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Climate of the Past
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Discussions

Interactive comment on "A 368-year maximum temperature reconstruction based on tree ring data in northwest Sichuan Plateau (NWSP), China" *by* Liangjun Zhu et al.

Liangjun Zhu et al.

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Response to Anonymous Referee 2:

Thank you for your constructive comments on our manuscript. Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied your comments carefully and have made correction.

1. Comments: The manuscript will benefit from a last check by a native speaker. However, readability will improve quite a lot following the careful language check done by reviewer 1.

Response: Comment accepted. Thanks for this constructive comment. We have invited a specialist (native-English speaker) made a job of language revision, in order to improve the ability of English expression.

2. General and minor comments: 1) The only potential weakness that I see on the paper refers to the chronology replication. Only 16 trees compose the chronology. This makes me wonder if the EPS has been calculated taking into consideration that more than one core per tree have been included in the chronology. It is not the same to calculate the EPS for an "n" of 32 than 16. On the other hand, I wonder if the few samples reaching back 1650 are cores from the same or different trees. How many trees are covering the part of the chronology with the lowest replication?

Response: Comment accepted. Thanks, we have recalculated the EPS of the chronology. EPS has an overall mean of 0.9, well above the generally accepted 0.85 cutoff except for a brief period in the 1690s when it falls to just above 0.8 (the Rbar decline to 0.37). The lower EPS and Rbar values Ca.1695 (Fig. 1) seem to result from suppressed growth during this cool period in more mature trees and somewhat erratic juvenile growth in the trees entering the chronology about this time (D'Arrigo et al. 2001). To extend the length of the chronology, we thus consider this chronology to be most reliable over the past 368 years (AD 1646-2013), which corresponds to a minimum sample depth of 5 cores (four trees) for our chronology (Fig. 1). In order to avoid confusing the reader, we have added some related description about the replication and EPS of the chronology in the text. Please see lines 9-16, page 4 in the text.

2) The authors compared the newly developed reconstruction with pre-existing temperature reconstructions. The correlation values obtained between the different reconstructions are not very high, but they are significant due the high number of observations. The interesting point of comparing different reconstructions is more related to medium and low-frequency climate variations than interannual. Hence, I would suggest to filter the reconstructions and discuss the similarities among them in terms of decadal to multidecadal variations. Moving correlations will definitely help to visualize

and describe the periods of agreement and disagreement.

Response: Comment accepted. Thanks, we have filtered our and other reconstructions with 11- (medium-frequency) and 61-yr (low-frequency) moving averaged, and have visually described the similarities between them using the moving correlations. Our reconstruction temperatures on the whole showed consistency with the near reconstruction in decadal (11-yr moving averaged) variations and the far away reconstruction multidecadal (61-yr moving averaged) variations, although some potentially differences remain (Fig. 2; see lines 9-16, page 9 in the text). However, those decadal or multidecadal differences between them might be due to differences in season, species and the different standardization approach applied on tree-ring data as well as those inherent differences in climate variables and its driven mechanisms (see lines 16-23, page 5 in the text).

3) It would be also interesting to discuss the existence or not of the Little Ice Age in the new reconstruction.

Response: Comment accepted. Thanks, we have added the discussion of the existence or not of the Little Ice Age in our reconstruction. The Little Ice Age (LIA) climate obviously exist in our reconstruction and end with the climatic abrupt change of the end of 19th century. Changes in temperature as well as the frequency of low temperature events both show that the 18th and 20th centuries were mainly in warm and the 17th and 19th centuries were in cold, which were in agreement with other study of the LIA. For the detailed information, please look up the lines 2-7, page 10 of the discussion section.

4) The authors discuss the link between solar changes and temperature variations. What about the volcanic forcing? A large number of studies have reported a link between volcanic eruption and temperature changes. I would suggest to include some analysis (such as superposed epoch analysis) in order to complete the discussion including the influence of volcanic forcing on temperature variations.

