

## **Anonymous Referee #1**

To understand the influence of the westerly wind and EASM on precipitation in the Alxa Plateau, Xiao et al. used dendrochronology to examine the tree-rings from its three sites. It is well known that the study region is influenced by the interaction of EASM and westerly, and there have been quite a few studies on this topic using different approaches.

However, in this article, the authors didn't not identify shortcomings of previous studies and point out the scientific problems.

Reply: While previous studies in this area are all single-point climate reconstruction studies, there is a lack of research on the interaction areas and driving mechanisms of the two major circulations (Westlies and East Asian summer monsoon). This paper aims to study the spatio-temporal heterogeneity of climate change and the driving mechanisms of the two major circulations using the dendroclimatological methods and three sample sites around the Alxa Plateau. It has been added in the Abstract and Introduction sections.

They also didn't explained why their approach is better suited to address these issues. In summary, the motivation behind this study is unclear.

Reply: Dendroclimatology can provide high-resolution, long-term, and reliable multi-point proxies for the study of inter-annual and inter-decadal climate change.

The article exhibit poor overall writing quality, making it challenging to read. The authors excessively use abbreviations, some of which are unnecessary. Many

sentences require rephrasing, and there are organization problems. Several sections, especially Introduction, need reorganizing or rephrasing. After introducing the background, the literature review doesn't need to include all the previous studies. The purpose of the review is to summarize the major findings or our current understanding of the topic with this article, highlighting the problems with existing studies, and present scientific questions that this article aims to address.

Reply: The English in this paper has been reviewed by Karen Lofstrom (MA), a professional editor and a native speaker of English. Abbreviations that appear for the first time are explained in the text, such as EASM, PDSI and SPEI. The references in the Introduction section are relevant and necessary to the topic and study region.

We have revised the review in the Introduction section and the scientific questions and research objectives in this paper.

The Abstract needs rewriting. A good abstract should include the following components: the general background with scientific questions, details about investigation methods, major findings, and hypothesis for what you observed. The implications or significance can be included at the end, although it is optional.

**Reply:** The abstract section has been rewritten.

To establish a correlation between two data sets, the authors intentionally divided them into different groups and conducted correlation analysis (Figures 6 and 7). However, the methodology for this correlation analysis is questionable and

lacks scientific basis. For any pair of data sets, it's possible to selectively choose a small portion of data and find a so-called correlation between them.

**Reply:** Tree radial growth in the three sample sites was influenced by the interaction of the westerlies and the East Asian summer monsoon on interannual and interdecadal scales. Meanwhile, there are interannual and interdecadal variations in the westerlies and the East Asian summer monsoon. Therefore, it is necessary to carry out correlation analyses of the two circulation indices and chronology indices for the corresponding high, medium, and low value groups (or typical years) to explore their driving mechanisms. For details, see line229-233, line358-362.

Several figures were presented in the text without detailed explanations or descriptions, and some captions lack informativeness.

**Reply :** We have added some explanations and descriptions to the figures. In Figure 1, we have added the three major geographic regions of China (Tibetan Plateau zone, inland arid zone, and Eastern Asian monsoon zone) and the boundaries of the modern East Asian monsoon. We have merged Table 2 with Figure 3 as suggested by the reviewer. In Figure 5, we add an indication of dry and wet variations.

In the results section, the first part is extremely challenging for any reader to follow, and this section should be merged with the next, focusing on introducing general observed patterns rather than detailed or exact years with variations.

**Reply :** This section has been revised.

While reviewing the article, I made some comments (see attached annotated PDF file). Hope that they can assist the authors in improving their article during the revision.

Reply : The details of the revision are as follows.

**Specific editing suggestions in the manuscript:**

1. The abstract needs to be rewritten.

Reply: The abstract were rewritten.

2. Please rephrase this sentence, as it sounds weird, especially the first part.

“Against the background of changes in global atmospheric circulation, local changes in the East Asian summer monsoon (EASM) and the mid-latitude westerly winds will inevitably affect the climate and ecology of the arid zone of Northwest China” .

