Clim. Past Discuss.,
https://doi.org/10.5194/cp-2017-98-AC2, 2017

Climate of the Past Discussions

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.

Olga N. Ukhvatkina et al.

ukhvatkina@gmail.com

Received and published: 18 October 2017

Dear Referee, We sincerely thank you for your careful attitude to our manuscript and your help in improving it. We closely analyzed manuscript in accordance with your comments. These help as to make our research more clarify for readers. All detailed response is below. Thank you for your help!

With best wishes, Olga Ukhvatkina and co-authors.

Response to general comments:

1. Comment: I worry that the reconstruction should cut at 1600, where there is more

sample depth and a higher EPS value. Generally, the rule is 0.85 and I've seen others use 0.80 but not 0.75 as the authors do. Further, the sample depth during the period prior to 1600 is very small, less than 5 cores.

The authors' response: As we have already responded to the Referee #1, in our opinion it is very important to extend the reconstruction as far as possible, since there are few long climatic reconstructions for this region. Therefore, we would like to keep part of the reconstruction from 1529 to 1602. In order for the reader to better understand that from 1529 to 1602 the EPS value is above 0.75 but less than 0.85, we added some clarifications to the text. We also added lines denoting reconstruction part with 0.75< EPS<0.85 in Figures 3 and 5. However, if the Editor decides that this part should be excluded, we will make this change (and, accordingly, changes in further results and conclusions).

2. Comment: I also wonder why the authors are comparing their reconstruction with other reconstructions from different seasons. I think there is merit to this paper and think some of my comments could be issues of clarity but would like the C1 authors to consider them to determine if these are methodological concerns or clarity issues.

Specific comments: Line 219: Why do the authors use Aug-Dec when not all the months are significantly correlated?

The authors' response: Indeed, if we look at individual months, the tree-ring growth is not significantly correlated with the minimum temperature of some of them (in particular, August). However, when we consider combinations of months, the situation changes. We tried all possible combinations of months, before we chose the period from August to December. And if we only consider October-December, the correlation between radial growth and temperature will be 0.56. But if we add August and September, then it rises to 0.62 (new version of manuscript in supplement and the response to Ref.#1).

3. Comment: Line 244: The explanation of KNMI needs to be in the methods.

The authors' response: Comment accepted. (see also response to Ref.#1)

4. Comment: Lines 251: This is a bigger point, why are the authors comparing the Aug-Dec min temperature reconstruction to different seasonal reconstructions? This in itself is not wrong but there needs to be some explanation as to why the signals are different in these reconstructions. I'd be more comfortable with different seasonal comparison with the overall NH reconstructions but wonder why the two reconstructions that are 500km and 430km away are from April to July and Feb. to April. This is especially strange when the authors state that others have found this same Aug-Dec signal but do not compare their reconstruction to those. There could be different reasons for seasonal shifts in climate. Thus, I think this needs to be handled carefully.

The authors' response: As we understood the Referee's comment can be divided into two questions. The first one is why the climatic signal for the same tree species is different though the distances between the study areas are rather small (500 and 400 km). The second one is why we compare the reconstructions for different seasons despite the fact that seasons can have different climatic shifts. First, we will answer the second question. There are few reconstructions for the North-East Asia region, so we have to use the available reconstructions. At the same time, the presence of cold and warm periods generally coincides in the compared reconstructions, while the difference between them can be attributed to different seasonal shifts and local climate specifics (but so far, we say this under correction). We also need to clarify that another two papers which we refer to saying that the other authors have identified similar associations (have revealed the similar correlation) of tree growth and temperature (Line 233) could not be used for comparison. In the first work ("Temperature signals in tree-ring width and divergent growth of Korean pine response to recent climate warming in northeast Asia", Wang et al., 2016), the authors compared the response of Korean pine radial growth to temperature, precipitation and PDSI in different parts of distribution area. The study points in this work were distributed along a latitudinal gradient along the entire boundary area between the northeastern part of China and Russia. The main

