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of the Past**

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Discussions

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Interactive comment on "Climate records in ancient Chinese diaries and their application in historical climate reconstruction – A case study of *Yunshan Diary*" *by* Siying Chen et al.

Siying Chen et al.

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Dear Editors and Referees,

Thank you very much for taking your time to review this manuscript. We really appreciate all your comments and suggestions. They have enabled us to improve our work. According to the comments, we did some modifications. Please find our itemized responses below. Thanks again!

Comment 1: The justification for selection an intercept of 0 for the regression equations is undermined by the observation that rainfall can occur even when it is not observed

by humans. I suggest re-calculating the regressions. I don't imagine this will change the conclusions or affect the analysis much, although figure 2 will need to be redrawn.

Response 1: Thank you for the comment. We rechecked the precipitation reconstruction process. The data used to establish the regression equations are not from human observation. Instead, the data of precipitation and precipitation days are both modern meteorological data from instrumental measurements. They come from the dataset of monthly climate data of Chinese surface stations (dataset code: SURF_CLI_CHN_MUL_MON), which is published by China Meteorological Data Service Center (http://data.cma.cn/). The 'precipitation days' is defined as days with daily precipitation $\geq$0.1mm. So we think the point that rainfall can occur even when it is not observed by humans does not conflict with the selection of regression equations with an intercept of 0.

Comment 2: Line 33 – please define 'ancient diaries'

Response 2: According to the comment, the definition of 'ancient diaries' was added: "Ancient diaries refers to diaries written before the collapse of the Qing Dynasty in 1912".

Comment 3:Line 56-58 – give a summary here of the key findings.

Response 3: According to the comment, the key findings of the case study of Yunshan Diary were briefly added: "Through the analysis of Yunshan Diary, the severe cold winter of 1308/1309 in the Taihu Lake Basin and the drought in the summer of 1309 in southern Jiangsu Province are identified. On a multi-decadal scale, it is proved that the climate had begun to turn cold in the early 14th century at the latest."

Comment 4: Lines 89-91 – it's not clear to me what this delineation of four categories is adding, given that the information from the diary are then delineated into four different. Please either clarify or consider removing this sentence.

Response 4: Thank you for the comment. It is a general method to divide climate

information into the four categories mentioned here, which is applicable to most Chinese historical documents. For better understanding, we added some explanations and examples of the four categories in the manuscript. The revised sentence is as follows: "On the whole, climate records in historical documents can be classified into four categories based on the content, (1) weather records, including qualitative descriptions (such as sunny, cloudy, rainy) and quantitative observation (such as the infiltration depth of each precipitation event in Yu Xue Fen Cun); (2) meteorological disaster records, such as floods, droughts and their impacts on agriculture and society; (3) phenological records, such as the flowering date of plants, the migration date of birds; (4) records relating to the characteristics of regional climate, such as cropping system, distribution range of specific crops and fruits, the southern boundary of snowfall and the southern boundary of river freezing." As for the four types of climate information in Yunshan Diary, species distribution records, phenological records and weather records belong to the fourth category, the third category and the first category mentioned in the previous paragraph respectively. The perception record is a particular type only appearing in diaries, and we added the corresponding explanation in the manuscript: "As one kind of private documents, the diary contains perception records additionally, which record authors' subjective feelings about the weather (such as warm and cold)."

Comment 5: Lines 128-129 and 368-372 – you need to define what you mean by the MWP (and LIA) before you use this term for the first time. Please move the section in lines 368-372 into the opening sections of the paper.

Response 5: Thank you for the comment. We considered how to solve the problem. Lines 368-372 are literature reviews of the starting and ending time of MWP and LIA in China, which is closely related to the discussion of climate transition time in the following paragraphs. If they were moved into the opening sections, the integrity of section 4.1.3 would be undermined. In order to avoid the problem of unclear definitions of MWP and LIA, the previous references to the two terms were deleted. All issues related to MWP and LIA were discussed in section 4.1.3.

