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Temperature and precipitation fluctuations in the Czech Republic during the period of instrumental measurements

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The history of early meteorological observations using instruments in the Czech Lands is described (the longest temperature series for Prague-Klementinum starts in 1775, precipitation series for Brno in 1803). Using the PRODIGE method, long-term monthly temperature and precipitation series from selected secular stations were homogenized (for 10 and 12 stations, respectively). All the seasonal and annual temperature series for the common period 1882–2010 show a significant positive linear trend with accelerated warming from the 1970s onwards. No significant linear trends were disclosed in the series of seasonal and annual precipitation totals. Correlation coefficients between the Czech series analysed decrease as distances between measuring stations increase. A sharper decrease of correlations for precipitation totals displays much weaker spatial relationships than those for mean temperatures. The highest correlations between all stations appeared in 1921–1950, the lowest in 1891–1920 (temperature) and 1981–2010 (precipitation). Wavelet analysis reveals that very distinct annual cycles, as well as the slightly weaker semi-annual ones, are better expressed for temperature series than for precipitation. Statistically significant cycles longer than one year are temporally unstable and sporadic for precipitation while in the temperature series cycles of 7.4–7.7a (a = year) and 17.9–18.4a were recorded as significant by all stations in 1882–2010 (quasi-biennial cycle of 2.1–2.2a for half the stations). Czech homogenous temperature series correlate best with those of the Northern Hemisphere for annual, spring and summer values (with significant correlation coefficients between 0.60 and 0.70), but this relation is temporally unstable. Circulation indices, such as the North Atlantic Oscillation Index (NAOI) and the Central European Zonal Index (CEZI) may explain the greater part of Czech temperature variability, especially from December to March and for the winter; however this relationship is much weaker, or even random, for precipitation series. Further, relationships with the Southern Oscillation Index (SOI) are weak and random. Relatively weak coincidences exist between statistically significant cycles in the Czech series and those detected in NAOI, CEZI and SOI series.