



Time series requirements and trends of temperature and precipitation extremes over Italy

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Extreme climate events have strong impacts on society and economy; accordingly, the knowledge of their trends on long period is crucial for the definition and implementation of a national adaptation strategy to climate change. The Research Programme on Climate Variability and Predictability (CLIVAR) identified a set of temperature and precipitation indices suited to investigate variability and trends of climate extremes. It is well known that extreme indices calculation is more demanding than first and second order statistics are: daily temperature and precipitation data are required and strict constraints in terms of continuity and completeness must be met. In addition, possible dishomogeneities affecting time series must be identified and adjusted before indices calculation. When metadata are not available, statistical methods can provide scientist a relevant support for homogeneity check; however, ad-hoc decision criteria (sometimes subjective) must be applied whenever contradictory results characterize different statistical homogeneity tests. In this work, a set of daily (minimum and maximum) temperature and precipitation time series for the period 1961-2011 were selected in order to guarantee a quite uniform spatial distribution of the stations over the Italian territory and according to the afore-said continuity and completeness criteria. Following the method described by Vincent, the homogeneity check of temperature time series was run at annual level. Two well-documented tests were employed (F-test and T-test), both implemented in the free R-package RHtestV3. The Vincent method was also used for a further investigation of time series homogeneity. Temperature dishomogeneous series were discarded. For precipitation series, no homogeneity check was run. The selected series were employed at daily level to calculate a reliable set of extreme indices. For each station, a linear model was employed for indices trend estimation. Finally, single station results were averaged to provide a “national” trend for Italy.