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Interactive comment on "Spring temperature variability over Turkey since 1800 CE reconstructed from a broad network of tree-ring data" *by* Nesibe Köse et al.

Anonymous Referee #2

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General comments: This is a nice paper overall and is worthy of publication because, as indicated in the Introduction, there are no long temperature records in Turkey for the assessment of changing springtime temperature warming, especially that related to a decrease in diurnal temperature range (DTR) through an increase in nighttime temperatures. This paper does not directly reconstruct springtime DTR, but it does produce the first springtime (March-April) temperature reconstruction for a region where it has not been done before. This is a useful result in and of itself. For this reason, I recommend publication after a few recommended changes and clarifications below are addressed.

Specific comments:

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Discussion paper

1) Discussion of how the tree-ring chronologies were produced for reconstruction (pg. 5) is adequate overall, but it sounds like the residual chronologies from ARSTAN were used for reconstruction. Is that true? If so isn't there a concern that a certain amount of low-frequency variability due to climate will be lost after prewhitening? This is a legitimate concern because it is not strictly true to say that "persistence not related to climate variations" (line 104) is only being removed from the ARSTAN residual chronology. If there is any persistence due to climate in the chronologies, it will be convolved with biological persistence ("persistence not related to climate") and therefore removed by prewhitening too. This is an important distinction that must be considered when and how to use autoregressive prewhitening. How this issue might affect the reconstruction presented here is unclear and should be at least mentioned.

2) Given that the 23 tree-ring chronologies used for temperature reconstruction are in general more precipitation sensitive (mainly May-June) than temperature sensitive (mainly March-April) (Fig. 2), there are reasonable grounds for concern that the temperature-only reconstruction will in fact be mixed with precipitation effects on tree growth. To reduce the likelihood of this being a problem, a stepwise PC regression procedure was used in which all 23 tree-ring PCs temperature were tested for use as predictors of Mar-Apr temperature, resulting in 9 PCs being entered into the model (Table 3). This appears to factor out and use the reasonably discrete March-April temperature signals in the chronologies quite well while minimizing the influence of precipitation in the final reconstruction. I would like a bit more information about this model, e.g. the order of entry of the PCs into the model and the stopping criterion for entering variables in the model. I also assume that the PCA applied to the chronologies was done over the entire period in common to the tree-ring chronologies, thus making the PCs non-orthogonal by some amount over the 1930-2002 calibration period and thus necessitating the use of stepwise regression. It would be good to clarify exactly what was done here.

3) Regarding the quality (skill) of the reconstruction, the resulting bootstrapped recon-

struction and RE and CE statistics appear to support the reconstruction method used (Table 4). However, I don't believe this is the most powerful use of RE and CE because those statistics use the calibration and verification means, respectively, as the basis for assessing reconstruction skill typically against a block of withheld instrumental data. This implies that split calibration/verification may provide a more rigorous test then the way it is done with the bootstrap. Given this suggestion, it would be nice to see how good the RE and CE statistics are over the 1901-29 period of withheld temperature data as well in comparison to those provided in Table 4. The correlations look very good over this period (Fig. 6), so why not calculate the RE and CE too? Since RE and CE are more sensitive to changes in mean level between the calibration and verification periods, it could indicate how strong an effect there might be in using the assumed prewhitened chronologies as predictors. I would also like to see actual and reconstructed temperatures plotted in Fig. 4 extended back to 1901. All this with the understood caveat that the 1901-29 temperature data over Turkey are interpolated from surrounding areas.

4) Eq. (1) on page 10 is fine for showing the regression weightings of the selected PCs in the temperature reconstruction model, but this does not provide any useful information on the relative importance of the 23 tree-ring chronologies used in the reconstruction. This can, in the case of a fully orthogonal PC regression, be easily provided through the algebraic back-transformation of the regression model coefficients from PC space to tree-ring data space. It is unfortunate that this cannot be done here because (as best as I understand the method in the paper) the PCs in the calibration period will not be orthogonal by some unknown amount. Consequently, I am not sure the Eq. (1) is all that informative. It can be easily left out in my opinion.

A suggested reference to add: A recent paper on rainfall reconstruction that includes far eastern Turkey might be cited to: Martin-Benito, D., Ummenhofer C.C., Köse, N., Güner, H.T., Pederson, N. 2016. Tree-ring reconstructed May-June precipitation in the Caucasus since 1752 CE. Climate Dynamics

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