Different climate response of three tree ring proxies of *Pinus sylvestris* from the Eastern Carpathians, Romania

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The aims of this study are:

i) to compare MXD, BI, and TRW chronologies developed from the same set of *Pinus sylvestris* cores taken from the Eastern Carpathian Mountains;

ii) to employ monthly and daily data in order to evaluate the potential of each tree ring parameter for dendroclimatic studies; and

iii) to determine the optimal time interval for ensuring the highest correlation in future climatic reconstructions (Nagavciuc et al., 2019).

Methods:

For this study, 20 cores of *Pinus sylvestris* covering the period 1886–2015 were extracted from living non-damaged trees from the Eastern Carpathian Mountains (Romania). Each chronology was compared to monthly and daily climate data. All tree ring proxies had a stronger correlation with the daily climate data compared to monthly data.

To examine the stationarity of the long-term relationship between our proxies and the gridded Tmax dataset we make use of stability maps. The basic idea of the stability map is to identify regions with stable teleconnections (the correlation does not change in time) between our proxy data and Tmax. A detailed description of the methodology is given in (Ionita, 2017), and was successfully applied by Nagavciuc et al. 2019 and Nagavciuc et al 2020.

Results

The highest correlation coefficient was obtained between the MXD chronology and daily maximum temperature over the period beginning with the end of July and ending in the middle of September (r=0.64). The optimal intervals for the temperature signature were 01 Aug – 24 Sept for the MXD chronology, 05 Aug – 25 Aug for the BI chronology, and both 16 Nov of the previous year – 16 March of the current year and 15 Apr – 05 May for the TRW chronology (Nagavciuc et al., 2019).

Conclusions

“Our results suggest that MXD and BI paleoclimate proxies retain a similar paleoclimate signal, while TRW has a different paleoclimate signal. The strongest correlation with all climatic variables was obtained for the MXD chronology, with the highest value for maximum temperature over the time interval extending from the end of July to the middle of September.

The high correlation between MXD and BI and the strong climate signal recorded by both proxies suggest that the BI chronology can be used as a surrogate proxy for MXD, but only for August. The MXD and BI chronologies can also be used in parallel with TRW since they record climatic signals from different periods.

The results of the present study show that the relationship between climate variables and proxies can be stable or unstable depending of the type of proxy, indicating that caution is needed in paleoclimate reconstruction studies because the stability of the climate signal recorded in paleo proxies is the basis of climate reconstructions” (Nagavciuc et al., 2019).

References

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