Clim. Past Discuss., 11, C787–C791, 2015
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Climate of the Past Discussions

Interactive comment on "1200 years of warm-season temperature variability in central Fennoscandia inferred from tree-ring density" *by* P. Zhang et al.

P. Zhang et al.

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Received and published: 24 June 2015

Dear Referee,

Thank you for your valuable comments. We hope that we have addressed all the expressed concerns in the manuscript. We think that your comments have greatly improved the revised manuscript. The comments were responded as following:

1. Be careful with generalised, unquantified, comments "an improved" chronology? Improved by what metrics? Such qualifying comments need to be evidence based.

Responses: The previous reconstruction, G11, is largely based on the tree-ring sam-

ples collected from historical buildings, especially for the period before 1500 CE. The geographic source of these samples is unclear, thus the climatic signal that the samples reflects is more uncertain than tree rings collected at the tree line. In this study, new samples collected from tree-line area were used to replace the historical samples. We think that this as an improvement compared to the previous study. Furthermore, the chronology is extended by some 300 years back in time. We will more clearly phrase that this is what we mean in the revised manuscript.

2. Improved and clarified aims and objectives and citing of the work in the broader context of northern Fennoscandian dendroclimatology

Responses: We have revised the introduction to clarify the aims and objectives. In order to put our study in a broader context, we compared our new reconstruction with the tree-ring MXD based summer temperature reconstruction from northern Fennoscandia covering the MCA (Matskovsky and Helama, 2014) and the multi-proxy based northern Fennoscandian summer temperature reconstruction (McCarroll et al., 2013)

3. Improved details on the physical and statistical methodologies used.

Responses: In the revised manuscript, we have now added detailed information about tree-ring sample preparation and MXD measurements. The Zhang et al. (2015) is now published, but we anyway added a brief summary of the findings in that paper about the mean adjustment method.

4. Improved and more detailed discussion of the results and their relevance to the wider climate evolution of the region over the last millennium

Responses: The discussions now include more info about the similarity of the temperature evolution between northern and central Fennoscandia focusing on MCA. The possible causes are also illustrated.

5. Improved clarity, language and grammar.

Responses: We have now improved the clarity, grammar and language.

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6. “C-scan suggests a later onset of LIA and a larger cooling trend during 1000–1900 CE than previous MXD based reconstructions” Again this is difficult to qualify as comparisons are not made with a wide range of reconstructions.

Responses: We have now added more reconstructions that included MXD and compare to them. We still remove this statement in the revised manuscript.

7. The motivation for the sampling strategy could be more clearly explained and linked to a clearer indication of what is new material and which parts of the chronology are preexisting? I am confused on the provenance of the majority of the wood. You indicate that most of the trees are of known (temperature sensitive) provenances, however also that a lot of building materials were used? This should be clarified and expounded upon.

Responses: As mentioned in point 1, we intended to use the new collected samples to replace the samples collected from historical buildings. In addition to the samples from Furuberget-south (used in the G11), all the samples from other sites (except for historical buildings) are new material. The building materials were used in the comparison, but not used in the final chronology and reconstruction. This information will be clarified in the notes of Table 1. The new Figure 9 also clearly gives information about the provenance of the samples.

8. At the end of the introduction the motivation for the study, its aims and objectives, relevant background remain murky at best. I would recommend some clear aims and objectives, linked to gaps in knowledge, which this data set can address and perhaps tied to some hypotheses which can be tested with this new data? This is particularly important in such a densely studied part of the world.

Responses: We have reworked and hopefully improved the introduction.

9. It’s ok to refer to another paper for the details of a method but some methodological elements should be included to give the reader an indication of sample preparation and

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protocols etc.

Responses: We have now added information about the method of sample preparation and MXD data measurement in the revised manuscript.

10. Further discussion, detail and discussion of the implications of the mean adjustment procedure are also required.

Responses: We discussed mean adjustment procedure more in the revised manuscript. However, more detailed information can be found from Zhang et al. (2015). That paper is now published.

11. Grammar, language and clarity really need addressing in the methods section.

Responses: We have now corrected the grammar and language in the methods section.

12. Detrending methods – the section is a little outdated. There is a huge body of literature now on differences in standardisation methods, signal preservation and the impacts of different detrending methods on variance preservation. I would recommend reading more widely on these topics and extending this discussion.

Responses: We added the latest relevant literatures about the standardisation methods in the method section. A new comparison and new discussions were added in the discussion section.

13. Results are broadly thoroughly discussed however I find the conclusions too brief. What are the broader climatological features of interest in the series? What does the evolution reveal in comparison to ideas about known climate transitions in the region over that time period? What climatic features might explain differences between this southern reconstruction and more northerly one?

Responses: We have added more contents in the conclusion. E.g. the results of the regional temperature comparison and the possible causes of the differences in regional

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temperature evolution.

14. As the authors note they do present a comparison with Matskovsky and Helama, 2014 which, critically make reference to the new Toneträsk series. Comparisons are important, as the commentator points out, and various other options are available – McCarroll et al 2013 is a robust other option for comparisons (from a more northerly site) and contains useful discussions on variance differences which may be relevant

Responses: We have added the comparison with the MXD based northern Fennoscandia summer temperature reconstructions (Matskovsky and Helama, 2014; McCarroll et al., 2013), and discuss the results.

Best regards, Peng Zhang and co-authors

Interactive comment on Clim. Past Discuss., 11, 489, 2015.