

Interactive comment on “Autumn – winter minimum temperature changes in the southern Sikhote-Alin mountain range of northeast Asia since 1509 AD” by Olga N. Ukhvatkina et al.

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Received and published: 7 October 2017

Dear Referee, We carefully revised our manuscript according to your comments. We very appreciate your helpful comments on our manuscript. These comments help us to make our reconstruction more perfect and accurate. All detailed revision and response are as below. Thank you so much for all your help. To our response we attached a file in which all the changes in the main text of the manuscript are highlighted in yellow.

Sincerely yours, Olga Ukhvatkina and co-authors

Response to general comments:

Comment: “This biggest problem of this study is that the explained variance of the reconstruction equation is very low. The low explanation means the reliability of the reconstruction equation decreases. In addition, the year to year (high-frequency) variations of the reconstructed series was not in good agreement with the actual minimum temperature series (Fig. 5a). The correlation (0.52) may be caused by the similar trends. Thus, the real correlation coefficient between tree-ring index and autumn-winter minimum temperature might be lower than 0.52, which could be tested by calculating the 1st-order difference correlation coefficient between them. Please try using some methods to increase the amount of the explanation of the reconstruction equation.”

The authors' response: We are very grateful to you for this comment. We once again tried to search for available meteorological data and found data on the minimum temperatures from Chuguevka. Then we tried to reconstruct the minimum temperatures (August-December for the previous year) based on these data. This allowed us to significantly increase the explained variance to 39% (our previous result was only 25%). Similar values are often found for reconstruction in the East-Asian region (e.g. Willes et al., 2014). Interestingly, the temperature correlation between Chuguyeva and MP7 for all months is 99%, but the correlation for August-December is only 83%. Compared to the data from Chuguyevka, the data from the MP7 for these months looks a little bit "noisy". We think that this is because on MP7 obtaining data in the winter months was sometimes difficult because this is a weather station on a Research Station without permanent staff of meteorologists.

Comment: “In addition, the greatest advantage of this reconstruction is that it spans a longer time range (more than 500 years), which can capture low-frequency climate variations (as the author said in Lines 40-48, 51). We know it is very important to extend the reconstruction series (or tree-ring chronology), but a generally acceptable threshold of the EPS is greater than 0.85. However, the EPS value from AD 1509 to 1602 is only greater than 0.7 and it contained 3 trees (or cores) (lines 119-124). Please try to find more older trees if you want to make up for this deficiency.”

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The authors' response: Thank you very much for the suggestion. Indeed, the EPS value becomes greater than 0.85 after 1602. But we think that it is very important to extend the reconstruction as far as possible, since there are few long climate reconstructions in this region. Moreover, the northern Hemisphere temperature series (D'Arrigo et al., 2006) and historical documents very rare for the North-East Asia (and are absent for the Russian Far East), confirmed that the reconstruction temperature from 1529 to 1602 is valuable. Therefore, we kept part of the reconstruction from 1529 to 1602 (EPS>0.75). In order for the reader to understand this, we added some clarifications to the text about the EPS value from 1529 to 1602, and also added lines denoting this part on Figures 3 and 5.

Response to specific comments:

"1. Five main objectives of this study are too much. The objectives (1) and (2) that develop the first (more than 500-year) tree-ring-width chronology in the far eastern region are not the real objectives. Please only list the most important goals and make them less than three."

The authors' response: Comment accepted. We reduced number of objectives from five to three.

"2. It's impressive that the authors say "two cores per undamaged old-growth mature tree (50 cores from 25 trees) and one sample from dead trees (20 samples) were extracted from *Pinus koraiensis* trees in the sample plots" (lines 98-99). However, the maximum sample depth of the VUS chronology shown in Figure 3 is nearly 35. It is far less than the actual sample depth. Please check this inconformity or give a reasonable explanation."

The authors' response: It was not a mistake. In fact, we took 2 cores from each living tree, but only one was used for analysis - with a large number of tree rings (we did not mention this in the text). Thus, the total number of samples in the analysis was 45. In addition, we do not have time periods when all 45 samples overlap with each other

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because some old trees died before new live ones appeared. Therefore, the maximum number of samples on the Figure 3 is less than 40. We made changes to the text, so as not to confuse the reader.

"3. The reconstruction period of this study is from 1509 to 1602, which matches the $EPS > 0.7$, while the authors highlighted the EPS with the value 0.75 in figure 3. Please let them keep consistent."

The authors' response: Comment accepted. We deleted line denoting $EPS > 0.7$ (fig. 3 and fig. 5) and added lines denoting $EPS > 0.75$ and $EPS > 0.85$ on Figures 3 and 5.

"4. Some figures (for example, Fig. 3, 5, 8) in the manuscript have no Y-axis title. Please add it."

The authors' response: Comment accepted, titles added.

"5. In the manuscript, new plant name should be added with Latin name only if it appears for the first time. Please write the whole Latin name, for example the *P. koraeinsis* in line 20, and the *A. nephrolepis*, *B. costata*, *P. jezoensis*, *P. koraiensis*, and *T. amurensis* (lines 79-80)."

The authors' response: Comment accepted. In the text we added whole Latin names (lines 89 and 90): *Abies nephrolepis* (Trautv.) Maxim, *Betula costata* (Trautv.) Regel., *Picea jezoensis* (Siebold et Zucc.) Carr., *Pinus koraeinsis* Siebold et Zucc., and *Tilia amurensis* Rupr.

"6. Two climate data sets (Chuguevka and MP7) were used to evaluate the tree growth-climate relationships, but in Figure 2 only the climate (monthly temperature and total precipitation) of MP7 meteorological station were shown. It is better to add the data of another weather station."

The authors' response: Comment accepted. We added climatic parameters of Chuguevka to fig. 2 too.

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"7. Why there are some big difference in the results of tree growth-climate relationships between long (Chuguevka) and short (MP7) climate data sets? Is it because the tree growth-climate relationships are unstable over time? If it is, the tree-ring data might be not suitable for the climate reconstruction."

The authors' response: After we found the data on the minimum temperatures from Chuguevka, we compared this data with MP7. The results showed that the correlation between the data from Chuguevka and VUS for all months is very high (99%). But the correlation between the data in the winter period is significantly reduced (up to 83%) – see also response to general comment 1. Now Figure 4 clearly shows that the results of the interconnections are very similar for these two weather stations and differ only in the degree of severity.

"8. There are some methodological and results sentences in discussion section, please move them into the correct places (method or result section), such as lines 268-269, lines 349-351."

The authors' response: Comment accepted. We added new text to the Methods section (lines 140-143) and also moved and added the comparison results of the reconstruction and CRU TS4.00 in the Results (lines 216-218) and the Discussion (lines 255-261). However, we left the text (lines 349-351) in Conclusion, as we believe that it is important to repeat this here.

"9. There are some Russian in line 275, please change them to English."

The authors' response: Comment accepted.

Please also note the supplement to this comment:

<https://www.clim-past-discuss.net/cp-2017-98/cp-2017-98-AC1-supplement.pdf>

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2017-98>, 2017.

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