and reconstruction of past climates. Journal of Climate, 833-849. Response: Drought and

Flood Charts of the five hundred years and the two publications mentioned here are all influential works. While the methodologies are different, we agree that we could revise the sentence and more considerably discuss what messages we want to deliver here. Thank you.

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2019-115/cp-2019-115-AC2-supplement.pdf

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