RECONSTRUCTION AND ANALYSIS OF THE TEMPERATURE SERIES OF VERONA (1741-2005)

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VERONA AND ITS CLIMATE – Verona is a middle sized city (260,000 inhabitants). The foothills of the Alps begin immediately north of the town and Lake Garda is only 20 km away. Historically, the city has always been situated at the junction of two important transport axes: the one which links up Europe and Italy through the Brenner corridor and East and West of the italic peninsula. This characteristic has always given great vitality to the city. Studying the climate of a region can be an instrument that may be used to improve human life quality for example by evaluating the return period of meteorological events to dimension civil works or prevent dangerous situations on streets. This kind of study can also help in cultivation management or in water resources management or, eventually, an interesting aspect is the development of knowledge on energetic urban expense for winter heating.

COLLECTED DATA – Data covering the period 1741-2005 have been collected after careful search of both published and unpublished data from air temperature observations in various archives, libraries and academies. The first period (1741-1750) was covered by Jean-François Séguier (1703-1784). Afterwards, observations were taken by Antonio Maria Longina (1735-1798) and Giuseppe Maggi in the castle of Castelvecchio. In 1788 the astronomer Antonio Cagnoli (1743-1816) started collecting meteorological data for the Accademia di Agricultura Scienze e Lettere di Verona (Academy of Agriculture, Sciences and Letters), a task which was taken on for the same institution by many observers, the most remarkable being Bartolomeo Bertoccelli, who took continuously observations form 1854 to 1898 (45 years!), until the end of XIX Century. In 1900 Giovanni Fracastoro started again collecting meteorological data on request of the Ufficio Centrale di Meteorologia e Geodinamica (Central Office of Meteorology and Geodynamic) having set up a weather station in a scientific secondary school. After him other two observers continued collecting data till the middle of the XX Century when Emilio Bellavite took up this task which he still carries out.

DATA ANALYSIS – A preliminary assessment about quality and reliability has been performed on the basis of metadata and historical information and a complete series of monthly averaged data has been obtained. Various gaps has been filled by means of correlation coefficients with respect to a reference series, evaluated on the basis of a weighted mean of correlation coefficients of the homogeneous series of Milan (1763-1998) (Mauger et al, 2002), and Padua (1725-1997) (Camuffo, 2002) with the series of Verona. Then the series obtained has been normalized to the reference series in order to value and remove outliers. Values has been considered outliers when they were out of an interval wide 3 σ (σ is the standard deviation) centred on the mean value. It has been found that the 90% of outliers are located before 1900, as it could be imagined as a consequence of the better quality of recent instruments against older ones. Then the Standard Normal Homogeneity Test (Moberg and Alexandersson, 1997; Alexandersson and Moberg, 1997) has been applied to the series. This procedure has given correction for the original series for a total of 1.21 °C and a mean value of 0.31 °C on the complete series.

CLIMATIC FEATURES – After application of a recursive filter (de Franceschi and Zardi, 2003) to the homogeneous series, highest frequencies of the climatic signal have been filtered out and possible trends evaluated. Fast Fourier Transform for finite and discrete data series provided seasonal and annual power spectra of the considered phenomena, amenable to El Niño Southern Oscillation, North Atlantic Oscillation, Mediterranean Oscillation and Sunspot series.

Sequence of series’ elaboration for the SNHT. Light blue line represents the threshold of homogenization. The red one is the original series and the green is the homogenized series.

REFERENCES:

For additional information, please refer to the Contacts section.