

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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Dear Referee,

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

1. It is unclear which part of the MXD data is new, which portion of the MXD data used in this paper originates is actually the same as G11 data (the abbreviation the authors use) or data produced and analysed previously. The authors are recommended to

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provide this information.

Responses: This has now been clarified in Table 1. Tree-ring data from 'Furuberget-south' is the data that has been used in both of the previous (the G11) and the new (C-Scan) reconstruction. Tree-ring data from Furuberget-north, Håckervalen-south and Håckervalen-north are the newly collected and measured data. Tree-ring data from Lilla-Rörtjärnen, Öster Helgtjärnen and Jens Perstjärnen are the data collected some years ago, and measured recently.

2. It should be mentioned explicitly already in the abstract, how this paper advances the research in the region of central Fennoscandia and Sweden by introducing new data, what are the new insights produced by this paper in comparison to G11 study and Linderholm et al. (2014a), and the other past MXD studies in this region (also the new MXD papers from Lapland incl. Esper et al. (2014), Pritzkow et al. (2014) and Matskovsky and Helama 2014) are studies to be introduced here), what are the advancements produced in this paper in comparison to G11 w.r.t. the MXD data, the standardisation and reconstruction methods, how is the reconstruction produced in this paper advancing the science w.r.t. G11 paper. Without this information the reader of the paper is confused and the value of the current paper is questioned.

Responses: We have revised the introduction. We briefly review the state of dendrochronology, MXD length and spatial coverage, and MCA to identify some areas for improvement. We finally state what we intend to do to contribute. The main advance of this paper is to extend G11 back to 850 CE (covering the important and spatially variable MCA (cf. PAGES2K consortium)), with new collected MXD data. And to replace the questionable historical material which made out a large part of the G11 reconstruction. This has improved our knowledge about the >millennium summer temperature evolution and perhaps unfortunately made it even more elusive, which further highlights the need for even more material covering a larger part of the region from more sites to really come to terms with the MCA in Fennoscandia. Compared with the G11 reconstruction, the new reconstruction (C-Scan) suggests that the warming between 1120

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and 1220 detected by G11 reconstruction is not that distinguished. Compared with the reconstructions from northern Fennoscandia (i.e. Matskovsky and Helama, 2014 and McCarroll et al., 2013), we did see the spatial differences in temperature evolution in northern and central Scandinavia. We summarized this information, and gave them in the abstract in the revised version of the manuscript. For standardization method, we used regional curve adjusted individual signal-free approach (RSFi) to standardise the MXD series. This method has a better potential to remove unwanted noise (e.g. related to stand dynamics) on tree level comparing to other RCS standardisation methods.

3. Second major source of criticism: the methods used in this paper are not sufficiently described. In page 6, the authors refer to G11 paper w.r.t. setting of ITRAX method. And they also refer to standard techniques (line 16-17). It is hard to believe there is such a thing as standard method.

Responses: We added detailed information about the settings of ITRAX method and the sample preparation processes in the revised manuscript.

4. If any adjustments were made, in G11 paper or in this paper, to modify the MXD data from Walesch (the authors spell this differently in lines 15 and 16) and ITRAX techniques, this should be mentioned if it was done in G11 paper or by the authors of this paper.

Responses: In G11 paper, the authors did not adjust mean level and variance of raw MXD data before standardisation. In our paper, we adjusted the mean level of raw MXD data, no matter if data were measured by Walesch or ITRAX techniques. We gave more information about this in the revised manuscript. We have corrected the spelling.

5. It is interesting to find out that the authors are also adjusting (page 6, lines 18 onwards) the absolute MXD values as dictated by temperature lapse rate using a method which they have developed previously in yet unpublished paper (Zhang et al. 2015). As this paper is not yet published, it is not possible to judge if this method is reasonable at

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any level and what are the requirements and actual statistical procedures to attain this adjustment. It recommended that if this paper is not yet published, the authors make an illustration of the method in the supplementary portion of the paper. If not done so, the current paper is done using fully unpublished methods and this is not following any scientific requirement. This is important because the adjustments of this type can introduce low-frequency variability to the reconstructed temperature data.

Responses: That paper (Zhang et al. 2015) has been published (DOI: 10.1007/s00468-015-1205-4), and can be found on line.

6. The authors should also include all the statistical tests and their verbal illustration in the methods section. Now there are statistical measures and tests done to the data (Table 1 and 2) which are not described in the correct section of the text.

Responses: We have included all the statistical tests and their description in the methods section in the revised manuscript.

7. It is also suggested that the language of the paper is reviewed by native English speaker. At this point, there are several inconsistencies in the text needing clarification.

Responses: Done.

8. Smaller points of criticism: p2, l6, it is unclear what “mean adjusted” actually means

Responses: Now clarified.

9. p2, l7, RSFi is mentioned as a method with no other information what this actually means and stands for

Responses: Now clarified.

10. p3, l15, once again the author mention something new, Delta-Density, but this is not described

Responses: Now removed.

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11. p3, l20, dry deadwood is also subfossil wood

Responses: The name of subfossil wood has been used in many of our studies to describe the wood which has been buried in the lake sediments for hundreds or thousands of years. Dry deadwood cannot be seen as subfossil wood since it is not buried in sediments. We have explained the meaning of subfossil wood in the revised manuscript.

12. p3, l21, for the language, it would be good to decide if G11 means the study or the data used in the study

Responses: G11 means the previous reconstruction. This is clarified in the introduction of the revised manuscript.

13. p4, l2, what is this study, what did it do, and how it relates to your study

Responses: This is an analysis in G11 paper by visually comparing the temperature reconstructions by Gunnarson et al. (2011) and by Gouirand et al. (2008), which shows the spatial differences in regional temperature evolution. We added this information to emphasize the importance of producing a new temperature reconstruction in central Fennoscandinavia. However, we removed this in the revised manuscript.

14. p4, l13, it is uncertain what is the uncertainty that the authors mention here

Responses: The ‘uncertain’ mentioned here is related to the uncertainty caused by the possible weak summer temperature signals in the historical samples. This is clarified in the revised manuscript.

15. p5, l3-12, the authors are recommended to add papers that actually show the influence of all these factors to the study region

Responses: Done.

16. p7, l24-27, really unclear sentence

Responses: This sentence has been rewritten.

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17. p8, l14 onwards, when using RCS methods, do the authors always apply the RCS method using a single or multiple curves. It is surprising to that the author skip the papers of Melvin & Briffa (2014, 2014b) “CRUST: Software for the implementation of regional chronology standardisation: part 1. Signal-free RCS” and “CRUST: Software for the implementation of Regional Chronology Standardisation: Part 2. Further RCS options and recommendations”, where the M & B demonstrate the importance of using multiple curves in RCS.

Responses: We used single RCS curves in the standardisation. For example, in Figure 4, the chronologies in green and red colour are both based on single RCS curves. The RSFi chronology is not based on single curve. We have added a comparison with the multiple-curve-based RCS chronology in the revised manuscript.

Best regards, Peng Zhang and co-authors

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

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