Response: Comment accepted. Thank you for this constructive comment. We have added some analysis between volcanic eruptions and temperature variations and discussed the influence of volcanic forcing on temperature variations. Results show that volcanic forcing has an important influence on temperature variations, which has found in other dendroclimatological studies in the Tibetan Plateau, Central Asia, Europe as well as the Northern hemisphere (Fischer et al., 2007;Liang et al., 2008;Breitenmoser et al., 2013;Davi et al., 2015;Stoffel et al., 2015). On one hand the radiative forcing for volcanic indices series (Crowley, 2000) presents a high consistency with our temperature reconstruction (see Fig. 3B). On the other hand most of volcanic eruptions events lead a temperature drop in the year and subsequent years and the result of SEA also shows significant cooling occurred during the year of the eventas well as the following years (see Fig. 4). For the detailed information, please look up the lines 24-34, page 11 of the discussion section.

5) I would also recommend to rewrite the conclusion section. At the moment looks pretty much like a summary of results and lacks the description of the main findings and their implication on a more general context.

Response: Comment accepted. Thanks, we have rewrite the conclusion section. Following is the new conclusion: In this study, a high resolution tree-ring chronology was used to reconstruct RLST in NWSP from 1645 to 2012. The model of our reconstruction explains 37.1

3. Minor comments: 1) We have followed your suggestion to modify the “-0.288*” to “-0.29*” in Table 3.

Response: Comment accepted. Thanks, we have replace “-0.288*” with “-0.29*” in Table 3.

2) Figure 1: The scale of precipitation should be double the scale of temperature.

Response: Comment accepted. Thanks, the scale of precipitation has been adjusted to double the scale of temperature. Details see Fig. 5:

3) Figure 3. Labelling each graph with the corresponding climate variable will make the figure easier to interpret at a fist look.

Response: Comment accepted. Thanks, we have labelled each graph with the corresponding climate variable. Details see Fig. 6:

4) Figure 4: The results of the residual analysis are embedded in the text but it would also be nice to show the plot of the residuals in this figure.

Response: Comment accepted. Thanks, we have added the residual results into Figure 4. Details see Fig. 7:

Once again, thank you very much for your comments and suggestions.

Best Regards, Liangjun Zhu, on behalf of all co-authors

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/cp-2016-6/cp-2016-6-AC2-supplement.pdf

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Interactive comment on Clim. Past Discuss., doi:10.5194/cp-2016-6, 2016.

