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Analyses of observed and simulated annual rainfall trends in Sardinia

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Many studies based on global and regional climate models agree on the prediction that the Mediterranean area will be most likely affected by future climate changes that will lead to reductions of water availability. The extent to which these projections are valid resides in the ability of models to mimic the historical trajectories of climate, among other features.
In this context, the aim of this work is to test climate models' capability in reproducing historical recorded trends, taking as a benchmark case study the island of Sardinia, Italy, located in a central position in the Mediterranean Sea. To determine historical trends we considered observations data from 229 rain gauge stations, sparsely distributed in the 24,090 km2 of the region, with more than 50 years of observations, during the timespan 1929-2000. Modeled precipitation time series arise from a set of more than 25 combinations of global and regional climate models from the Coordinated Regional Climate Downscaling Experiment (CORDEX). Climate simulations were obtained at two spatial resolutions of $\sim$11 and $\sim$44 km for the "historical" period from 1950 to 2009, which is representative of past climate and CO_2 concentrations.
A preliminary part of this study refers to data homogenization, which means that both historical and modeled annual rainfall data have been properly interpolated to the same reference grid with resolution of 0.5°, so that time series are comparable at given locations. Annual rainfall time-series have been then analyzed applying the nonparametric Mann–Kendall test to detect presence and significance of trends, while trend magnitudes have been quantified using a nonparametric robust estimate. Observed and simulated trends of annual precipitation have been compared at each location in the island, investigating the role of physical factors such as elevation and distance from the coast, as well as the effect of climate model resolution. In addition, the probability distributions of annual rainfall have been analyzed by exploring the correspondence between their first two moments.