Dear Editor,

Thank you so much for handling our manuscript, and the reviewers for their comments and suggestions. We have made a major revision of the manuscript, addressing all of the concerns raised by Reviewers # 2&3. We have submitted the revised manuscript on to the editorial system. Below are our responses to the comments by the reviewers, with the original comments in **blue** and the responses in **black**.

If you have any questions and other instructions, please let me know.

Best regards,

Guoyu Ren

Response to Reviewer 2

Reviewer 2: comment 1

Abstract needs to be revised. It's too long and poorly structured. Description for results for example is too detailed and disproportionately occupies 12 lines.

Author: response to comment 1

Thank you for pointing this out. In the revised manuscript, we streamlined the abstract.

Reviewer 2: comment 2

Data and method parts were nicely revised. But you still need to use 1-2 sentences briefly explaining why IDW is needed for analysis. Figure 5 I believe is not a product of IDW analysis, please correct. I also added some comments on the following figures.

Author: response to comment 2

Thank you for this comment, and apology for the lack of carelessness. In Lines 314-318 of the revised manuscript, we added a statement of the reason for choosing IDW. The contents are as follows:

" *Xie et al. used four spatial interpolation methods with the Upper Sangamon basin and analyzed the accuracy of the interpolation results separately. They found that IDW had the highest interpolation accuracy when the study area was small and the number of meteorological observation stations was relatively small (nine sites of observational stations in the basin; Xie et al., 2018).* "

Figure 5 is a scatterplot, and In Line 434 of the revised manuscript, we made a correction.

Reviewer 2: comment 3

It's a good idea to move the comparison to Asian monsoon index and ENSO to discussion part. The way of articulation now is less controversial, but I still feel a few points not clarified, such as (p18 line 476) extreme flood were increasing when monsoon was strong. Theoretically this is acceptable, but if this is true in your analysis (Figure 9) then 18th century should see a lot more floods than it was now. I suggest you to give a more precise description about this and/or tone down a bit. Please see my comments on page 18.

Author: response to comment 3:

Thank you for this constructive suggestion. In Line 585-589 of the revised manuscript, we changed the wording of this section. The revised contents are as follows:

"*As a whole, this suggests that the multi-decadal variations in the frequency of extreme drought/flood events of the HRB are influenced to some extent by changes in the strength of the Asian monsoon, with relatively more extreme drought events when the monsoon is weak and more extreme flood events when the monsoon is strong.* "

Reviewer 2: Minor comment 1

Abstract: Too long sentence. >12 lines related to results in abstract is inappropriate, you have to trim it.

Author: response to Minor comment 1

Thank you for pointing this out. In the revised manuscript, we streamlined the abstract.

Reviewer 2: Minor comment 2

L94: century→centennial.

Author: response to Minor comment 2

Thank you for this comment, In Line 109 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 3

L98: multi-→multi-decadal?

Author: response to Minor comment 3

Thank you for this comment, In Line 114 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 4

Figure 1: it's nice to show Yangtze river on this map for better comprehension of the river system.

Author: response to Minor comment 4

Thank you for this constructive suggestion. We added the Yangtze River basin and the Yangtze River main stream to Figure 1 in the revised manuscript.

Reviewer 2: Minor comment 5

Table 1: please justify if this is correct?

Author: response to Minor comment 5

Thank you for this comment, and apology for the lack of carelessness. 1.17 is correct, and in the revised manuscript, we modified the other 1.7 to 1.17.

Reviewer 2: Minor comment 6

L204: enough amount→abundance.

Author: response to Minor comment 6

Thank you for this comment, In Line 242 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 7

L256: IDW is for interpolation purpose but inevitably brings a certain degree of errors from statistics. You may like to explain here why you need to use IDW for analysis.

Author: response to Minor comment 7

Thank you for this comment. In Lines 314-318 of the revised manuscript, we added a statement of the reason for choosing IDW. The contents are as follows:

" *Xie et al. used four spatial interpolation methods with the Upper Sangamon basin and analyzed the accuracy of the interpolation results separately. They found that IDW had the highest interpolation accuracy when the study area was small and the number of meteorological observation stations was relatively small (nine sites of observational stations in the basin; Xie et al., 2018).* "

Reviewer 2: Minor comment 8

Table 2: please correct.

