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Interactive comment on "A universal error source in past climate estimates derived from tree rings" *by* Juhani Rinne et al.

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This paper introduces a "new" standardisation method to construct chronologies. It tries to show that there is low-frequency bias in tree ring chronology reconstructions. The new reconstruction method is used with the Tornetrask MXD data from 1988 to demonstrate this bias.

The authors state that "The presented method to estimate past temperatures from tree ring measurements is a new approach, where no age dependence of the tree rings is estimated." yet they are clearly removing the age related growth of trees as a linear trend. For each calendar year they have a few measured rings (e.g. 20 values). They effectively create further values by extrapolation including younger rings and older rings to a total of 270 (e.g. adding 250 values) with a linear age-related decay. These 270

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values are then averaged together thus removing the effect of ring-width aging using the presumption of some form of liner decay of ring width with age. The method of estimating R1 and Rn (page 4 line 17) will need a detailed explanation. Overall it is likely to have a similar result to that of creating and fitting a linearly decaying RCS curve. In RCS the averaging and smoothing of the RCS curve tends to reduce the climate noise from the estimation of the ageing trend whereas in the proposed method using rings from a single year which all have the same climate signal achieves this. Their conclusion that they do not remove the effect of age-related growth from their measurements is not justified as they do try to remove the age effect.

The 1988 Tornetrask MXD data were selected by age (oldest well behaved trees) from the much larger TRW data set with a view to using curve-fitting standardisation methods with sufficient replication for reconstructing medium frequency variability. An even distribution of tree rings by age in each year was not thought necessary in 1988. This is not a suitable data set to introduce or evaluate the proposed new standardisation technique.

The authors need to note that Briffa et al (2009, Hughes book chapter) show that for these MXD measurements from Tornetrask the assumption of linear decay creates a bias in the reconstruction. For TRW, the assumption of linear decay would create even more bias.

The Esper 2012 chronology has more trees (even after using mean tree rather than multiple cores) and less error due to sample count i.e. less noise. Is the age distribution of the Esper trees biased over time? No assessment is made of this so the presence or absence of systematic bias is not known and the comparison (and conclusions based on it) in this paper is not justified.

There is no attempt to distinguish between bias due to the age-related growth decay in tree measurements and noise created by poor replication and the authors confuse these two effects making their conclusions less valid and unhelpful. The presentation

in this paper is not suitable to introduce a “new” standardisation method. A comparison of new against existing methods is needed which shoulfd include a careful assessment of errors – with separation of noise related to insufficient samples and systematic bias related to poor removal of age-dependent growth and an evaluation of error magnitude. A sample data set with sufficient samples in each year to sub-divide the data and show the effect of reducing sample counts is needed and only then can the bias due to age-trend be shown.

My overall assessment is that this paper requires considerable improvement before it is suitable for publication.

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