Drought variability reconstructed from multiproxy archives for the territory of the Czech Republic since AD 1500

Petr Dobrovolný (1,2), Rudolf Brázdil (1,2), Miroslav Trnka (2,3), Michal Rybníček (2,4), Tomáš Kolář (2,4), and Martin Možný (5)

(1) Masaryk University, Department of Geography, Brno, Czech Republic (dobro@sci.muni.cz), (2) Global Change Research Institute, Czech Academy of Sciences, Brno, Czech Republic, (3) Mendel University, Department of Agrosystems and Bioclimatology, Brno, Czech Republic, (4) Mendel University, Department of Wood Science, Brno, Czech Republic, (5) Czech Hydrometeorological Institute, Doksany Observatory, Czech Republic

Better understanding of past hydroclimate (drought/precipitation) variability is of great importance due to negative impacts of drought in recent Central Europe and also due to high uncertainties in future hydroclimate according to model projections. We present late spring–early summer (AMJJ) drought reconstruction for the territory of the Czech Republic (CR) spanning the last 500 years. Drought is represented by Z-index, which well characterizes especially short–term drought occurrence. Instrumental measurements from CR covering most of 19th and 20th centuries represent the target data. Four different proxy archives from the CR territory were used for Z-index reconstruction: a) spring–summer precipitation index series derived from documentary evidence (1501–1854); b) grape harvest dates for the Czech Lands (1499−2012); c) oak (Quercus spp.) ring width chronologies from CR (1500–2012); fir (Abies alba Mill.) ring width chronologies from South Moravia (South Eastern part of CR, 1500–2007). The previous studies proved significant drought-sensitivity of all proxies. The strongest hydroclimate signal was found for indices derived from documentary data and for grape harvest dates while tree ring width series showed relatively weaker signal. Used proxies showed a distinct correlation structure and they were combined to new variables using Principal Component Analysis. The first principle component (PC1) explaining 55 % of common variance correlates significantly with target data. Linear regression with subsequent variance scaling was used for PC1 calibration to Z-index values calculated from instrumental measurements. Response functions were further verified on independent proxy and target data. New 500 years long drought reconstruction is characterized with a large inter-annual and inter-decadal variability with no long-term trends, the picture that confirms our knowledge on drought variability from the instrumental period. Well documented historical droughts (e.g. 1540, 1590, 1616 and 1790) are well represented also in the new reconstruction.