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## **A novel, Copula-based approach for the bias correction of daily precipitation: a case study in the eastern Mediterranean**

**Georgia Lazoglou<sup>1</sup>**, George Zittis<sup>1</sup>, and Adriana Bruggeman<sup>2</sup>

<sup>1</sup>The Cyprus Institute, Climate and Atmosphere Research Center, Nicosia, 2121, Cyprus

<sup>2</sup>The Cyprus Institute, Energy, Environment and Water Research Center, Nicosia, 2121, Cyprus

Climate model output is widely used as input to impact models. Such applications include hydrological, crop, energy modeling, and more. However, due to model deficiencies and the stochastic nature of climate processes, some variables (e.g., daily precipitation) tend to present systematic biases and deviations from the observed conditions. This is particularly important when studying high-impact extreme events. The present study aims to develop a Copula-based method for bias-correcting modeled daily precipitation. Precipitation data are provided by two EURO-CORDEX regional climate models (KNMI-RACMO22E and CLMcom-CCLM4) and for two time periods (1981-2010 and 2031-2060). The demonstration area is the island of Cyprus, located in the eastern Mediterranean climate change hot-spot. Cyprus is characterized by a complex coastline and steep orography that drive the precipitation distribution. As a reference dataset, we used a high resolution (1x1km) gridded observational dataset, derived from a dense network of stations. For this application, we developed a copula-based structure scheme between the reference and the simulated data sets. This was for the historical period and each model grid cell. Then, assuming this relation remains unchanged, we corrected the biases for both study periods (historical and near future). Due to the stochastic nature of precipitation, the copula schemes were developed separately for each hydrological season (i.e., wet: November to March and dry: April to October). In addition, different copula schemes were developed for non-extreme and extreme events. The results showed that the proposed method could significantly improve the modeled precipitation for both models in 85% and 92% of grid cells, respectively. These improvements are evident throughout the year and for both extreme and non-extreme values. The climate change signal (precipitation decline near 7%) remains unchanged after applying the bias correction.