Quality control of daily precipitation data through neural networks

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Abstract. Hydrometeorological data acquired by monitoring networks are potentially affected by errors deriving from various causes that can compromise their applicability in describing hydrological phenomena. The necessary time for a traditional control of the data, based on a "manual" inspection, is clearly not compatible with the requirements of a timely dissemination of the information, thus the need arises for automatic quality control procedures of the data, that make it possible to perform a preliminary analysis of the acquired information, in order to identify potential anomalies in the observations. In the paper, a procedure for quality control of daily precipitation data, oriented to detect potentially erroneous data to be submitted for further manual controls, is described. Quality control of daily precipitation data in a given station is based on confidence intervals derived by applying neural networks techniques to contemporaneous data observed in reference stations. This enables to overcome the problem of the presence of zero values in the series and of the strong variability of precipitation at daily time scale, which would hinder the possibility of estimating reliable confidence intervals from historical data of the target station. Application of the proposed procedure to precipitation data observed in Sicily (Italy), leads to validate more than 80% of the data. Moreover, the accuracy of the procedure is verified by introducing known errors in precipitation datasets, supposedly correct, and by computing the probabilities of correctly classifying data as validated or not validated. The results enable to estimate the accuracy of the procedure as a function of the percentage of errors in the datasets.