conclusion of this work was that in different parts of the range there are various limiting factors for the Korean pine growth. However, the authors did not reconstruct the climatic parameters. The second work (Zhang et al., 2015) reveals the response of radial tree growth to the minimum temperatures of August-December of the previous year (as it is in our study), but it was made for the Tibetan plateau. We didn't think it would be correct to compare our results with the results of a study performed on the territory located more than 2.500 km far from the site of our study. The answer to the first question is more complicated. As we have said, the Wang et al., 2016 study shows that the tree response to climatic factors differs in different parts of the range. At the same time, we see that climate in the Sikhote-Alin and Northeast regions of China is very similar, which is also confirmed by Fig. 7a (new version of manuscript). At present, we cannot give the detailed answer to the question of what determines the difference in limiting factors for the Korean pine growth of in different parts of its range. However, we can make some assumptions. To do this, let's compare each neighboring reconstruction with ours separately. The first reconstruction was done by Zang et al. (2016) on the minimum temperatures of April-July. As it's explained by the authors of the article, the warming of the last decades was most strongly expressed by increasing the minimum temperatures in their study area. The authors of this article believe that for their territory the most important limiting factor for the Korean pine growth is the absence of spring and early summer frosts, that allows trees to form wider rings. At the same time, their analysis shows the correlation between the Korean pine growth and the minimal temperatures of August-December of the previous year (as it is in our study). But the correlation for that territory is less significant compared with the minimum temperatures of April-July. We compared the diagram of mean monthly temperature and total precipitation of this article with that one from our study area. The results show that in our study the minimum temperatures are much lower in August-December (especially in October-December), and the minimum temperatures of April-July almost completely coincide in these two points. Probably, that's that affected the differences of limiting factors. As for the second reconstruction (Zhu et al., 2009), the authors of

this study did not analyze the minimum temperatures effect on the Korean pine growth. They based their reconstruction at the average monthly temperature of February-April. Fig. 4c of our study clearly shows that it also reveals the correlation between the Korean pine growth and the February-April temperature, but it turned to be lower than the temperature influence in August-December of previous year (Fig. 4h). Perhaps, if the authors of the article Zhu et al., 2009 would have analyzed the correlation of the minimal temperature with the growth of the Korean pine, they could also reveal these relationships. In order for the reader to understand this, we added some clarifications to the text: “Although the spring and summer temperatures have been reconstructed in the last two cases, we use these reconstructions for comparison, because, firstly, there are no other reconstructions for this region, and secondly, despite the possible seasonal shifts, long cold and warm periods should be identified in all seasons”. (Lines 265-268).

5. Comment: Figure 5: The relationship between tree growth and instrumental temperature looks a little weak. I would like the authors to discuss what the tree-rings are not getting (i.e., peaks or troughs). I also worry that the higher r-value is more of an artifact of both timeseries trending upward rather than a true correlation.

The authors’ response: Comment accepted. According to comment of Referee #1 we improved R-value and R2-value of our reconstruction using more accurate climate dataset (see: response to Ref.#1 and new version of manuscript in supplement).

6. Comment: Figure 7: I’m not sure why this figure is in here. Are the authors trying to show that region has a strong consistent climate signal? If so, then again why are the other regional reconstructions based off of different seasons? Perhaps I’m missing something due to clarity?

The authors’ response: Comment accepted. We changed Fig 7. (see new version of manuscript). Fig. 7a showed that minimal temperature in our territories and neighboring territories is very similar. In spite of different response of Korean pine

radial growth on climate, Fig. 7b indicating that our temperature reconstruction is representative of large-scale regional temperature variations. But it suggestion needs further researches. We added next text in the manuscript for readers: “We can conclude that the analysis shows that the reconstructed data is representative for large-scale regional temperature variations (Fig. 7). At the same time, some cold and warm periods in our reconstruction and other neighbored studies do not coincide (Fig. 8), which can be due to the reconstruction of other climatic parameters and differing environmental conditions. So, we believe that these results can characterize regional climate variations and provide reliable data for large-scale reconstructions for the northeastern portion of Eurasia, but their use for large-scale regional reconstructions requires further research.” (Lines 325-330, new version)

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2017-98/cp-2017-98-AC2-supplement.pdf

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