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Homogenization of daily atmospheric data for detecting extreme events in the Mediterranean basin

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Long-term reliable instrumental climate time series are key information in order to better understand, detect, predict and respond to global climate variability and change. There is also high confidence that semi-arid areas such as the Mediterranean basin will suffer a decrease in water resources because of reduction in precipitation and an increase of heat waves (IPCC 2007). Since global climate change is often associated with altered extreme event patterns the focus of this study is not to analyze mean daily series but higher-order moments. The Mediterranean region has a very long and rich history in monitoring the atmosphere, going back in time to the 19th century. However, many long-term instrumental climate records contain artificial shifts due to changed measurement conditions such as site displacement, changes in instruments or land-use changes. These changes are affecting the climate records and of course do not represent climatic signals. The detection and correction of these non-climatic aberrations are necessary to get reliable time-series which are indispensable for any reliable climate study. The importance of homogenizing Mediterranean atmospheric variables to detect and attribute present climate trends and to predict future meteorological extreme events was also identified by the EU-IP project CIRCE-project (Climate Change and Impact Research: the Mediterranean Environment) in 2007. This work contributes to the overall aims of CIRCE. A modified application of well-established homogenization-methods is applied to adjust Mediterranean climate series. An adapted penalized log-likelihood procedure is used to detect an unknown number of breaks and outliers in combination with a nonlinear model for the correc-

tion of the time series. These series consider mainly Tmax-, Tmin- and precipitation values/indices and cover the last 50 to 100 years. The homogenized time-series are indispensable for extreme value analysis and prediction such as modeling of block maxima which is essential for further extreme event impact research and ecosystem vulnerability studies.