Author: response to Minor comment 8

Thank you for this comment, and apology for the lack of carelessness. In the revised manuscript, we made a correction.

Reviewer 2: Minor comment 9

L301: please correct.

Author: response to Minor comment 9

Thank you for this comment, and apology for the lack of carelessness. In Line 367 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 10

L353-354: I wonder if Table 5 was made through IDW since IDW is mainly used for interpolation and this doesn't look like a case for this map.

Author: response to Minor comment 10

Thank you for this comment, and apology for the lack of carelessness. Figure 5 is a scatterplot, and in Line 434 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 11

L370-372: need to cite reference(s) for this.

Author: response to Minor comment 11

Thank you for the suggestion. In Line 456 of the revised manuscript, we added reference.

Reviewer 2: Minor comment 12

L380: need to further explain here: averaged to derive mean value for the period 1426-2017 at each site and then interpolated to produce the spatial patterns.

Author: response to Minor comment 12

Thank you for this comment. In Lines 468-474 of the revised manuscript, we describe this in more detail. The contents are as follows:

"*The severest droughts and floods years in the HRB were identified for each of the 15th-20th centuries (1426-1999), respectively. The years of the severest floods in each century are 1474, 1516, 1647, 1742, 1889, and 1931; the years of the severest droughts are 1433, 1528, 1690, 1768, 1877, and 1928. Then the average drought and flood grades for each site in the above years were calculated separately and spatially interpolated using the IDW. Each site's drought and flood grades were then plotted using ArcGIS10.6 (Figure 6).*"

Reviewer 2: Minor comment 13/14/15/16

L397: droughts→drought

L397:floods→flood

L399:shows→show

L399:~~analysis~~

Author: response to Minor comment 13/14/15/16

Thank you for this comment. In Lines 492 and 494 of the revised manuscript, we corrected the above mistakes.

Reviewer 2: Minor comment 17

L429-430/L437: rich-poor precipitation encounter is vague in meaning to me. Can you modify with clearer phrase?

Author: response to Minor comment 17

Thank you for this comment. In Lines 521-522/532-533/544-545 of the revised manuscript, we revised this part in a clearer expression.

Reviewer 2: Minor comment 18/19

L448: ~~of these~~.

L449: ~~visual~~

Author: response to Minor comment 18/19

Thank you for this comment. In Lines 556 and 557 of the revised manuscript, we modified the inappropriate wording.

Reviewer 2: Minor comment 20

Figure 9: Flood → drought.

Author: response to Minor comment 20

Thank you for this comment. In the revised manuscript, we made a correction.

Reviewer 2: Minor comment 21

L476-477: If this is true, then there should be a lot more flood in the 18th century when monsoon index is high. Generally, I agree there can be a correlation. But I suggest you to tone down and give more precise explanations/descriptions.

Author: response to Minor comment 21

Thank you for this comment. In Line 585-589 of the revised manuscript, we changed the wording of this section. The revised contents are as follows:

"As a whole, this suggests that the multi-decadal variations in the frequency of extreme drought/flood events of the HRB are influenced to some extent by changes in the strength of the Asian monsoon, with relatively more extreme drought events when the monsoon is weak and more extreme flood events when the monsoon is strong."

Reviewer 2: Minor comment 22

L481-487: This is confusing. So HRB flood can correlate with strong El Nino and La Nina. And the last two sentences you first said HRB bears similarity with Yellow river plain and then you seemed to indicate HRB flood is related to Yangtze River basin precipitation. Need more explanation!

Author: response to Minor comment 22

Thank you for this comment. In the revised draft, we deleted this controversial sentance.

Reviewer 2: Minor comment 23

4.2: unclear sentence and the paragraph overall. you mean this is the limitation of Atlas or this study? do you use summer as main season for the judgement? so a year can only be judged as either dry or humid based on the grade rule.

Author: response to Minor comment 23

Thank you for this comment, and apology for the lack of carelessness. In Lines 218-220 of the revised manuscript, we supplemented the relevant provisions for seasonal screening. The contents are as follows:

"*If droughts and floods occurred successively at the same site in the same year, for instance, spring droughts and summer floods, or summer droughts and autumn floods, etc., the summer condition was considered prevailing.* "

Lines 274-275 illustrate that one of the characteristics of Chinese historical documents is "considering only disasters but not normal conditions", which indicates that historical documents only record abnormal conditions and not normal conditions, so some years are classified as grades 3 (i.e. normal years, as shown in Lines 210-233 and Table 1).

