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USING TIME SERIES FOR THE COMPARISON
OF AIR TEMPERATURE MEASURED WITH STANDARD AND AUTOMATIC STATION

Key words: automatic station, extreme air temperature, mean air temperature, standard method, time series

Summary

The study presents the result of a comparison between air thermal parameters measured with standard (manual) and automatic method in the Wroclaw-Swojec Observatory in the period 2000–2009. Daily values of mean air temperature ($t_p$), maximum ($t_{\text{max}}$) and minimum ($t_{\text{min}}$) air temperature were analyzed. Manual measurements were conducted using standard and extreme thermometers placed 2 meters above the ground in a meteorological screen. The average daily values of $t_p$ were calculated from four temporal measurements (1, 7, 13, 19 CET); values from 1 a.m. were obtained from daily thermohygrographs. Parallel to standard observations, measurements were performed with the Campbell automatic weather station. Electronic sensor for measuring air temperature (MP 100A Rotronik) was placed in the same screen, in which manual devices were situated. This sensor was programmed to sample every 60 seconds and to record the extreme values of air temperature and the hour they had occurred. Hourly averages from automatic station were calculated from minute measurements and mean daily $t_p$ was calculated from hourly values.

In most cases, during the period 2000–2009, standard thermometers showed higher temperature than electronic sensors. Mean differences between values from both stations were 0.8°C for $t_p$, 0.9°C for $t_{\text{max}}$ and 1.1°C for $t_{\text{min}}$. The greatest differences were: 4.4°C ($t_p$), 12.5°C ($t_{\text{max}}$), 10.5°C ($t_{\text{min}}$), but so high values occurred incidentally. Time series of differences did not show seasonal changes, which was confirmed by the analysis of autocorrelation and partial autocorrelation. Transformation of automatic data resulted in much closer adjustment of air temperature values to standard in the comparison with original automatic daily data. Moreover, the frequency of differences in the middle ranges significantly increased.