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Discussion paper

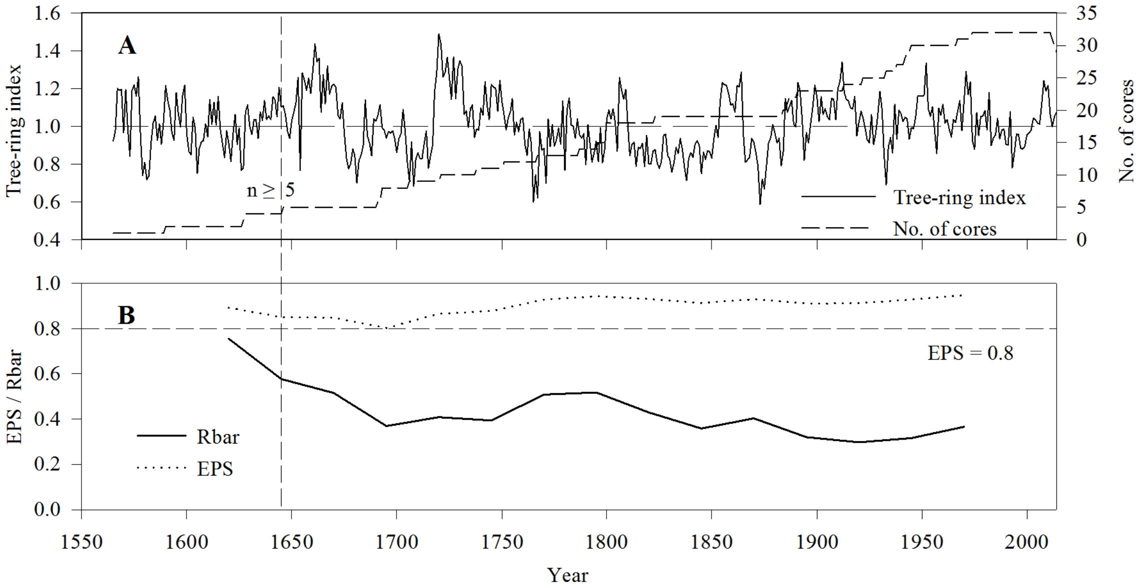

Fig. 1. The tree-ring chronology of Picea purpurea at timberline in Chali. A, Standard chronology and sample size changing with time and B, Rbar and EPS (see text for explanation) plotted for 50-year windows

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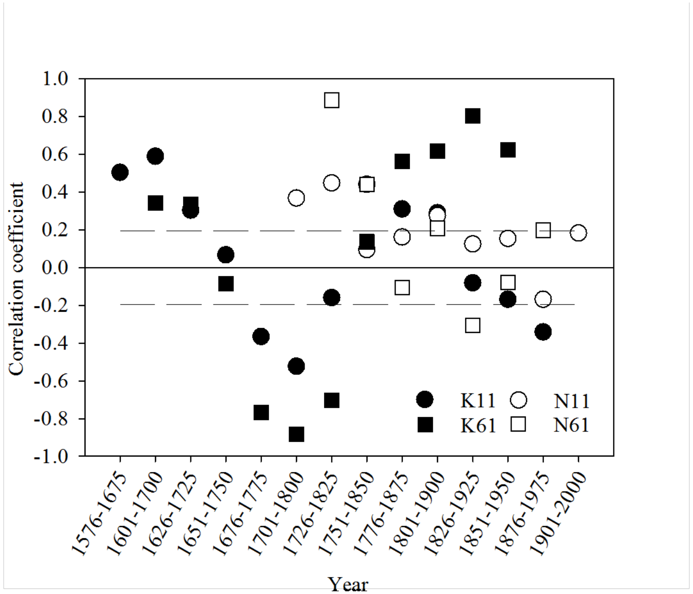

Fig. 2. Moving correlation coefficients calculated between our reconstructed temperatures and other temperature reconstructions in decadal (running 11-yr mean) and multidecadal variations (running 61-yr mean)

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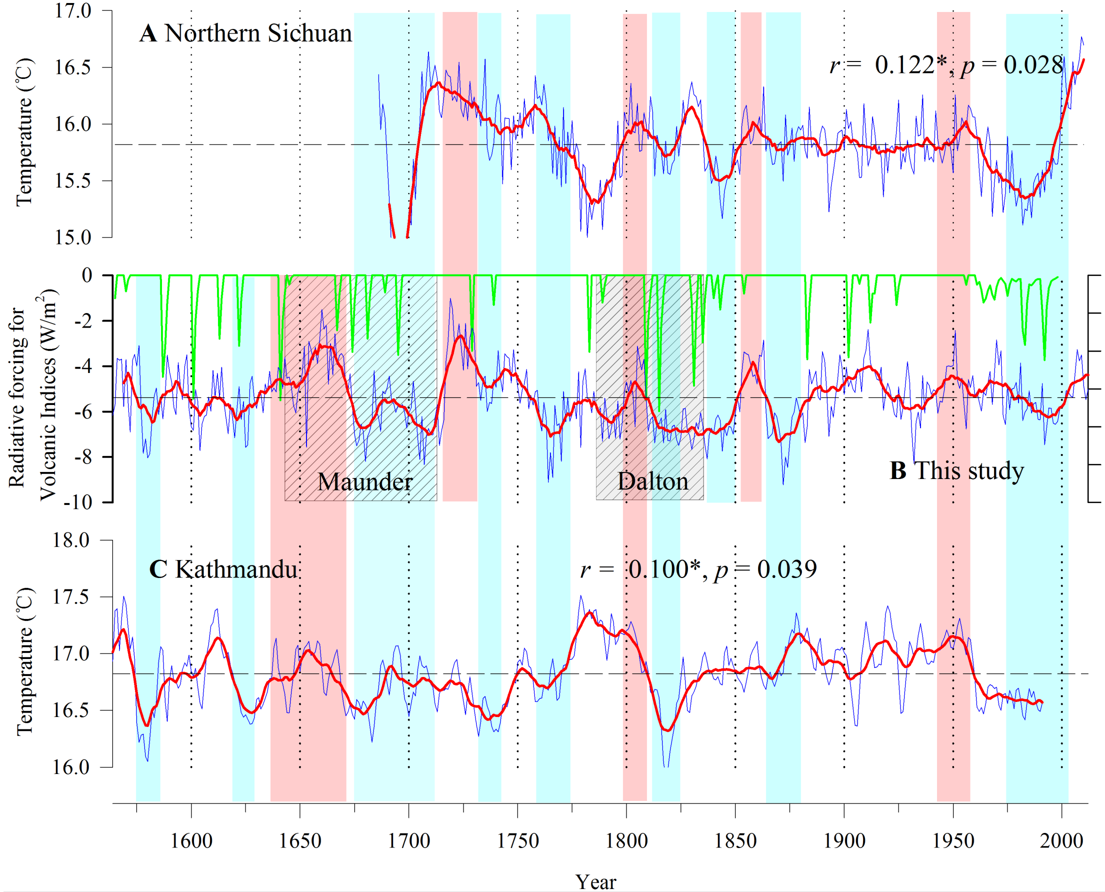

