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TEMPERATURE AND PRECIPITATION VARIABILITY IN ITALY IN THE LAST TWO CENTURIES FROM HOMOGENISED INSTRUMENTAL TIME SERIES

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ABSTRACT

The Italian monthly temperature (mean, maximum and minimum) and precipitation secular data set was updated and completely revised. Station density and metadata availability were greatly improved and the series were subjected to a detailed quality control and homogenisation procedure. The data homogenisation is described in detail. The bias affecting original data is quantified by studying the temporal evolution of the mean adjustments applied to the series and examined in the light of the stations history. The results stress the importance of homogenisation in climate change studies.

The final data set was clustered into climatically homogeneous regions by means of a Principal Component Analysis. Yearly and seasonal trend analyses were performed both on regional average series and on the mean Italian series. The results highlight a positive trend for mean temperature of about 1 K per century all over Italy; it is generally higher for minimum temperature than for the maximum temperature. The progressive application of trend analysis shows that, in the last 50 years, behaviour is the opposite; the maximum temperature trend being stronger than that of the minimum temperature. This has led to a negative trend in the daily temperature range that for the last 50 years has become positive. Precipitation shows a decreasing tendency, even if low and rarely significant, the negative trend being only 5% per century on a yearly basis. Copyright © 2006 Royal Meteorological Society.

KEY WORDS: Italy; data homogenisation; trend analysis; monthly temperature records; monthly precipitation records; minimum and maximum temperature; daily temperature range

1. INTRODUCTION

The awareness of the importance of data quality and homogeneity for the correct detection of climate change has increased rapidly in the last few years.

Most of the contributions concern upper-air data (e.g. Luers and Redder, 2003; Lanzante *et al*., 2003; Fu *et al*., 2004); however, errors and inhomogeneities also concern surface data. At surface level, it is often assumed that such inhomogeneities have a random distribution and by considering a sufficiently large number of series, average records with negligible bias can be obtained. This assumption is likely to be correct if global or hemispheric averages are considered, but it may not be correct on a regional scale. An interesting example of this problem is given by Böhm *et al*. (2001) in a paper investigating temperature variability in the Alps and their surroundings, based on instrumental series of monthly mean temperatures. In the frame of the EU-project ALPCLIM, they subjected about 100 secular temperature records of this area to a detailed quality control and homogenisation procedure and performed a systematic comparison between the original and the corrected records. The results clearly showed that the original series were biased by non-climatic noise and, even if the average over all the series was considered, the long-term temperature evolution of the original

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