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Assessment of the future effects of temperature and precipitation regimes over Europe using a combination of downscaling approaches and quantitative impact models

Maria Francisca Cardell, Arnau Amengual, and Romualdo Romero
University of the Balearic Islands, Physics, Palma, Spain (maria.cardell@uib.es)

Associated with the human-induced global warming, a complex redistribution of rainfall and other atmospheric variables across Europe is expected towards the end of the century. Furthermore, the occurrence of extreme weather events (e.g persistent droughts, heavy precipitation, heat waves, etc.) might be increasingly responsible for severe economic costs and human losses in many zones of the continent, including the Mediterranean region.

Perspectives on the future of mean regimes and extreme events (along with a collection of relevant temperature/precipitation-based climate indexes) are derived by combining model projected daily data with observations. Specifically, daily observed series of precipitation and 2-m maximum and minimum temperatures from E-OBS dataset have been used to derive the present climate potential (baseline). For future projections, the same daily variables have been obtained from a set of regional climate models (RCMs) included in the European CORDEX project, considering the rcp4.5 and rcp8.5 future emissions scenarios. The adoption of a multi-model ensemble strategy allows quantifying the uncertainties arising from the model errors and the GCM-derived boundary conditions. To properly exploit the RCM data at local scale, a quantile–quantile adjustment has been applied to the simulated regional scenarios. The method detects changes in the cumulative distribution functions (CDFs) between the recent past and successive time slices of the simulated climate and applies these changes, once calibrated, to the observed series of maximum, minimum temperature and precipitation.

Preliminary assessments on the future impact of mean regimes and extremes of these variables over different facets (agriculture, human health, environment ...) will be presented by applying different quantitative impact models adapted to regional contexts. With this information at hand, it is expected that policy makers and stakeholders can respond more effectively to the future challenges imposed by climate change over a number of crucial European socioeconomic and natural sectors.