

Clim. Past Discuss., author comment AC2
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Reply on RC1

Maierdang Keyimu et al.

Author comment on "A 406-year non-growing-season precipitation reconstruction in the southeastern Tibetan Plateau" by Maierdang Keyimu et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-13-AC2>, 2021

Dear editor, Dear referee 1,

First of all, we would like to thank you for your comments and suggestion, some of them are critical but invaluable to improve our original work. Secondly, we benefited from the discussion process, while we were solving existed problems and answering questions, we gain some insights, found new data resources, and improved our data visualization skills, which surely benefit us in our future scientific work.

Below is our one-by-one reply to the concerns and suggestion of the referee 1. The author replies were illustrated in *ITALIC*. Some of our replies included updated figures, and they were attached as supplementary file to our response.

Thanks again.

Best regards

on behalf of all the authors

Zongshan Li and Maierdang Keyimu

General comments

Tree rings response to local climate conditions, and the temperature and moisture in the growing season are usually the controlling factors for radial growth. In semi-arid regions on the southern Tibetan Plateau, where the climate is cold and dry, including the upper treeline, tree-ring width of coniferous species respond to growing season climate variables, e.g. early summer, warm season, or the whole year average (Zhang et al., 2015; Liu et al., CR 2012; Liu et al, 2014 QSR). Liu et al (NSR) comprehensively revealed that tree rings in SETP respond to growing season or annual precipitation and only a few tree ring chronology respond to PDSI due to the pre-monsoon moisture deficiency. As a result the physiological dynamics of tree ring/NGS correlation should be carefully and reasonably clarified. Consider the climate background and the tree growth/climate patterns, it is suggested to see the tree ring index responding to pre-monsoon climate variables.

Comparisons with previous results in the nearby area should include the difference and attributions within series other than consistence only.

There were lots of tiny mistakes in the manuscript and some figures needs improving. Acceptance could be done after the second revision.

Specific comments

1. It's unnecessary to show descriptive statistics of the reconstructions in the abstract. Concentrations on the key results are mainly demanded.

Author reply:

*Thanks for the suggestion. We will remove the lines (**and the leave-one-out verification parameters indicated the reliability of the reconstruction**) which interpreted the descriptive statistic of the chronology or reconstruction.*

2. Tree rings are more and more of important in paleoclimatology. It's interesting to see that 'tree rings' are written in different way. Some are 'tree rings', and some are 'tree-rings'. Early dendrochronologists or students need standard of the terms. Would the authors like to say something on this?

Author reply:

Thanks for the simple but not simple question. Honestly, I (first author) have not really paid much attention to the context in which we use the terms of "tree ring" and "tree-ring", but I was using the latter one in most of the cases. But the above question by the referee 1 really made me think, and I have looked through a few books in tree-ring science seeking for an answer. I have realized some basic differences in the application of "tree ring" and "tree-rings". Understanding of the usage of "tree-ring" is relatively easy. It is used in compound situations, such as "tree-ring samples", "tree-ring width/density", "tree-ring data", "tree-ring indices", "tree-ring chronology", "tree-ring series", "tree-ring analysis", and "tree-ring research". But it is used as "tree ring/s" when it is a separate and independent unit, i.e., "application of tree rings", "climate signal in tree rings", "use tree rings to date years", "wide/narrow tree rings", and so on. I'd like to thank the referee 1 to make me ponder over the correct usage of above-mentioned terminologies.

Accordingly, we will check through the whole manuscript and run corrections on the existing mistakes.

3. Line 37, ...'of the planet Earth'..., delete planet please.

Author reply:

Thanks. We will delete as suggested.

4. Figure 1, besides the study site and the sites from previous sequence's reference, we knew quite few from the figures. We couldn't see where the sites are, and what the key geographical settings are nearby.

Author reply:

Thanks for the comment. We will replace an updated the location map of the study area. Please refer to the attachment for the updated figure.

5. Line 99, 3.26e gridded? Latest version of CRU is 4.04 (2020, Nature scientific data)

Author reply:

Thanks. We have downloaded the scPDSI data using KNMI climate explorer (<http://climexp.knmi.nl/select.cgi?id=someone@somewhere&field=scpdsi>). On this website, the latest version of PDSI data provided was 3.26e. We will try to download the latest version of scPDSI data from other sources and run tree growth – climate relationship analysis again, and observe if the correlation results between TRW and scPDSI were the same/different.

6. Line 96, 101-102, 27.17 N, 99.28 E à 17° N, 99.28° E; 27.0-27.5 N, 99.0-99.5 E à 27.0-27.5 °N, 99.0-99.5° E.

Author reply:

Thanks for pointing out the mistake. We will modify accordingly.

7. The EPS was below 1475 A.D., and the sample depth was less 7 according to Figure 2. Why didn't safely choose the confident period since 1600 A.D. for reconstruction?

Author reply:

Thanks for the suggestion. Combining the suggestions of referee 1 and Dr. Ji Yuhe in the public comment, we have re-calculated the running EPS and Rbar values of the chronology, and updated the Fig. 2 (it will be appeared as Fig. 3 in the revised manuscript). As suggested by the referee 1, we have used the EPS criterion value of 0.85 to truncate the most reliable length of the TRW chronology and used it for the reconstruction (updated Fig. 5). We will replace the updated Fig. 2 and updated Fig. 5 (will be Fig. 6) in the revised manuscript. Please refer to the attachment for the updated figures.

