Thank you very much for providing valuable important comments. We are thankful for the time and efforts you expended. Our responses to the RC3 comments are as follows:

1. Please provide the necessary details of the historical documents. For example, where the 20 cities/towns are actually located? How is a disaster defined and recorded (by examples)? What is the difference and connection between long rain and flood? Are there descriptions of connection between drought/long rain with famine in the original record?

Reply:

We add a map showing the location of each municipality where Town/City histories were used in this study as Fig. S1 below according to the suggestion. Fig. S1 in reply to RC1 comment #1 will be re-titled as Fig. S2. Fig. S1 in the original manuscript will be re-titled as Fig. S3. Line 107 is revised as follows.

Line 107:

All 20 titles of Town/City histories in the Tono area were used in this study (Table S1 and Fig. S1).

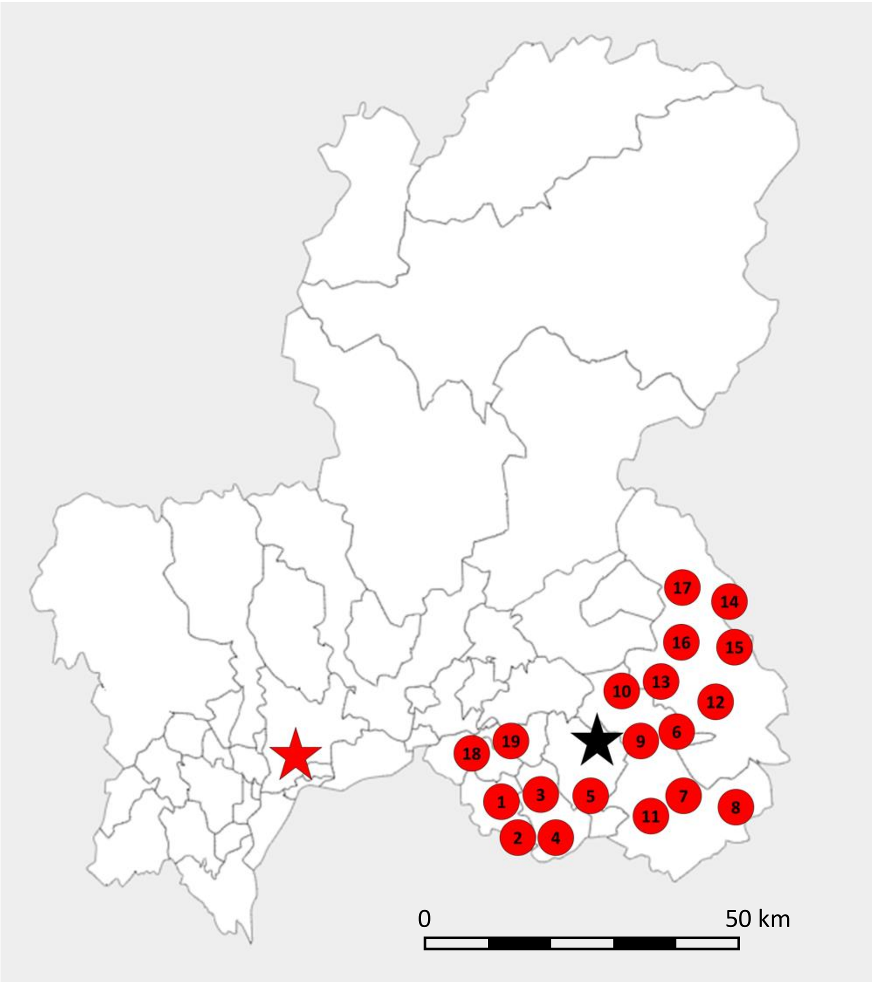

Fig. S1 Map of Gifu Prefecture showing the location of the municipalities of the Town/City histories used in this study (red solid circles) together with the location of the sample tree (black star) and the meteorological station (red star). The numbers within the red circles link to the numbers in Table S1. We collected 20 Town/City histories, 19 of which were issued by municipalities in the vicinity of the sampling site and one by Gifu Prefecture.

Also, according to the comment, we add more detailed explanations of the historical documentary records to line 106 and lines 151-153.

Line 106:

… documents left in the town/city. Those descriptions of disaster in historical documents are subjective depending on personality and situation of the writer. Most of those descriptions in Town/City histories report just the occurrence of the disaster, while some descriptions contain more detailed information such as the season and duration of the occurrence. Also, continuity of those records is not guaranteed in many cases. Lack of disaster records in a certain year does not necessarily mean non-occurrence of significant disaster in that year. There is another possibility that the disaster record is simply missed for that year. In this study, we collected as many disaster records as possible from Town/City histories in the vicinity area of the sample tree to evaluate the magnitude of disasters quantitatively.

