Detecting trends and long term persistency in precipitation indexes in Tuscany

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The issues related to droughts and to water resources management are going to became more and more important, especially in the framework of the climate change discussion. Citizens, stakeholders and managers have to know if the amount and the distribution of the available water could be different in the future. The analysis of climatic events like long periods of water shortage is made more difficult by the general lack of long sequences of data. Here the authors analyzed 5 indexes of precipitation regime: the annual precipitation, the number of wet days (precipitation > 1 *mm*), the Precipitation Concentration Index – PCI, the number of days with more than 10 *mm* of precipitation and the maximum number of consecutive dry days (precipitation $<$ 1 *mm*). The region analyzed is the Tuscany region, with a dataset of 785 rain gauges covering the period 1903-2003. A methodology, to use more data than usual, including the gauges with very short time series, i.e. only 1 year, based on time variable spatial interpolation techniques, is here proposed. Both a distributed and lumped trends analysis of the indexes calculated have been performed by means of the Mann-Kendall test. The 5 time series of regional value of the indexes have been detected to present long memory, i.e. to reveal the presence of a not negligible dependence between distant observations in the time series. The implication of Long Term Persistency – LTP can lead to a remarkable increase of uncertainty in statistical estimation. The results do not show any evident signals of changes in the amount of water precipitated in Tuscany during the last century even in the more restrictive hypothesis of absence of long term persistency.