8. Table 1, was it number of cores or trees? If it was number of cores, well, 38 cores rather than trees make the reconstruction since 1475 A.D. disputable.

Author reply:

Thanks for the concern. It was the number of trees and the cores. One core per tree was sampled intending to increase the sampling representativity. We will replace the updated figure (the name of the scale of the figure on the right side has been modified). Please refer to the updated Fig. 2 in the attachment.

9. The tree grown/temperature correlation pattern looks rather weird. There wasn't positive correlation coefficient found at all. If we take the climate factors together, it was found TRW negatively correlated with temperature but positively with precipitation in current May. It is typically the pattern that the hemlock radial growth is limited by the pre-monsoon drought. The non-significant correlation coefficients with PDSI could possible attributed to temperature during the pre-monsoon season. Have the authors ever tested the correlation between TRW and pre-monsoon drought (prior December to current May)?

Author reply:

Thanks for pointing out the mistake. (1) We will rectify the interpretation of the correlation between TRW and temperature. (2) We have checked the relationship between TRW and PDSI of aggregated months (previous year December to current year May). The correlation value between aggregated PDSI and TRW was weaker ($R = 0.47$) than the correlation value between NGS precipitation and TRW ($R = 0.56$), and thus we would keep the original variable (NGS precipitation) as reconstruction target.

10. Figure 6 displayed comparison between this study and previous results where the sampling site are close. Visually compared, besides the common wet/dry variations in decadal scales were identified, much difference could be easily found. Obviously, Zhang's and Li's series showed increasing trend during the 2000s, but the other three series didn't. For Zhang's series, which was a compo-site reconstruction, could the authors adopt only sites that are close to Lijiang? During 1540s-1580s, 1680s-1720s, 1840s-1920s, no common variation patterns were identified, and some were even contrarily varied. By the way, the 'year' scale of the figure was shown in the window of 80 years, and it is difficult to read. Why didn't show it in every 50-year step?

Author reply:

Thanks for the concerns. We would like to answer the above question by separating it into three sections:

- *As mentioned by the referee 1, apart from similarities, dissimilarities were also existed among different reconstructions. The dissimilarities among reconstructions can be attributed to (1) different tree species in chronologies which have different morphological structures and different drought tolerance capacities, (2) different reconstruction target (PDSI/precipitation), (3) seasonal differences in reconstruction target (annual/summer/winter/different aggregations), (4) sample replication, (5) different methods of detrending the tree ring measurement series and different chronology establishment methods (standard chronology/residual chronology), (6) different length of calibration period.*

We have summarized the differences among the compared reconstructions as in Table S1 (please see attachment), and because of these, there appeared dissimilarities among the variabilities of different reconstruction series.

- *We have used the average PDSI reconstruction series of Zhang et al (2015) in the southeastern Tibetan Plateau to carry out the comparison with our reconstruction series.*
- *We have updated the Fig. 6 (it will be appeared as Fig. 7 in the revised manuscript) according to the suggestion by the reviewer (using 50 years interval to separate), please refer to the attachment for the updated Fig. 6.*

11. Extreme dry/wet years were investigated, did they were consistent with other results in Fig 6? What did those extreme years imply? In terms of the spatial correlation analysis, did those extreme years spatially exist? Were there coincident with the Asian Monsoon Atlas (Cook et al, 2010)

Author reply:

Thanks for the questions and suggestions. We have defined the years which had more/less than one times of the standard deviation of NGS precipitation as wet/dry NGS years; two times of the standard deviation of NGS precipitation as extreme wet/dry NGS years. According to the above definition, appearances of wet/dry years were too frequent, therefore, we have selected the extreme wet/dry years to demonstrate variability of wet and dry years.

We have compared the extreme wet/dry NGS years with reconstruction series of Fan et al., 2008, Fang et al., 2010, Li et al., 2017, and Zhang et al., 2015. By comparison, some of the extreme wet/dry years in present reconstruction series were consistent with other reconstructions; some of the extreme wet years in present reconstruction were not extreme wet but wet in other series; some of the extreme dry years in present reconstruction were not extreme dry but dry in other series. We have made clear

comparison of the extreme wet/dry years among different reconstructions in Table S2, S3, please refer to the attachment.

We have extracted the drought series of Asian Monsoon Atlas (Cook et al.2010) from the nearest point (<http://drought.memphis.edu/MADA/Extract.aspx>) and compared it with our NGS precipitation reconstruction (please refer to updated Fig. 6 in the attachment). The extreme wet years in our reconstruction were coincided with the extreme wet years in the MADA; six out of 11 extreme dry years in our reconstruction were matched with the extreme dry years in MADA (please refer to the Table S2, S3 in the attachment).

12. Line 262, was the 1920s-1930s drought called World War I drought in southeastern China? (Kang et al., 2013, QI).

Author reply:

Thanks for the comment. We have checked the reference provided, and found that the drought period (1920s) should be called "China mega-drought". We will modify as "China mega-drought" in the revised manuscript.

Please also note the supplement to this comment:

<https://cp.copernicus.org/preprints/cp-2021-13/cp-2021-13-AC2-supplement.pdf>