Lines 151-153:

This is consistent with the negative correlation between tree-ring $\delta^{18}O$ and relative humidity (precipitation) in the growing season. Intra-ring $\delta^{18}O$ variation for long-rain and flood years are similar (Fig. S3) because they are both caused by more precipitation than normal. However, they did not necessarily coincide. None of the 9 long-rain years and 6 flood years recorded in ≥ 3 titles of Town/City history in the 1701–1900 period occurred in the same year (Table S2). This is probably because long rains and floods are associated with rainfall events in different time scales.

$\delta^{18}O$ values in famine years were lower than the averages for most segments (Fig. S3), implying the occurrence of famines in this period can be related to wet atmospheric conditions rather than dry conditions in the growing season. In fact, 4 of 6 famine years recorded in ≥ 3 titles of Town/City history in the 1701–1900 period occurred in the same or the next year of long rain with ≥ 3 descriptions, while only 1 famine year occurred in the same or the next year of drought (Table S2). Similar relationships were found for poor-harvest and drought/long-rain years (4 of 7 poor-harvest years coincided with long-rain years, while 1 poor-harvest year coincided with a drought year). This suggests that many famines in historical times were caused by crop failure due to long rain and related climates such as poor sunshine or low temperature in the growth season. Some disaster descriptions supporting this speculation can be found in the Town/City histories.

2. *<u>The quality and reliability of the historical documents needs brief validation, including its comparison to documents from other regions, and application in previous investigation.</u>*

<u>Reply:</u>

We calculated the mean number of days and the mean precipitation of the Baiu season in historical times reconstructed by Mizukoshi (1993) for drought and long-rain years recorded in ≥ 1 to ≥ 4 titles of the Town/City histories. The significance of difference between the mean value of extracted drought/long-rain years and that of the whole period (1751–1900 for the number of days or 1701–1900 for precipitation) is shown in Table S3. According to this result, the highest significance with $p<0.01$ was found for ≥ 3 titles.

Following the comment, we add Table S3 and revise 3.4.3 as follows. Lines 145-146 are revised as follows.

Table S3 The mean numbers of days and the mean precipitation of Baiu duration for drought/long-rain years extracted by disaster records in the Town/City histories together with the number of disaster years extracted (n) and the significance level (p-value) of the difference between the mean values for disaster years and all years in the analyzed period.

	The mean number of days (37, 1751-1900)				The mean precipitation (mm) (351, 1701-1900)			
Number of disaster descriptions	≧ 1	≧ 2	≧ 3	≧ 4	≧ 1	≧ 2	≧ 3	≧ 4
Drought	35 (n=49) (p>0.05)	32 (n=20) (p>0.05)	27 (n=9) (p<0.01)	27 (n=7) (p<0.05)	315 (n=57) (p>0.05)	265 (n=21) (p<0.05)	193 (n=9) (p<0.001)	193 (n=7) (p<0.01)
Long-rain	42 (n=19) (p>0.05)	45 (n=13) (p<0.05)	48 (n=9) (p<0.001)	51 (n=3) (p<0.05)	475 (n=22) (p<0.01)	473 (n=13) (p<0.01)	492 (n=9) (p<0.01)	645 (n=3) (p<0.05)

3.4.3:

As shown in the analysis in 3.4.1 and 3.4.2, the intra-ring $\delta^{18}O$ data and the documentary drought/long-rain records used in this study are expected to be closely related to dry/wet conditions in the Baiu season in Central Japan. Here we validate the result of drought/long-rain years in the previous subsections by comparing to the reconstructed annual variation of the length and magnitude of the Baiu season in Mizukoshi (1993). Mizukoshi (1993) estimated the date of the onset and end of the Baiu season for every year since 1751 and the precipitation for the duration from the onset to the end of the Baiu season (here we call as "Baiu duration") for every year since 1692 based on daily weather distribution in Central Japan.

We calculated the mean values of the number of days and the precipitation of Baiu duration for drought and long-rain years recorded in ≥ 1 to ≥ 4 titles of Town/City history together with the significance of their difference from the mean values for all years in the analyzed period (Table S3). The mean number of days for drought (long-rain) years was significantly less (more) than the mean for all years 1751–1900 of 37 days in the case of ≥ 3 and ≥ 4 (≥ 2 to ≥ 4) titles at $p<0.05$ or smaller. The mean precipitation for drought (long-rain) years was significantly less (more) than the mean for all years 1701–1900 of 351 mm in the case of ≥ 2 to ≥ 4 (≥ 1 to ≥ 4) titles at $p<0.05$ or smaller. The highest significance was found in the case of ≥ 3 titles at $p<0.01$ or smaller. According to this result, we decided ≥ 3 titles as the threshold of extracting drought/long-rain years based on disaster descriptions in the Town/City histories.