Fig. 3. Comparison of July-August mean maximum temperature reconstruction of NWSP in this study with other tree-ring based temperature reconstructions. A, July-August mean temperature in northwest Sichun (Xia

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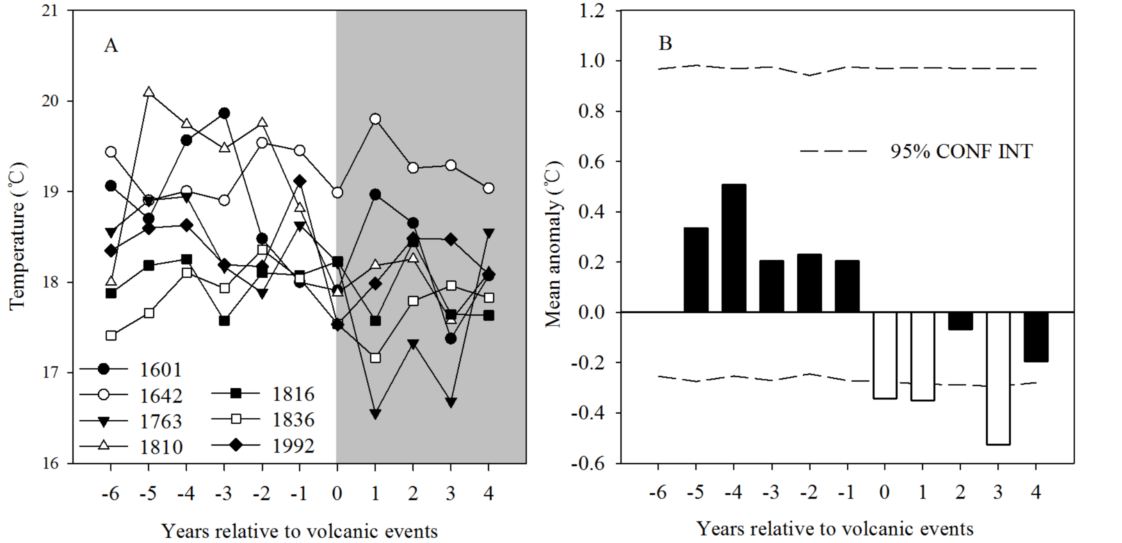

Fig. 4. The influence of volcanic forcing on temperature variations. Temperature change around the volcanic eruptions (A) and results of the superposed epoch analysis (SEA) for volcanic cooling (B).