The Atlas is a classification of drought and flood conditions for the whole of China, so the choice to focus on summer drought and flood conditions is consistent with the climatic conditions of most of China, especially for areas where rice is mainly grown (the HRB is dominated by rice cultivation), but there are some limitations to this provision, as described in this part.

Reviewer 2: Minor comment 24

L518: ~~the~~.

Author: response to Minor comment 24

Thank you for this comment. In Line 631 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 25

L521: results → result.

Author: response to Minor comment 25

Thank you for this comment. In Line 637 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 26

L535: the era is an unclear time scale. please modify.

Author: response to Minor comment 26

Thank you for this comment. In Line 650 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 27

L537: pls correct the number to be consistent with line 268 on page 9.

Author: response to Minor comment 27

Thank you for this comment, and apology for the lack of carelessness. In Line 653 of the revised manuscript, we made a correction.

Reviewer 2: Minor comment 28

L549: I suggest to rephrases the sentence starting with 'The spatial distribution of the high frequency extreme drought centered in…. '. And better add a sentence in the end to explain possible human influence of record frequency on the sites to deter spatial analysis.

Author: response to Minor comment 28

Thank you for this comment. In Lines 666-669 of the revised manuscript, we made a correction. The contents are as follows:

"*The spatial distribution of the high-frequency extreme droughts centered in the middle reaches of the HRB, and the high-frequency extreme floods centered in the lower reaches. The frequency of droughts and floods was higher in the middle and lower reaches than those in the upper reaches. However, human factors may have some influence on the statistical results of spatial distribution.*"

Response to Reviewer 3

Reviewer 3: Major comment 1

They showed Figure 3 to show the validity of their flood/drought index and observed precipitation. They concluded they were well correlated and their flood/drought index was reasonable. However, when the curves are compared with the years in Table 2, the listed extreme flood and drought years seem not to match with the minimum or maximum of the curves in Fig. 3. Will they plot these extreme years in Fig. 3 to check the validity of these data and explain the reason of the differences if they differ in some years?

Author: response to Major comment 1

Thank you for this comment, and apology for the lack of carelessness in the figure. In the revised manuscript, we redrawn Figure 3 and labeled the extreme drought and flood years corresponding to the two sequences, according to the suggestion. The extreme drought and flood years identified in the grade sequence very well correspond to those shown in the precipitation anomaly percentage curves in the figure.

Reviewer 3: Major comment 2

They divided the whole period into three stages. But in the latter description it seems nothing was considered on interpreting the results. It will be needed how they treated such data discrepancies during the target period.

Author: response to Major comment 2

Thank you for this comment. The division of the three stages was for showing the different recording rates of the drought and floods in history. It would not be used in the later analysis, and the use of this method would not affect the the data homogenization and the analysis results. It was done only to verify the credibility of the grade data series in this study. The two abrupt change points in 1812 and 1951 appeared in the homogeneous test of the original records, and they would also affect the homogeneity of the relative index (grade) series. We changed a sentence in the paragraph to avoid misunderstanding ("the Ming and Qing dynasties" to "before 1951") in the revision (Line 261).

Reviewer 3: Major comment 5

Although they seem to add English references, adding two more important former studies on long-term Asian monsoon variability from the 15th century by Shi et al. (2018, 2019) will be recommended.

Author: response to Major comment 5

Thank you very much for recommending these two excellent studies, which we have added to the references in the revised manuscript after reading them carefully.

Reviewer 3: Specific comment 1&29

L26-28: It is rather hard to understand the relationship between the lower flood/drought frequencies in the upper reach, and the highest sensitivities to droughts and floods in the Ankang region located in the upper reach.

L382: It is not clearly understandable why they regarded higher flood/drought grades in Fig. 6 to be"sensitive".

