



A 500-year multi-proxy drought reconstruction for the Czech Lands

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Four different moisture-sensitive proxy series from the territory of the Czech Republic are used for quantitative reconstruction of drought via Z-index over the last 500 years. Two tree-ring width series, grape harvest dates and precipitation indices derived from documentary data were combined using Principle Component Analysis. It was found that the first component described 55% of overall variability of four original proxy series. Using simple linear regression the component scores were calibrated to April–July measured Z-index values in the 1805–1854 overlapping period reaching 70% of the common variance explained. Good reconstruction skill was proved with numerous independent calibrations randomly selected from the full overlapping period; all of them providing highly positive RE and CE verification statistics. Moreover, it was proved that the relatively short 50-years long calibration period covering early instrumental data (1805–1854) does not influence the quality of reconstruction. It is demonstrated that the new regression-based reconstruction does not significantly reduce the variability of original proxy series and it does not underestimate significantly dry extremes. New Z-index reconstruction is characterized by a considerable inter-annual and inter-decadal variability with no long-term trends. The driest (1616) and the wettest (1713) years match previously published hydroclimate reconstructions from the same region, whereas the driest and wettest 30-year periods occurred in 1998–2017 and 1890–1919 respectively. Thus central Europe has recently experienced the most severe decadal-scale late spring–early summer drought of the past 500 years. The new multi-proxy drought reconstruction demonstrates progress beyond previous single-proxy attempts as for the strength of hydroclimate signal.