Comment 6: Section 3.2 – This section is misleadingly titles. Phenology is the seasonal timing of biological phenomena, whereas this section also looks at first and last snows. A more accurate title would be something like 'climate-dependent phenomena' or 'documentary proxy data', both of which would include phenological records.

Response 6: We are grateful for the comment. This problem may be caused by the different definitions of "phenology". The original definition of phenology was the study of the timing of recurring biological events (Leith, 1974). But in recent years, some scholars have proposed that phenology is the study of the times of recurring natural phenomena (van Vliet and De Groot, 2003). It includes not only biotic phenology (observations of plant and animals), but also abiotic phenology (observations of other natural phenomena with seasonal character) (Jeanneret and Rutishauser, 2010). In this paper, the broad definition is adopted. For better understanding, a clear explanation of the meaning of "Phenology" was added: "Here, the broad definition is adopted, that is, phenological phenomena not only includes recurrent biological phenomena, but also recurrent meteorological or hydrological phenomena, such as the timing of frost, snow and river freezing."

Comment 7: Lines 229-230 – Please give the justification for this threshold of 20 days

Response 7: Thank you for pointing out this deficiency. There is indeed not enough justification to use 20 days as a threshold for participation in precipitation reconstruction. Therefore, the original sentence was deleted and the reasons for excluding February, July and December were explained separately.

Comment 8: Table 3 – If you are going to express P values to 4 significant figures, please express 0.000 as >0.001 – P = 0 is a misnomer. Please explain why February, July and December are missing here (i.e. before Figure 2)

Response 8: Thank you for pointing out this deficiency. In the 'P' column of Table 3, 0.000 was changed to <0.001. The reason why February, July and December are missing was explained in the main text.

Comment 9: Lines 255-259 – this is a good point, but it rather undermines the decision to put the intercept of the regression equations through zero, since R = 0 does not necessarily equate to P = 0. I suggest you redo your regression equations. Clearly if you're getting ridiculous intercepts (e.g. P = 100 mm) then you may be justified to force the intercept through zero, but you then need to be clear that this is what you are doing.

Response 9: Thanks for the comment and we want to do some explanation. The perspective stated here is some precipitation events might have been too slight for humans to notice, but the data of precipitation and precipitation days used to establish the regression equations is modern meteorological data from instrumental measurements. Therefore, we think that this point does not conflict with the selection of the regression equation with an intercept of 0. In addition, a new perspective was added here: "precipitation events occurred in the night may also be ignored by humans".

Comment 10: Line 361 – Remove the sentence 'This is an exceptionally unique case'. You don't really have the evidence to say that, it could have happened many times between 1309 and 1955.

Response 10: Thanks for the comment and we did some modifications accordingly. The original expression was indeed too absolute. But we still wanted to clarify that the winter of 1308/1309 is different compared to modern cold winters, so the sentence was changed to "it is quite unusal".

Comment 11: Lines 362-366 – I think you have to be very careful in assuming climatic changes when you only have the weather for a couple of years. Please give detail of the analysis and findings in Zheng et al. (2005), otherwise it's difficult to say whether your inference is justified.

Response 11: According to the comment, a detailed explanation of the conclusion in Zheng et al. (2005) was added: "Zheng et al. (2005) analysed the winter temperature anomaly sequence in eastern China from 1951 to 1995. The results show that the average temperature anomaly of every 10 years is positively correlated with the

temperature anomalies of abnormally cold years among the 10 years. The correlation coefficient is 0.965 and the significance level is 0.001."

Comment 12: Lines 409-424 – this mostly repeats what was in the opening sections, and can either be significantly shortened or removed altogether.

Response 12: Thanks for the suggestion. Accordingly, this part was simplified and those repetitive sentences were deleted.

Please also note the supplement to this comment:
https://cp.copernicus.org/preprints/cp-2020-72/cp-2020-72-AC1-supplement.pdf

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Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2020-72, 2020.