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Trend analysis of observed and simulated rainfall extremes in Sardinia

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Rainfall extremes in Mediterranean area are characterized by high spatial variability, strong seasonality and large inter-annual fluctuations. In addition, the interaction with the complex topography in many Mediterranean coastal regions makes catchments particularly prone to the occurrence of floods. Furthermore, many studies based on global and regional climate models agree on the prediction that the Mediterranean area will be most likely affected by climate changes with intensified hydrologic extremes and paradoxical reduced water availability.
In this context, the aim of this work is to explore changes in rainfall extremes in the Sardinian Island (Italy), which is located in the middle of the Mediterranean Sea. The first part of the work is focused on observed extremes, specifically on annual maxima for different durations (15, 30, 45 minutes, 1, 3, 6, 12 and 24 hours) recorded by tipping-bucket rain gauges during the timespan 1929-2008. A wider database of daily time series more than 50-year long and collected by 256 non recording rain gauges is also analyzed to better characterize spatial features, seasonal and annual frequency and intensity, and possible trends in the mean. The daily rainfall events are subdivided into different intensity-based rainfall classes, light, moderate, heavy and torrential precipitation. Signal of trends are detected analyzing the frequency and the contribution of each class to the total annual amount.
The second part is dedicated to the analysis of precipitation grids produced by a set of global and regional climate models from 1950 to 2100, before and after bias correction and statistical downscaling. Annual maxima for different durations are extracted from simulations of past climate and future scenarios. Possible trends and shifts are investigated in the extreme and main precipitation. Results are then compared with the outcome from the analysis of observed time series in order to show commonality and contrasting behaviors.