# Referee report on “Spring temperature variability over Turkey since 1800 CE reconstructed from a broad network of tree-ring data”

**Major comments:**

The article fills a gap among present tree-ring network studies and contains some novel features that merit its publication – but only after a revision and expansion of certain parts of the article. Normally, such short tree-ring temperature reconstructions as the present one (e.g. ~200 years) do not merit publication today, but since Turkey is a relatively under-sampled area – with a short instrumental record – an exception can be made here. What I, however, find perhaps even more interesting than the (short) temperature reconstruction presented in the article is the potential to present the chronologies as a “network study”, looking at their different responses to various climate parameters over different seasonal windows. Such an analysis would make the article much more interesting and may provide valuable guidance for future research efforts. I would like to see the authors address/consider the following things before the article is published (although I understand that it might be too time consuming to address all of them fully):

1) A very interesting, and informative, addition to the work would be a network analysis of the Turkish tree-ring width records presented, preferably together with nearby ITRDB records, regarding their response to temperature and precipitation, respectively, during various seasonal windows. “Blue prints” to such a type of simple, yet very informative analysis, may be found in St. George (2014) and St. George and Ault (2014) and additionally in Hellmann et al. (2016). This information, preferably in the form of maps, could easily be included in a Supplement although a map of correlation to temperature and precipitation, respectively, during the key seasons considered could also be included in the main article.

2) The temperature signal in the tree-ring chronologies presented in the article is very weak and precipitation seems to be an even more important factor controlling the tree-ring growth. The PC analysis performed in the article requires the relationship between temperature and precipitation control to be relatively stable back in time (prior to the calibration period). This is very likely not the case. In many semi-arid areas the relative influence of temperature vs. precipitation control of tree-ring growth is highly unstable in time. Often the relationship between temperature and precipitation changes over time and there may occur dry and warm periods as well as dry and cold and likewise wet and warm as well as wet and cold periods. While I think this will be very difficult to test with regard to the Turkish tree-ring chronologies in the article the authors might at least be able to problematize this issue. I do not suggest that they should try to solve it but merely discuss it. One paragraph could easily be devoted to the issue and the problem could there be discussed in the light of previous tree-ring research in other semi-arid areas.

3) Given that the decorrelation decay length for temperature is in the order of a few thousand kilometres it might be a useful approach – since the Turkish instrumental records are so short – to look at the temperature variability further back in time from longer instrumental records in other parts of the Mediterranean. However, since the climate in the eastern Mediterranean is very different from that in the western Mediterranean any such analysis needs to be done with care. One simple approach could be to visually compare and maybe correlate the temperature reconstruction to longer instrumental records from the (eastern) Mediterranean region as a way to validate the temperature reconstruction prior to 1930.

4) It would be helpful if the authors would compare their new tree-ring based temperature reconstruction, and also the precipitation signal they find in the tree-ring chronologies, with existing gridded temperature and hydroclimate reconstructions for Europe. In Figure 2 the extracted local gridcell from the Old World Drought Atlas (Cook et al., 2015), the gridded seasonal precipitation reconstructions for Europe by Pauling et al. (2006), the gridded seasonal European temperature reconstructions by Luterbacher et al. (2004) and Xoplaki et al. (2005), and the new gridded European gridded summer temperature reconstruction by Luterbacher et al. (2016) could be used. A brief discussion could be added about what the local grid cells of these reconstructions show with regard to similarities/differences. It is important, however, to recognize that most of these products include limited data from Turkey.

5) There exists an extensive literature about (palaeo)climate conditions in the Mediterranean region but the authors hardly mention this research at all. In my opinion, it is a prerequisite for a scientific article to provide A) a general overview of the state-of-the-art knowledge in the field, and B) to place the new results obtained into a wider context of previous research in the same/similar field. I think a very useful start for the authors would be to consider the following works and the references cited there-in:

Lionello, P. (Ed.), 2012. The Climate of the Mediterranean Region, from the Past to the Future. Elsevier, Amsterdam, Netherlands.

Roberts, N. et al. 2012: Palaeolimnological evidence for an east-west climate see-saw in the Mediterranean since AD 900. Glob. Planet. Change, 84, 23–34.

Sanchez-López, G. et al. 2016: Climate reconstruction for the last two millennia in central Iberia: The role of East Atlantic (EA), North Atlantic Oscillation (NAO) and their interplay over the Iberian Peninsula. Quaternary Science Reviews 149: 135–150.

**Minor comments:**

Lines 45–47: This section about urban heat effect is rather interesting and could, preferably, be extended a little with references to other results, in other areas, of changes in the diurnal temperature range due to urbanization.

Lines 55–56: Also cite Cook et al. (2015) here.

Line 62: Change “the Medieval Climate Anomaly” to “the end of the Medieval Climate Anomaly”.

Lines 123–126: Maybe add a short section of the sensitivity to the choice of gridded instrumental temperature product?

Line 289: It is an exaggeration to call it the “Great Depression”.

**Literature cited/suggested:**

Cook, E. et al. 2015: Old World megadroughts and pluvials during the Common Era. Sci. Adv., 1, e1500561, doi:10.1126/sciadv.1500561.

Hellmann, L. et al. 2016: Diverse growth trends and climate responses across Eurasia’s boreal forest. Environmental Research Letters: 11: 074021, doi:10.1088/1748-9326/11/7/074021.

Lionello, P. (Ed.), 2012. The Climate of the Mediterranean Region, from the Past to the Future. Elsevier, Amsterdam, Netherlands.

Luterbacher, J. et al. 2004: European seasonal and annual temperature variability, trends and extremes since 1500. Science, 303: 1499–1503.

Luterbacher, J. et al. 2016: European summer temperatures since Roman times. Environmental Research Letters, 11: 024001, doi:10.1088/1748-9326/11/1/024001.

Pauling, A. et al. 2006: Five hundred years of gridded high-resolution precipitation reconstructions over Europe and the connection to large-scale circulation. Clim. Dynam., 26: 387–405.

Roberts, N. et al. 2012: Palaeolimnological evidence for an east-west climate see-saw in the Mediterranean since AD 900. Glob. Planet. Change, 84, 23–34.

Sanchez-López, G. et al. 2016: Climate reconstruction for the last two millennia in central Iberia: The role of East Atlantic (EA), North Atlantic Oscillation (NAO) and their interplay over the Iberian Peninsula. Quaternary Science Reviews 149: 135–150.

St. George, S. 2014. An overview of tree-ring width records across the Northern Hemisphere, Quat. Sci. Rev. 95: 132–150.

St. George, S., and T. R. Ault. 2014. The imprint of climate within northern hemisphere trees, Quat. Sci. Rev. 89: 1–4.

Xoplaki, E. et al. 2005: European spring and autumn temperature variability and change of extremes over the last half millennium. Geophys. Res. Lett., 32, L15713, doi:10.1029/2005GL023424.