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Trend analysis of air temperature and precipitation time series over Greece: 1955-2010

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In this study, a database of air temperature and precipitation time series from the network of Hellenic National Meteorological Service has been developed in the framework of the project GEOCLIMA, co-financed by the European Union and Greek national funds through the Operational Program "Competitiveness and Entrepreneurship" of the Research Funding Program COOPERATION 2009. Initially, a quality test was applied to the raw data and then missing observations have been imputed with a regularized, spatial-temporal expectation – maximization algorithm to complete the climatic record. Next, a quantile – matching algorithm was applied in order to verify the homogeneity of the data. The processed time series were used for the calculation of temporal annual and seasonal trends of air temperature and precipitation. Monthly maximum and minimum surface air temperature and precipitation means at all available stations in Greece were analyzed for temporal trends and spatial variation patterns for the longest common time period of homogenous data (1955 – 2010), applying the Mann-Kendall test. The majority of the examined stations showed a significant increase in the summer maximum and minimum temperatures; this could be possibly physically linked to the Etesian winds, because of the less frequent expansion of the low over the southeastern Mediterranean. Summer minimum temperatures have been increasing at a faster rate than that of summer maximum temperatures, reflecting an asymmetric change of extreme temperature distributions. Total annual precipitation has been significantly decreased at the stations located in western Greece, as well as in the southeast, while the remaining areas exhibit a non-significant negative trend. This reduction is very likely linked to the positive phase of the NAO that resulted in an increase in the frequency and persistence of anticyclones over the Mediterranean.