Author: response to Specific comment 1&29

Thank you for this comment. Based on your comment and the recommendation by Reviewer #2, we made a revision, and described this more clearly in the revised manuscript (Lines 468-474). The contents are as follows:

"*The severest droughts and floods years in the HRB were identified for each of the 15th-20th centuries (1426-1999), respectively. The years of the severest floods in each century are 1474, 1516, 1647, 1742, 1889, and 1931; the years of the severest droughts are 1433, 1528, 1690, 1768, 1877, and 1928. Then the average drought and flood grades for each site in the above years were calculated separately and spatially interpolated using the IDW. Each site's drought and flood grades were then plotted using ArcGIS10.6 (Figure 6).* "

Some sites (e.g. Ankang, Nanyang, and Qianjiang) were relatively more sensitive to drought, while others (e.g. Ankang, Xiangyang, and Zhongxiang) were relatively more sensitive to flood. This means that they are more likely to be affected by severe droughts or floods in history. We modified the sentences in the revised manuscript to read *"the sites of Ankang, Nanyang, and Qianjiang were relatively more likely to be affected by severe drought, while those of Ankang, Xiangyang, and Zhongxiang were relatively more likely to suffer from severe flood"* referring to the comment (Lines 474-476).

Reviewer 3: Specific comment 2&33

L44-45 and many others: The reviewer is not familiar with this journal's citation policy, but normally, the cited references are arranged from old to new, or alphabetical order.

References: He does not know this journal's policy but the reference order may need to be arranged alphabetical order. In addition, use consistent style for small/capital letter usages in the titles of the paper and/or the journal names.

Author: response to Specific comment 2&33

Thank you for this comment.

CP does not make any special requirements for the order of the references. The following are the journal's requirements for the order of references: "In terms of in-text citations, the order can be based on relevance, as well as chronological or alphabetical listing, depending on the author's preference. "

However, we followed your suggestion and arranged the reference citations in chronological order in the revised version. Meanwhile, the style was also modified.

Reviewer 3: Specific comment 3

L65: The word "especially" may not be needed, since this situation is not limited to eastern China's monsoon region.

Author: response to Specific comment 3

Thank you for this comment. In the revised manuscript, we removed the word "specially" and replaced it with "including" (Line 74).

Reviewer 3: Specific comment 4

L112-113: Need to add the averaged periods for the average annual precipitation and runoff.

Author: response to Specific comment 4

Thank you for this comment. The average period was 1960-2010, according to the cited article (Yin et al., 2015). We have added the reference period of the calculation in the revised manuscript (Line 131).

Reviewer 3: Specific comment 5

L116-117: It is not sure if these topographic features are the main reason for the severe droughts and floods.

Author: response to Specific comment 5

Thank you for this comment. There are relevant discussion on this issue in *Geographical Survey Report on Hanjiang River Basin* (Institute of Geography of Chinese Academy of Sciences, 1957), and we added the reference and citation in Lines 140-141 of the revised manuscript.

Reviewer 3: Specific comment 6&34

L119: In Fig. 1 "Jianghan Basin" is labeled, not "Jianghan Plain"

Fig. 1: As for (b), it is hard to distinguish green filled circles indicating study site from the background pale green color in the lowland areas. Better to change the color of the study area to be more easily distinguishable color. Put label of "Qinling Mountains" to be located somewhat southward, since they will be the northern boundary of the HRB. In addition, add unit for the color bar.

Author: response to Specific comment 6&34

Thank you for the comments and suggestions. We are sorry for our carelessness. In the revised manuscript, we modified Figure 1 referring to the suggestions. It should look much clearer now.

Reviewer 3: Specific comment 7

L139: "century AD" -> "century BC" (?), since "for more than 3000 years".

Author: response to Specific comment 7

Thank you for this comment, and apology for the lack of carelessness. We made changes in the revised manuscript (Line 164).

Reviewer 3: Specific comment 8

L141: Many people will not be familiar with the period of "Qing Dynasty". It will be better to specify the target period of this dataset.

Author: response to Specific comment 8

Thank you for the comments. We made changes in the revised manuscript accordingly (Line 166).

Reviewer 3: Specific comment 9

L157: It seems all these stations are in the HRB. Which stations are"around HRB"?

Author: response to Specific comment 9

Thank you for the comments.

In the revised manuscript, we added Table 2 to show the administrative areas represented by each site, and described them in more detail for clearer expression, in combination with Fig. 1a which had also been redrawn. The content of line 157 of the original manuscript has been deleted.

Reviewer 3: Specific comment 10/11/12/13

L185-186: It was not clearly understandable the terms “representative area”, “site”, and “most counties’situation”.

