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Empirical Statistical Downscaling of CMIP3(IPCC-AR4) Projections of Precipitation over Greece

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Southeastern Europe is known to be one of the most vulnerable regions globally with regards to precipitation amounts and trends due to climate change. Regional drought patterns are a subject of research and evaluation and of great concern for scientists, as well as authorities and the population. State-of-the-art projections of precipitation patterns rely on global climate models (CMIP3/IPCC-AR4) of low resolution (at best 100km) and regional models with at best 10km resolution. For local scale impacts it is necessary to employ downscaling techniques to the low resolution model projections. In the present study, we employ the Empirical Statistical Downscaling method (ESD; Benestad et al, 2004) to obtain future projections of precipitation for the end of the 21st Century for a number of locations in Greece. The method is applied to a suite of IPCC-AR4 models and uses the climate model large-scale precipitation field as the predictor. A statistical relation is built based on the first three EOFs of the present-day climate AR4 model runs and the ERA40 reanalysis estimates. The relation is regressed onto the observational data from stations in each location in Greece and future projections are made. Results show that for the present-day climate the method is superior to estimates based on the global climate models alone. The method's ability to predict local changes under future climate scenarios is discussed.