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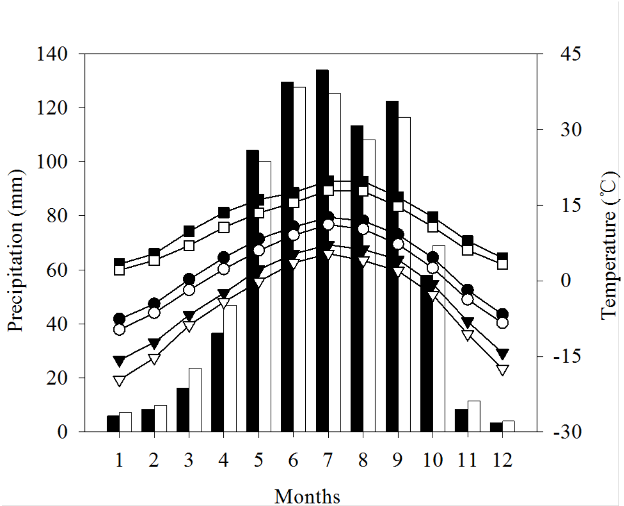

Fig. 5. Monthly variation of total precipitations (bars), mean maximum temperature (line with squares), mean temperature (line with circles), and mean minimum temperature (line with triangles) in Hongyuan (fi