Similarly, we calculated the mean values of the number of days and the precipitation of Baiu duration for drought and long-rain years extracted by the intra-ring $\delta^{18}O$ data in 3.4.1 and 3.4.2 together with the significance of their difference from the mean values for all years in the analyzed period. The mean number of days for drought (long-rain) years was 27 (43) days (n=24 (n=28)). This is significantly less (more) than the mean for all years 1751–1900 at $p<0.0001$ ($p<0.05$). The mean precipitation for drought (long-rain) years was 261 (448) mm (n=38 (n=33)). This is significantly less (more) than the mean for all years 1701–1900 at $p<0.001$ ($p<0.01$).

These results suggest that drought (long-rain) years are related to shorter (longer) Baiu duration and less (more) precipitation in the Baiu season in terms of both historical documents and intra-ring $\delta^{18}O$ data.

Lines 145-146:

Herein, years of each type of disaster were extracted as years for which the disaster record is found in ≥3 titles out of 20 Town/City histories. The reason for using ≥ 3 titles as the threshold is described in 3.4.3.

3. Please provide the scientific rationale of dividing the annual tree-ring sample into six subsamples. The same applies to the association between the $\delta^{18}O$ results in the subsamples and the 10-day relative humidity and precipitation.

Reply:

According to the suggestion, we add the explanation of the number of segments to lines 88-89 in the original manuscript. Lines 129-131 are revised as follows.

Lines 88-89:

We divided each annual ring into six or more segments of the same width from 1609 to 1949 except for several years. Tree-ring widths of this sample were continuously more than 1 mm in most years until 1949. Six is the practical limit of dividing a 1-mm ring width with our current technique, so we divided each annual ring into six segments as long as possible.

Lines 129-131:

$\delta^{18}O$ measurements were correlated with relative humidity and precipitation data observed at the nearest meteorological station from the sampling site (Gifu Local Meteorological Office, 48 km to the west of the sampling site, Fig. 1c). The growing season of cedar trees in Central Japan is reported as May-August (Hirano et al., 2020). Since monthly meteorological data may be too coarse to analyze correlations with $\delta^{18}O$ data corresponding to six separate periods of the growing season, we used 10-day data that are commonly used as sub-monthly meteorological statistics in Japan.

Fig. 5 shows correlation coefficients between intra-ring $\delta^{18}O$ values and 10-day relative humidity and precipitation for each segment for years when 6-divided $\delta^{18}O$ data are available within the observation period since 1883.

4. *The scientific significance of this study needs to be made clearer. For sample, the authors mention in the conclusion that* "The range of $\delta^{18}O$ variation within an annual ring was generally larger than that of inter-annual variation (Fig. 4b), which indicates that substantial information originally contained in tree-ring $\delta^{18}O$ variation is obscured in annually-measured tree ring $\delta^{18}O$ data."

Then what contribution does this study offer if its drought/long rain chronologies also only have annual resolution?

Reply:

The resultant drought and long-rain chronologies in this study are in annual resolution, but these would not be obtained from tree-ring $\delta^{18}O$ data in annual resolution. Intra-ring $\delta^{18}O$ data allowed us to pick up drought and long -rain years equivalent to those recorded in historical documents. Moreover, as a future possibility, the season of occurrence of disasters may be determined using intra-ring $\delta^{18}O$ data.

To make these points clearer, we insert sentences to line 265 as follows.

Line 265:

… ring $\delta^{18}O$ data. Many of drought and long-rain years in our resultant chronologies could not be found in annually-measured $\delta^{18}O$ data because those are hydroclimatic anomalies in a time scale smaller than the length of the growing season of the sample tree. Moreover, it may be possible to obtain disaster chronologies by season of occurrence, that is, earlier and later in the growing season separately, though further accumulation of measured data and improvement in analyzing technique is needed.

5. *The conclusion would benefit significantly from including a paragraph discussion the implication of its results, for example, the drought/long rain chronologies in the broad field of climate research.*

Reply:

Following the suggestion, we insert a paragraph describing the contributions of the results of this study to relating fields of research between lines 262 and 263.

Between lines 262 and 263:

The significance of this study is that the method to obtain temporally consistent long-term hydroclimatic data of equivalent quality to historical documents was presented. Historical documentary records can offer more detailed information on each disaster event than other proxy data, but it is difficult to secure long-term continuity. Also, the quantity of those records generally decreases rapidly in older times. In contrast, the method of this study can be applied further back in time with consistent quality as long as adequate wood samples are available. It would offer useful information to analyze long-term trends, periodicity, amplitude, or possibility of abrupt change in magnitude and frequency of hydroclimatic extremes. Such analysis is essential to design protection from climate disasters unexperienced in recent centuries or adaptation to possible future climate change in long-term perspectives.