CLIMATE VARIABILITY IN ITALY IN THE LAST TWO CENTURIES
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The awareness of the importance of data quality and homogeneity issues for a correct detection of climate change has increased rapidly in the last few years. Considering the results obtained within the EU-funded ALPCLIM project (see Böhm et al., 2001), in the year 2000 the authors joined the CLIMAGRI research programme with the aim of better investigating the impact of data quality and homogeneity issues on the detection of Italian temperature and precipitation trends over the last two centuries. The final goal was to select, revise, improve and update the data-sets of Italian monthly monthly temperature and precipitation series (Maugeri and Nanni, 1998; Buffoni et al., 1999; Brunetti et al., 2000) and to give more reliable long-term trend-estimates. The poster displays a synthesis of the principal results of the research program. Full details are discussed in Brunetti et al., 2005.

INTRODUCTION
Around the mid 1990s the authors set up a wide research program with the aim of getting a better understanding of the evolution of Italian climate in the last 1800 years. This program allowed to obtain a first set of homogenized and pluviometric records that was discussed in Maugeri and Nanni, 1998, in Buffoni et al., 1999 and in Brunetti et al., 2000. Thanks to the CLIMAGRI project and to other international projects, in the year 2000 a new research program was set up with the aim of constructing a new database with a greater improvement of station density and metadata availability.

Monthly precipitation and temperature series included in the new data-sets are shown and information on data availability are also given.

METHODS
QUALITY CHECK AND MISSING DATA FILLING
All data records were quality checked by means of trend control and individual analysis of all the values that markedly disagreed with the ones of surrounding stations. Then, some minor gaps in precipitation records were filled by a method described in Brunetti et al., 2004 and monthly series were calculated.

HOMOGENEITY TESTING AND RECORD ADJUSTING
Monthly records were tested for homogeneity by means of a procedure that rejects the a-priori existence of a homogeneous tolerance series. The resulting break points were then collected in a decision-matrix and checked against metadata (Böhm et al., 2002).

STATION CLUSTERING AND REGIONAL AVERAGE SERIES
Temperature and precipitation records were clustered into homogeneous regions by means of a Principal Component Analysis (PCA). Station records of the same area were then averaged in order to obtain regional average series. Some results and examples are given in the figures.

TRENDS ANALYSIS
Trends longer than 20 years were calculated by means of least square linear fitting, and their significance levels were estimated by progressive non-parametric Mann-Kendall test (Sneyers, 1990).

A grid-like version of the new data-sets was produced. The grid has one-degree resolution, both in latitude and in longitude, and was realised with a Gaussian weighting function.

RESULTS AND CONCLUSIONS
RECORD ADJUSTMENTS
Record adjustments were performed for the largest Italian temperature series are systematically biased by non-climatic noise. So, using the original data in estimating long-term temperature evolution produces biased results. This result is in agreement with the findings of Böhm et al., 2001 and Bogen et al., 2005.

STATION CLUSTERING
Principal Component Analysis allows some climatic regions to be identified. In particular for minimum, mean and maximum temperature, 3 EOFs representing Po Plain (PL), Alpine (AL) and Peninsular (P) regions were extracted. 6 EOFs were extracted for precipitation. The identified regions are: Northern, Central, Southern and Eastern Italy (NE), the Central part of North-Eastern Italy (CEN), the Southern part of North-Eastern Italy (SOU), the Central part of Southern Italy (CBS), the South-Eastern part of Southern Italy (SE) and the Southern part of Southern Italy (S).

TRENDS ANALYSIS
Quite a uniform temperature trend was observed in the different regions, with a trend of 1 K per century all over Italy on a yearly basis. The trend is generally higher for maximum than for minimum temperatures for all seasons and the year.

Precipitation trend analysis showed a decreasing tendency, though such decreases are very low and rarely significant. Considering the average all over Italy there is a 0.1% decrease per century in the annual precipitation amount, mainly due to the spring season (90% per century).

A progressive trend analysis revealed that, both for temperature and precipitation and the slope of the trends strictly depend on the selected period.

Temperature and precipitation trends obtained by analyzing the new data-set show significant differences from the results presented in Maugeri and Nanni, 1998, in Buffoni et al., 1999 and in Brunetti et al., 2000. The old record assessments being characterized by a lower temperature increase (around 0.5 K per century) and a small decrease in precipitation decrease (around 10% per century).

Tables show the estimated trends of minimum, mean, maximum temperature and precipitation in 1865-2000 period according to the new data-set. Bold values indicates trends with significant level higher than 99%.

For precipitation, the values are expressed in percentage per centage relative to the mean of the standard period 1961-1990.

REFERENCES