L188-191: The method how to make this ideal frequency needs to be explained.

L208: This definition of the term “site” needs to be explained earlier (See comment 10). Better to show county and municipalities boundaries in Fig. 1 or explain such region names’ conditions. Also add how they are called in Chinese.

L230: Is there any meaning of the value “20%”?

Author: response to comment 10/11/12/13

Thank you for the comments.

In Lines 214 and 221 of the revised manuscript, we annotated on "specific administrative range" (this correlates to ‘most counties’) and "representative area". In historical climate reconstruction studies in China, “site” is similar to the meaning of a weather station.

This frequency criterion is from the “*The Atlas of Drought and Flood Distribution in China in the Last 500 Years* (Central Meteorological Bureau, 1981)”. In the revised manuscript, we modified the expression of this part to avoid confusion among readers (Lines 224-230).

20% is the ideal frequency of extreme droughts and floods (line 225). In Lines 278-279 of the revised manuscript, we annotated 20% to make it clearer to the reader.

We redrawn Figure 1a. Because space is limited, however, we included the maps with Chinese place names and showed boundaries in the supplement for the convenience of readers who hope to learn more.

Reviewer 3: Specific comment 14

L236: How do you calculate the precipitation anomaly percentages? Is it just 8 station mean value? Are the interannual variabilities within only several percent? Then it will be highly stable precipitation regime.

Author: response to Specific comment 14

Thank you for the comments. The method we use is as follow: (annual precipitation - average precipitation) / average precipitation. The average precipitation is the mean of annual precipitation during 1951-2017. We made an explanation of the calculation in the revised manuscript (Lines 284-286).

Yes, the precipitation regime in the HRB is somehow stable. This may be related to the subtropical climate with a large and relatively stable interannual variability of precipitation.

Reviewer 3: Specific comment 15

L285: In the 1580s and 1730s no extreme droughts are listed in Table 2. Also, no extreme droughts are in 1628-1641. Are they indicate the inconsistent results with this paper?

Author: response to Specific comment 15

Thank you for the comments and sorry for the error in the translation process due to our oversight. In Line 345 of the revised manuscript, we made a correction.

As shown in Table 2, we identified 1640 as an extreme drought year, with 1640 falling in the period 1628-1641.

Reviewer 3: Specific comment 16

L294: When and where the "Ming Chongzhen drought" occurred?

Author: response to Specific comment 16

Thank you for the comments. In Lines 355-356 of the revised manuscript, we made an explanatory note of the event.

Reviewer 3: Specific comment 17

L297: When is the Danjiangkow Reservoir constructed? For which purposes?

Author: response to Specific comment 17

Thank you for the comments. In Lines 361-362 of the revised manuscript, we made an explanatory note of the reservoir.

Reviewer 3: Specific comment 18

L298-299: Which region's average precipitation are these values indicated?

Author: response to Specific comment 18

Thank you for the comments. In Lines 363-364 of the revised manuscript we revised the sentence so that the reader can understand it more clearly.

Reviewer 3: Specific comment 19

L301: 1660s -> 1610s.

Author: response to Specific comment 19

Thank you for this comment, and apology for the lack of carelessness. In Line 367 of the revised manuscript, we revised it.

Reviewer 3: Specific comment 20

L306: Are any flow rate data available before 1959? It is not sure if the 20 times are abundant or not from this description only.

Author: response to Specific comment 20

Thank you for the comments. The flow data before 1959 were unavailable. The 20 times in the period of 50 years correspond to one in 2.5 years.

In the revised manuscript, we added more references to demonstrate its validity more clearly (Lines 372-378). The contents are as follows:

"*Yin and Huang (2012) showed that severe floods with flow rates greater than 15,000 m3/s occurred 20 times in the Ankang area only from 1960 to 2010. They also found the highest frequency of floods occurred in the 1980s, when there were eight severe floods occurred in Ankang, with the maximum flood flow reaching 31,000 m3/s. In particular, the worst flood in the last 100 years (once in 130 years) occurred in Ankang in July 1983, which caused the inundation of the entire city and nearly 1,000 people died (Shaanxi Province local history codification committee, 2000).* "

Reviewer 3: Specific comment 21

L311: Need to show the recorded period to indicate the "record high"

Author: response to Specific comment 21

Thank you for the comments. In the revised manuscript, we indicated the time period (line 382).

