

RC3: 'Comment on cp-2023-102', Anonymous Referee #3, 12 Feb 2024 reply

Xiao et al present tree ring width records from three different parts of the Alxa Plateau covering climate history of this region for about two centuries. The region was claimed to be affected by both the westerlies and the East Asian Summer Monsoon. To understand the history of the interactions between the westerlies and the EASM, the authors attempts to use the presented tree ring records from the Alxa Plateau to reconstruct the history of such interactions. Although understanding the interaction is the main focus, however it is still unclear to me how did the westerlies and the EASM interact with each other in this region after reading through the manuscript. Many scientific terms and expressions in the manuscript lack a concise definition to improve readability. Further, the authors need to improve the presentation of manuscript not only for language but also the organization of the paper.

Reply: As the result in the section 3.2 showed, the chronology of the three sites in the monsoon-westerly interaction region was significantly positively correlated with SPEI in the growing season (April-July) and precipitation in May-June. It showed that the tree growth was limited mainly by the precipitation in the growing season. Section 3.3.2 showed the spatial and temporal heterogeneity of the three study sites in the annual and decadal time scales. These results systematically illustrate the interaction between westerlies and EASM over the study area.

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.

Major comments:

When the authors indicate the interaction between the westerlies and the EASM, it is not clear what is the precise meaning of the interaction. Did the authors mean the shift of the boundaries, the influence between each other, or something else? The authors should make this point clear to let readers correctly understanding the scientific content delivered by the authors.

Reply: On the monsoon-westerlies interaction area, the two atmospheric circulation systems are all can bring precipitation to the region, thus promoting tree growth. However, the interaction between the two circulation systems is characterized by high spatial and temporal heterogeneity. As the abstract showed: "The results show that radial growth was indeed affected by changes in the monsoon and westerlies. The heterogeneity of precipitation and climatic wet-dry changes in different regions is primarily influenced by the interactions between atmospheric circulation systems, each with its own dominant controlling factors. In the case of the Helan Mountains, both of these major atmospheric circulation systems play a significant role in shaping climate changes. Changling Mountain in the southern part of the Alxa Plateau are mainly influenced by the EASM. Dongdashan Mountain is mainly influenced by the westerlies."

The authors should briefly introduce the definition and calculation procedure of any index that has been used in manuscript. For instance, there are many different definitions of the

EASM index. Only give a citation to the index that has been used is not friendly to readers not familiar with these indexes.

Reply: The related information was added following the suggestion. The East Asian summer monsoon (EASM) index is defined as an area-averaged seasonally (JJA) dynamical normalized seasonality (DNS) at 850 hPa within the East Asian monsoon domain (10°-40°N, 110°-140°E)(Li and Zeng 2005). This EASMI is the current popular index.

When calculating correlation coefficients, the authors may need to make it clear how the degrees of freedom were adjusted to account for serial correlation in the data, and that this procedure applies to all correlation coefficients and significance levels.

Reply: All of the correlation statistical test used the SPSS19 program and the two-tail test.

Other comments:

L284-286: is it a quantitative representation of a specific index of the wet/dry conditions or just a qualitative representation?

Reply: It's a qualitative representation.

L284-286: as low precipitation is the major limiting factor, is it possible that the records are more sensitive to drought while less sensitive to wetter conditions?

Reply: As the 2.1 section showed, the study area is located in the eastern margin of the inland arid region of Central Asia. The annual mean precipitation is lower than 220mm in the nearest meteorology station of the sampling sites. So that, the low precipitation is the major limiting factor for the tree radial growth.

Figs 6 and 7: from the figure captions, these two figures look identical. The authors may need to revise the figure caption to make the difference between the two figures clearer.

Reply: It was changed following the suggestion.

Figure 6. Grouping related charts among the ring-width index of three regions (HL, CL and DS) and the two atmospheric circulations' indices (EASMI and WCI), grouped by chronological values. The noted numbers are the person correlation coefficients (two-tails test) and the corresponding significant credible level. Only the significant correlations was labeled. Red dots indicate the higher ring-width index group ($>mean+1\delta$), gray dots indicate the middle ring-width index group ($>mean-1\delta\sim<mean+1\delta$), and blue dots indicate the lower ring-width index group ($>mean-1\delta$).

Figure 7. Grouping related charts among the two atmosphere circulations' index (EASMI and WCI) and the ring-width index of three regions (HL, CL, and DS), grouped by the two atmosphere circulations' index. Red dots indicate the higher atmosphere circulations' index group ($>mean+1\delta$), gray dots indicate the middle atmosphere circulations' index group ($>mean-1\delta\sim<mean+1\delta$), and blue dots indicate the lower atmosphere circulations' index group ($>mean-1\delta$).

There are some typos and grammar errors in the manuscript. The authors need do a through check on the writing of the paper.

Reply: The English in this paper has been reviewed by Karen Lofstrom (MA), a professional editor and a native speaker of English.