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Homogenization results for various meteorological elements in the Czech Republic

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In many scientific disciplines it is needed to process long time series of meteorological elements. In recent years considerable attention has been devoted also to analysis of daily data. Prior to any analysis, the need to homogenize data and check their quality arises. Unfortunately, most of the time series of atmospheric data with a resolution of decades to centuries contains inhomogeneities caused by station relocations, exchange of observers, changes in the vicinity of stations (e.g. urbanization), changes of instruments, observing practices (like a new formula for calculating daily average, different observation times), etc.

For the period 1961–2007, 1750 series of seven climatological characteristics were tested for homogeneity (on monthly, seasonal and annual scale) and inhomogeneities were found in 42% of them. This value is underestimated, due to the low number of detections in precipitation series, in which breaks were detected only in 15% of series. For all other characteristics, this number was above 50%.

Before homogenization itself, quality control on the subdaily data (for individual observation hours 7,14,21) was performed and all suspicious values were removed from time series. In our approach, data quality control is carried out by combining several methods (Štěpánek et al 2009). Detection of inhomogeneities was performed using monthly, seasonal and annual means (or sums in the case of precipitation and sunshine duration). In the homogenization of the time series, the use of various statistical tests and types of reference series made it possible to increase considerably the number of homogeneity tests results for each series tested and thus to assess homogeneity more reliably. The relative homogeneity tests applied were: Standard Normal Homogeneity Test [SNHT], the Maronna and Yohai bivariate testand the Easterling and Peterson test. Data were corrected for found inhomogeneities on daily scale. We created our own correction method (called DAP – Distribution Adjusting by Percentiles), an adaptation of a method for the correction of regional climate model outputs by Deque (2007). Our process is based on comparison of percentiles (empirical distribution) of differences (or ratios) between candidate and reference series before and after a break.

Annual cycles, inter-annual variability and spatial distribution of homogenization results are further discussed in our contribution.