



## **Quality control of climatological time series in the province of macerata (adriatic side of central italy)**

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The analysis is focused on more than 100 meteorological recording stations located in the Province of Macerata (Marche region, Adriatic side of Central Italy) and in its neighbours; it aims to check the time series of their climatological data (temperatures and precipitations), covering about one century of observations, in order to remove or rectify any errors.

This small area (about 2.800Km<sup>2</sup>) features many different climate types, because of its varied topography ranging, moving westward, from the Adriatic coast to the Appennines (over 2.100m of altitude). In this irregular context, it is difficult to establish a common procedure for each sector; therefore, it has been followed the general guidelines of the WMO, with some important difference (mostly in the method).

Data are classified on the basis of validation codes (VC): missing datum (VC=-1), correct or verified datum (VC=0), datum under investigation (VC=1), datum removed after the analysis (VC=2), datum reconstructed through interpolation or by estimating the errors of digitization (VC=3).

The first step was the "Logical Control", consisting in the investigation of gross errors of digitization: the data found in this phase of the analysis has been removed without any other control (VC=2).

The second step, represented by the "Internal Consistency Check", leads to the elimination (VC=2) of all the data out of range, estimated on the basis of the climate zone for each investigated variable.

The third one is the "Tolerance Test", carried out comparing each datum with the historical record it belongs to, in order to apply this test, the normal distribution of data has been evaluated. The "Tolerance Test" usually defines only suspect data (VC=1) to be verified with further tests, such as the "Temporal Consistency" and the "Spatial Consistency".

The "Temporal Consistency" allows an evaluation of the time sequence of data, setting a specified range for each station basing upon its historical records. Data out of range have been considered under investigation (VC=1).

Data are finally compared with the ones contemporaneously recorded in a set of neighboring meteorological stations through the "Spatial Consistency" test, thus eliminating every suspicious datum (recoded VC=2 or VC=0, depending upon the results of this analysis).

This procedure uses a series of different statistic steps to avoid uncertainties: at its end, all the investigated data are either accepted (VC=0) or refused (VC=2).

Refused and missing data (VC=-1 and VC=2) have been reconstructed through interpolation using co-kriging techniques (assigning VC=3), when necessary, in the final stage of the process.

All the above procedure has been developed using a database managing software in a GIS (ESRI ArcGIS<sup>®</sup>) environment.

The refused data are 1.286 in 77.021 (1,67%) for the precipitations and 375 in 1.821.054 for the temperatures (0,02%).