EMS Annual Meeting Abstracts
Vol. 10, EMS2013-252, 2013
13th EMS / 11th ECAM

Long-term variability in Czech temperature series: An attribution analysis

J. Mikšovský (1,3), R. Brázdil (2,3), P. Štěpánek (3,4), and P. Pišoft (1)

(1) Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic (jiri.miksovsky@mff.cuni.cz), (2) Institute of Geography, Masaryk University, Brno, Czech Republic, (3) Global Change Research Centre AS CR, Brno, Czech Republic, (4) Czech Hydrometeorological Institute, Regional Office Brno, Czech Republic

One of the key questions associated with the study of the past climate evolution is the issue of attribution, i.e. identification of the factors responsible for the observed variations and quantification of their effects. Here, we apply various elements of correlation, regression and wavelet analysis to detect the imprints of selected natural and anthropogenic forcings (related to changes in the atmospheric composition, as well as variations of solar and volcanic activity) and prominent climatic oscillations (ENSO, NAO, AMO) in the Czech annual and monthly temperature series. Our primary target variable, representing areal average of Czech annual temperature throughout the 19th and 20th century, was constructed from several Czech historical weather records, quality-controlled and homogenized. The results for the Czech Republic are also compared to those obtained for the series of pan-European and global annual temperature.

We show that the Czech temperature is strongly connected to the greenhouse gasses concentration and North Atlantic Oscillation phase, with minor contributions from the changes of the amount of tropospheric sulphate aerosols and solar activity, but no distinct signature of major volcanic eruptions. Presence and magnitude of nonlinear interactions between the explanatory and target variables were assessed through application of various nonlinear mappings, including different architectures of artificial neural networks. No major nonlinearities were detected, however, and purely linear approach thus seems appropriate for the presented type of attribution analysis, at least from the practical perspective.