Interactive comment

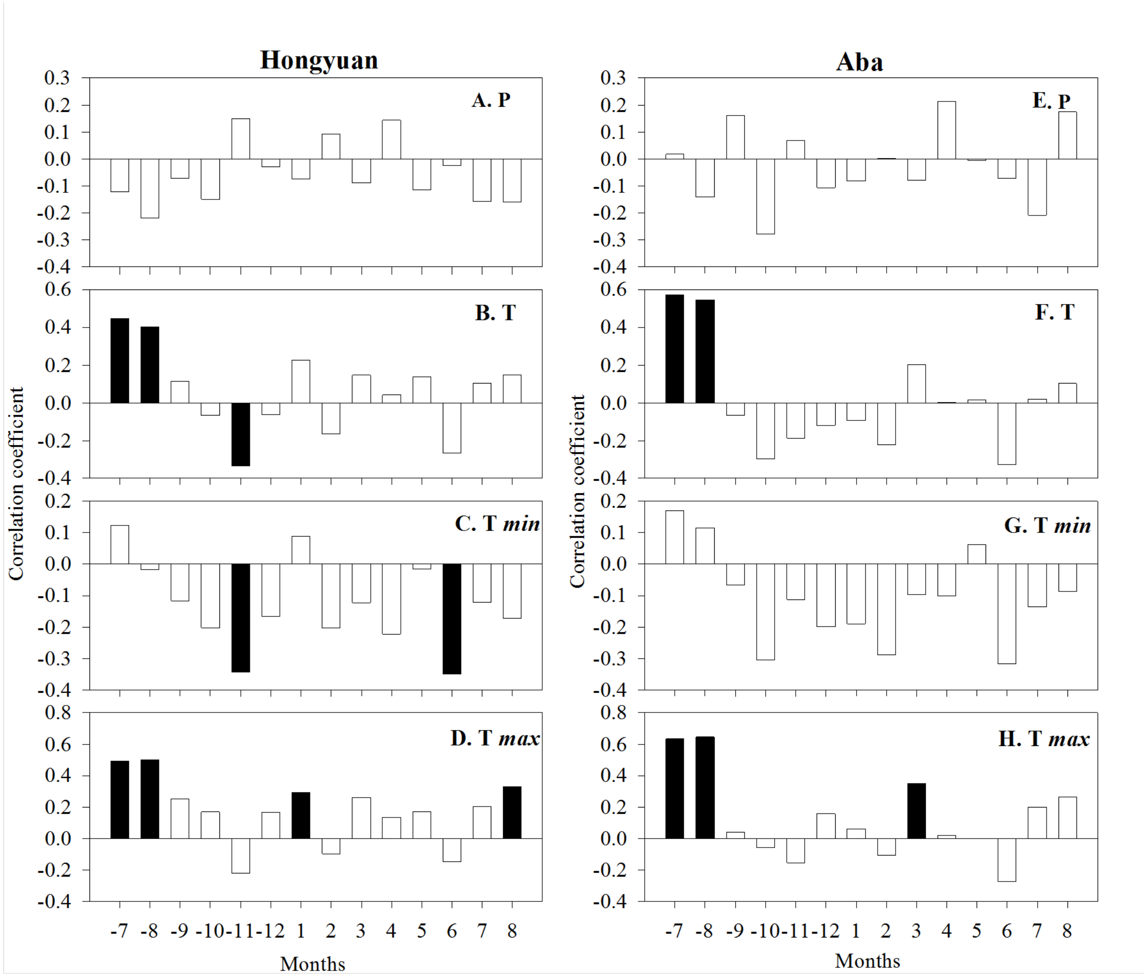

Fig. 6. Correlation analyses between the Chali tree-ring chronology and meteorological climate data of Hongyuan and Aba including total precipitation (A, E), mean temperature (B, F), minimum temperature(C, G)

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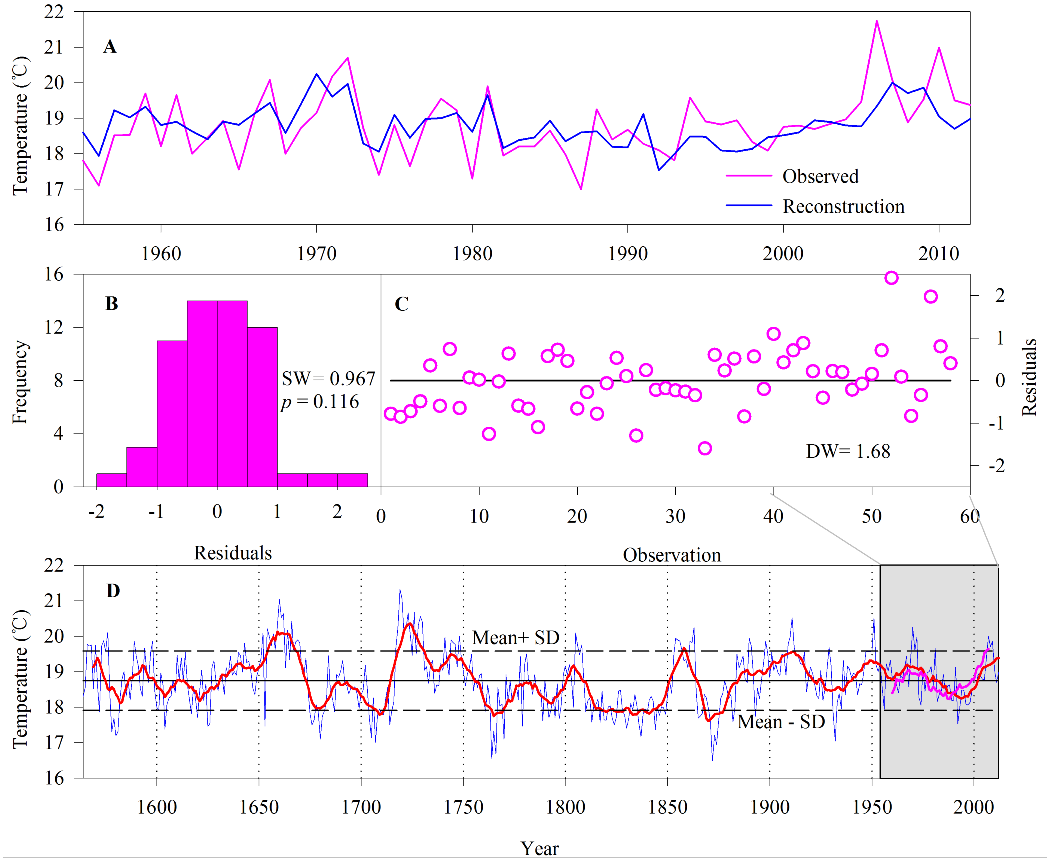

Fig. 7. Temperature reconstruction in NWSP, China. A, The comparison of observed (pink line) and reconstructed (blue line) regional Jul-Aug mean maximum temperature during the calibration period 1955-2012; B,

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