Reviewer 3: Specific comment 22&24

L312: Is "lake Taibai" located in Fig. 1? If yes, please label it, or if no, please indicate how much it is located downstream of the eastern limit of Fig. 1.

L323: Where is Wudu County located, and same comment as No. 22.

Same as for the Baiheliang stone fish in L326.

Author: response to Specific comment 22&24

Thank you for the comments. We indicated the latitude and longitude of these three locations in the revised manuscript (line 384, line 397, and line 402).

Reviewer 3: Specific comment 23

L315: The years 1631-1632 and 1979-1980 are not listed in Table 2.

Author: response to Specific comment 23

Thank you for this comment, and apology for the lack of carelessness. The years 1631-1632 were deleted in the revised manuscript. But the years 1979-1980 were listed in Table 2.

Reviewer 3: Specific comment 25

L353-355, Table 3: According to the definition of extreme flood/drought years in L250-255, they are not the same as Grade 1 or 5 years. It is very confusing that they used extreme flood/drought years to be similar as Grade 1 or 5 years.

Author: response to Specific comment 25

Thank you for the comments.

Because the study in 3.2 is about the spatial distribution characteristics of extreme droughts and floods in the Hanjiang River basin, it is necessary to analyze the extreme droughts and floods at individual sites separately. In the five-grade classification we used, Grade 1 and Grade 5 indicate the most severe drought and flood conditions, i.e., extreme droughts and floods (Table 1).

The method of defining extreme droughts and floods was used because there is not only one site in the Hanjiang River basin, so when analyzing extreme droughts and floods in the Hanjiang River basin as a whole, a new method of defining extreme droughts and floods is needed (i.e., the method presented In Lines 299-309 of the revised manuscript). This is because the regional average grades would be always smaller than that of any one site.

Reviewer 3: Specific comment 26

L367-368: From Figure 5, both floods and droughts are higher in the lowland not in the upper reaches. Isn't it a different result from the former studies?

Author: response to Specific comment 26

Thank you for the comments.

Lines 450-453 of the revised manuscript indicate that previous studies have only shown that the upper reaches of the Hanjiang River are more water-scarce than the middle and lower reaches, and that "water-scarce and relatively less resistant to drought" does not simply equate to a higher frequency of drought disasters in a region. Referring to this comment, and also that by reviewer #2, we added a reference citation to line 456 in the revised manuscript to avoid confusing readers.

Moreover, there are no previous studies that show a higher frequency of extreme droughts and floods in the upper Hanjiang River than in the middle and lower reaches.

Reviewer 3: Specific comment 27

L369-373: In L118, Zhongxiang is regarded as a starting point of the downstream, but here it is regarded as the middle reach which make the readers to be confused. In addition, Qianjiang and Wuhan in the lowland have higher drought frequency than in the upper catchment. Need more careful description.

Author: response to Specific comment 27

Thank you for the comments.

The sentence “Danjiangkou to Zhongxiang is the midstream and below Zhongxiang is the downstream” (line 138 of the revised manuscript) means that Danjiangkou to Zhongxiang is the middle reaches of the Hanjiang River, and the lower reaches of the Hanjiang River is below point Zhongxiang. The division point was thus regarded as a place in the middle reach.

In Lines 460-467 of the revised manuscript, we described this in more detail. The contents are as follows:

“This is probably because the middle and lower reaches of the HRB were economically developed earlier, with a more concentrated population and arable land than in the upper reaches. During the Ming and Qing dynasties (1368-1912), the middle reaches of the Yangtze River Plain (including the Jianghan Plain) centered on Hubei Province and Hunan Province had been developed into a national commodity grain supply base. The central government paid as much attention to these areas (Zhu, 2018; Lu, 2019), so the lower reaches of the HRB had documental records in more quantity and detail during the historical period relative to the upper reaches (Figure 2), which may have an influence on the statistical results (Zheng et al., 2014).”

Reviewer 3: Specific comment 28

L373: From the figure 5 -> From Figure 5

Author: response to Specific comment 28

Thank you for the comments. Change has been made in the revised manuscript (line 458).

Reviewer 3: Specific comment 30

L402-404: Why upper HRB droughts are more correlated with droughts in North China, while middle and lower HRB floods have stronger relationship with the middle and lower Yangtze River Basin? Any climatological evidence in recent years?

