Probabilistic quality control of daily temperature data

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A procedure for quality control of daily maximum and minimum temperature data acquired by a monitoring network is presented. The procedure aims to automatically identify data affected by potential anomalies, thus reducing the necessary time for a manual inspection of the operator who has the task to assign the final flags in each quality control system.

Potential anomalies in daily temperature data are identified through probabilistic confidence intervals derived from the historical dataset observed both in the target station and in the selected reference stations. In particular, a first control is carried out by verifying whether the observed data lie within a confidence interval of fixed probability, obtained from the historical series of the same station, after removal of statistically significant linear trend. A second control is based on comparing the observed data with confidence intervals derived by means of multiple linear regressions, developed by using contemporaneous data observed in reference stations. Examples of applications of the proposed procedures are reported with reference to daily maximum and minimum temperature observed from 1950 to 2004 at some Sicilian automatic stations, operated by the Water Observatory of Regional Agency for Waste and Water (formerly, the Sicilian Regional Hydrographic Office).

Finally, the accuracy of the proposed procedure is verified by introducing known errors in the available series of daily temperature, assumed as correct, and by computing the probabilities to correctly and incorrectly classify the acquired data in terms of the corresponding frequencies.