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Rainfall forecasting over a Mediterranean catchment using Empirical Statistical Downscaling techniques

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Abstract: Tackling the threats of climate change has become a global challenge. Rainfall in the Mediterranean region is characterized by a large spatiotemporal variability. In this research study, an Empirical Statistical Downscaling (ESD) approach was used to generate regression-based climate projections for the horizon 2100 at the level of six main climate stations in the Medjerda catchment in Tunisia. The MIROC5 model outputs for historical and future conditions were used, together with the reanalysis NCEP data and RCP emissions data (RCP4.5 and RCP 8.5). The downscaled values were based on correlations between large scale atmosphere, ocean variables and precipitation at the station level. Historical monthly rainfall data at six gauges during 30 years, from 1981 until 2010, archived given by the national climate data center NCDC were used. Data gaps were filled with data provided by the National Institute of Meteorology (INM). To choose the appropriate regression model, six different types of statistical models were tested: generalized linear models, selected GLM, generalized additive models, selected GAM, random forest models, and artificial neural networks based. It is concluded that the best prediction skill varies between stations. Further, it is shown that precipitation in the Medjerda catchment, for the horizon 2100, will undergo a decline of between 9% and 35% depending on the RCP 4.5 scenario. This decline will be more pronounced for the RCP 8.5 scenario.

***Keywords**:* Empirical Statistical Downscaling (ESD), MIROC5, RCP 4.5, RCP 8.5