Reply: We rewrote this sentence: Atmospheric circulation changes, their driving mechanisms and interactions are important topics in global change research. Local changes in the East Asian summer monsoon (EASM) and the mid-latitude westlies will inevitably affect the climate and ecology of the arid zone of Northwest China.

3. What changes, global or local or both? Be specific.

Reply: We revised it to: " Hence, it is important to study these regional changes ".

4. This is just a method you used to analyze your data. You cannot use a method to study the changes. You need to study something or some objects (samples, data and so on) using some methods (like your method used in this study) to

investigate your scientific questions. Therefore, you need to rephrase this sentence and the following few sentences.

Reply: We revised it to: "Dendroclimatology can provide high-resolution, long-term, and reliable multi-point proxies for the study of inter-annual and inter-decadal climate change. We chose to observe these changes in the Alxa Plateau using dendrochronological methods".

5. these two subsections should be merged into one and no point to divide them.

Reply: We have revised the section accordingly.

6. It would be great to show a map with these three zones for the convenience of readers who are not familiar with the geomorphology of Chinese mainland. Probably, you can modify the figure 1 to include this information.

Reply: We have revised the figure accordingly.

7. It displays the typical climatic characteristics of a continental climate.

Reply: We have revised the sentence accordingly.

8. To estimate the impact of global climate change on this interaction, it is crucial to comprehend its historical context.

Reply: Following with the suggestions.

9. As I commented above, it is better to include this information in the figure 1 for the convenience of readers.

Reply: In Figure 1, we have added the three major geographic region of China (Tibetan Plateau zone, Inland Arid zone, and Eastern Monsoon zone) and the boundaries of the modern East Asian monsoon.

10. You need to point out what you actually studied or what you did in this study using dendrochronology. In your abstract, you pointed out what you actually did in this study, and need to say that again somehow here.

Reply: We have revised the last paragraph of the introduction and added a simplified version to the abstract.

11. What are the scientific questions that were not answered and you will address in this study? What I mean is that what the previous studies have found regarding the topic of this study and what are the problems with their findings.

Reply: We summarize the results of previous research as follows and place them in the second-to-last paragraph of the introduction.

"Most modern researchers studying climate change in the region are mostly carried out on single sample sites (Wang et al., 2004; Liu et al., 2005; Chen et al., 2010; Chen et al., 2016; Li et al., 2016; Liu et al., 2016; Chen et al., 2018). While, there is a dearth of multi-site, regional and long time scale studies on the interaction of the westerlies and the EASM. "

11. how large is large scale study?

Reply: We have deleted this unclear statement.

12. "our group" changed by "we"

Reply: Following with the suggestions.

13. give the definition of SPEI for readers' convenience.

Reply: We revised it to: "We used SPEI (Standardized Precipitation Evapotranspiration Index) to represent the local drought and wetness conditions,

which is widely used in the dendrochronology studies and considering the effects of potential evapotranspiration, precipitation and time scales (Vicente-Serrano et al., 2010). "

14.citation is needed

Reply: We added it accordingly.

15. citation is needed.

Reply: We added it accordingly.

16. What general pattern were observed in this three time series? You need to point out the general patterns or do not present this figure.

Reply: The chronologies are the core data of this paper and it is necessary to place it in the main text. In the revised version, we have merged Table 2 into Figure 3, following the reviewers' comments. .

17. DO you mean only the correlation is only statistically significant  $p < 0.05$  in P9 but not significant in other months? Rephrase these two sentences.

Reply: CL chronology was negatively correlated with the mean temperature in most months, but only reached a significant negative correlation ( $P < 0.05$ ) with P9.

17. It is extremely hard, if not possible, for readers to follow the description in this section, as it is not systematic and not presented in some general patterns. This whole section is just result.

Reply: Section 3.3.1 focused on comparing extreme drought/wetness years on an interannual scale. Section 3.3.2 focused on comparing dry/wet changes on an

interdecadal scale. We believe that the organization of these two subsections is reasonable.