Author: response to Specific comment 30

Thank you for the comments.

This is an interesting issue in precipitation climatology of China. Yes, there are studies on this using observational data, and most reported the correspondences of precipitation between the HRB and North China/mid- to lower Yangtze. In the revised manuscript, In Lines 498-504, we adjusted the content of this section. The contents are as follows:

“*It was found that the middle and lower HRB was more sensitive to floods in the Yangtze River basin, while the upper HRB was more correlated with droughts in North China. In order to verify the correlation between the HRB and North China, the drought and flood grades of the eight sites in the HRB were correlated with the average grade series of North China (Figure 8; Central Meteorological Bureau, 1981). Among them, seven sites are significant at the 0.01 level, and one site (Wuhan) passed the correlation test at $p<0.05$ level.* ”

To show the relationship between the Hanjiang River and the Yangtze River more clearly, we added the Yangtze River basin and the mainstream of the Yangtze River to Figure 1.

We also added the results of the study of the upper Hanjiang River and North China In Lines 524-527 and 534-538 so that the reader can understand this section more clearly. The contents are as follows:

"*However, since the 20th century, the probability of the co-drought in each basin of the South-to-North Water Diversion Middle-Route Project's water source and recipient areas is at a historical high, and water transfer has been under great pressure (Ren et al., 2011; Qin et al., 2021).*"

"*In addition, the probability of co-drought events in the upper HRB and the Haihe River Basin (The largest water system in North China) shows an increasing trend throughout the year under two future climate change scenarios of RCP4.5 and RCP8.5. In particular, the probability of experiencing co-drought in the flood season and co-severe drought in the non-flood season may increase significantly (Yu et al., 2018).* "

Reviewer 3: Specific comment 31

L461-468: The comparisons with East and South Asian δ18O show not strong relationship with flood/drought frequencies in the HRB. Need to change their discussion on this point.

Author: response to Specific comment 31

Thank you for the comments. Referring to this suggestion, and also that by reviewer #2, we made appropriate changes to this section in the revised manuscript (Lines 585-589). The contents are as follows:

"As a whole, this suggests that the multi-decadal variations in the frequency of extreme drought/flood events of the HRB are influenced to some extent by changes in the strength of the Asian monsoon, with relatively more extreme drought events when the monsoon is weak and more extreme flood events when the monsoon is strong. "

Reviewer 3: Specific comment 32

L501: Any explanation on the reason why the HRB is more prone to floods when the South Asian monsoon is stronger?

Author: response to Specific comment 32

Thank you for the comments. This part is quoted from the previous research results. On line 611 of the revised manuscript, we added the reference citations to avoid causing confusion to the readers.

However, this would be a complex issue. Based on the results of previous studies we quoted, it appears that this relationship would be mainly applicable in the upper and middle HRB, which has the similar variability with North China. In the lower HRB, opposite would be the true. We only broadly explain this, and obviously further study is needed (as shown in lines 616-624 of the revised manuscript).

Reviewer 3: Specific comment 35

Fig. 4: The method of making this figure is questionable. 1. In the graph, the earliest year is labeled as 1426, but the caption shows it is from 1430. 2. It is not very sure how the precise year is located. For example, in Table 2, 1433 is listed as one extreme drought year in the 1430s. Maybe it is plotted as the second decade one extreme drought in Fig. 4a. No extreme flood year is listed during the 1420s or 1430s in Table 2. However, in the first decade starting from 1426, one extreme drought and flood is listed in Fig. 4c. The situation in the 1990s are also not clear. How do you define 10-year period? Is it starting from the year xxx0 oy xxx1? 3. Why you did not include the 21st century record? If you use the whole period data, it should be from 1426 to 2017, shouldn't it?

Author: response to Specific comment 35

Thank you for the comments, and apology for the lack of carelessness in the figure.

Because there were no extreme droughts and floods between 1426 and 1429, and for the convenience of counting and cycle completeness, in the revised manuscript, we adjusted the cycle of Figure 4 to 1430-2009, with 1430-1439 as the first decade and 2000-2009 as the last decade of the data series. This adjustment does not have any effect on the results of this study. This figure shows frequency, which would be better to indicate the temporal change, and any individual years would not be visible from the figure.