18. what is correlation coefficient?

Reply: We revised the statement.

19. It is extremely hard for readers to sort out these data and thus to understand the change pattern among these three. You should try a different way to present these data to readers so that they can easily understand them, in a figure or something, or in time series?

Reply: In the revised version, we have merged Table 2 into Figure 3, following the reviewers' comments.

20. extremely wet or dry?

Reply: In the revised version, we have merged Table 2 into Figure 3, following the reviewers' comments.

21. this section (3.3.2) should be combined with the previous section.

Reply: Section 3.3.1 focused on comparing extreme drought/wetness years on an interannual scale. Section 3.3.2 focused on comparing dry/wet changes on an interdecadal scale. We believe that the organization of these two subsections is reasonable.

Indicate the dry and wet direction on the figure. In your region, higher index suggests dry or wet conditions? please tell readers what red represent and what blue represent in the caption.



Reply: We revised it to: "Figure 5. Three regional chronologies demonstrating alternation between dry (red) and wet (blue) years on interdecadal scales (11 a running mean). "

22. delete "close to"

Reply: We revised it accordingly.

23. what is this? I don't understand your correlation.

Reply: See Figure 7 for details

24. probably it is better to label r and p in all these figures

Reply: Only data sets that reached a significant level of correlation are highlighted in the figure.

25. what is the difference between Figure 6 and Figure 7?

Reply: The grouping is based on different bases. In Figure 6, the datasets are grouped by chronological values. In Figure 7, the datasets are grouped by the index of the two atmospheric circulations.

26. very strange division. what are your bases to divide the index into, high, middle and low? Why you correlate them separately with ring-wide index?

Reply: This is because the correlation between tree growth and the circulation index at the three sample sites was not linear, so we performed a correlation analysis using two methods.

Method 1: Chronological indices were categorized into three groups: high, medium and low. Each group of data was correlated with its atmospheric

circulation corresponding indices. Results showed the effects of circulation under different growth conditions for trees.

Method 2: The indices of the atmospheric circulation were categorized into three groups: high, medium and low. Each group was correlated with its corresponding chronological data. The results showed the response of tree radial growth under different circulation intensities.

27. For "we control one factor" .

Reply: We revised the statement: " At HL, if we control one variable (the WCI or EASMI) from our analysis, the other variable will all showed a positive correlation with its chronology ( $P < 0.0001$ )."

28. show positive correlation with what?

Reply: It is positive correlation with HL chronology. We revised the statement: " At HL, if we control one variable (the WCI or EASMI) from our analysis, the other variable will all showed a positive correlation with its chronology ( $P < 0.0001$ )."

29. correlation of what with EASMI?

Reply: We revised the statement: " at CL, if we controlled the WCI, we find a positive significant correction between the chronology and EASMI ( $P < 0.0001$ ). "

30. how and in which way, be specific a little here.

Reply: The related details can be seen in the next paragraph.

31. only one year's change???? One year change cannot be considered a trend.

Reply: This year was the turning point. Before the year, the climate was wetter; after the year, it turned dry.

32. be crucial

Reply: We revised it accordingly.

33. not sure what do you mean? Do you mean that it's positively related to rainfall?

Reply: yes.

34. not quite sure what you mean and rephrase this

Reply: We revised it to: "When the weakened of the westerly wind and latitudinal circulation".

34. ???????

Reply: We revised it to: " when they are weaker, the zone moves southwestward. "

35. go too far and your data cannot answer this

Reply: Climate change is a temporal process and therefore requires an understanding of changes not only on interannual and interdecadal scales, but also over geological time. In order to understand climate change, circulation interactions and environmental effects at longer scales.

35. your data cannot address these questions

Reply: The westerlies and the monsoon, which are the two main circulation systems affecting climate change in the study area, are of interest in this paper. However, these two are only part of the global atmospheric circulation and they are also influenced by other circulations, i.e. they have global properties. This is an issue that needs further attention in the future for the subject of this study.