Reviewer 3: Specific comment 36/37/38

Fig. 5: The color bar for drought condition map will be better to be changed to indicate reddish color to be higher frequency, like their drought grade maps, since bluish color may feel wetter conditions

Fig. 9: The top right figure label will be "drought years", not "flood years".

Table 2: The top line of the 20th Century Extreme drought years: 194 -> 1941

Author: response to Specific comment 36/37/38

Thank you for the comments and suggestions, and apology for the lack of carelessness in the figures. We modified the figures referring to the suggestions. The redrawn figures should better show the spatial and temporal pattern of extreme droughts and floods in the HRB.

References

Central Meteorological Bureau: The Atlas of Drought and Flood Distribution in China in the Last 500 Years, Book publisher, Beijing, China, 1981(in Chinese)

Institute of Geography, Chinese Academy of Sciences, Geographical Survey Report on

Hanjiang River Basin, Science Publishing House, Beijing, China, 1957(in Chinese).

Lu, X.: Regional historical geography research: objects and methods, A case study of the Hanjiang River Basin (revised version), Social Science Literature Press, Beijing, China, 2019 (in Chinese).

Qin, D., Ding, Y., Zhai, P., Song, L., and Jiang, K.: Climate and Ecological Evolution in China: 2021, Science Publishing House, Beijing, 2021 (in Chinese).

Ren, G. Y., Liu, H. B., Chu, Z. Y., Zhang, L., Li, X., Li, W. J., Chen, Y., Gao, G., and Zhang, Y.: Climate change over eastern China and implications for South-North Water Diversion Project, Journal of Hydrometeorology, 12, 600-617，doi: 10.1175/2011JHM1321.1, 2011.

Shaanxi Province local history codification committee: Shaanxi Provincial Fangzhi - Geography Volume, Shaanxi People's Publishing House, Xi'an, China, 2000 (in Chinese).

Shi, H., Wang, B., Cook, E. R., Liu, J., and Liu, F.: Asian summer precipitation over the past 544 years reconstructed by merging tree rings and historical documentary records. J. Climate, 31, 7845−7861, doi: 10.1175/JCLI-D-18-0003.1, 2018.

Shi, H., Wang, B.,Liu, J., and Liu, F: Decadal-multidecadal variations of Asian summer rainfall from the Little Ice Age to the present. J. Climate, 32, 7663－7674, doi: 10.1175/JCLI-D-18-0743.1, 2019.

Wang, S., and Zhao, Z.: Analysis of the historical data of droughts and floods in China in the last 500 years, J. Geogr. Sci., 4, 329-341, CNKI:SUN:DLXB.0.1979-04-006, 1979 (in Chinese).

Xie, H., Zhang, S., Hou, S., and Zheng, X.: A comparative study of spatial interpolation methods of precipitation in a small sample area, Research of Soil and Water Conservation, 25, 117-121, doi: 10.13869/j.cnki.rswc.2018.03.017, 2018 (in Chinese).

Yin, S., and Huang, C.: Precipitation changes and the occurrence pattern of heavy rainfall and floods in the upper reaches of the Hanjiang River over the past 50 years, Bull. Soil Water Conserv., 32, 19-25, doi: 10.13961/j.cnki.stbctb.2012.01.006, 2012 (in Chinese).

Yin, S.: Research on extreme climate and hydrological events and their social impacts in the Upper Hanjiang River since historical periods, Science Press, Beijing, China, 2015 (in Chinese).

Yu, J., Xia, J., She, D., Zhou, L., and Li, T.: The analysis of encounter probability of drought between the water source area and the Hai River water receiving area in the middle route of the South-to-North Water Transfer Project in China, South - to - North Water Transfers and Water Science & Technology, 16, 63-68, doi: 10.13476/j.cnki.nsbdqk.20180010, 2018 (in Chinese).

Zheng, J., Ge, Q., Hao, Z., Liu, H., Man, Z., Hou, Y., and Fang, X.: Meteorological records in historical documents and quantitative reconstruction methods of climate change, Quat. Sci., 6, 1186-1196, doi: CNKI:SUN:DSJJ.0.2014-06-007, 2014 (in Chinese).

Zhu, K.: The way of heaven and humanity, Beijing Publishing House, Beijing, China, 2018 (in Chinese).