EMS Annual Meeting Abstracts
Vol. 9, EMS2012-180, 2012
12th EMS / 9th ECAC

Intercomparison of CMIP5 Climate Models over Iberian Peninsula and Balearic Islands using a Two-Step Analog Statistical Downscaling for simulating daily temperature and precipitation

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Key words: CMIP5, Statistical Downscaling, Climate Change, Model Skill.

Thanks to the CMIP5 (Coupled Model Intercomparison Project Phase 5), a set of Global Climate Models have been made available for its use in climatic studies. These models provide outputs which can be downscaled; in our case, we have run a two-step analog statistical downscaling method that has been succesfully tested in Spain, Europe and other regions. We have used the Spanish Meteorological Agency (AEMet) observations for a set of meteorological observatories in order to evaluate the behaviour of every used climate model when simulating the climate over our study area (the Spanish territory of Iberian Peninsula and Balearic Islands).

Every model provides a group of experiments and allows the use of a complete set of meteorological variables under different time steps. In our work, we have use the historical experiment – simulation of recent past – as its nature of baseline simulation for model evaluation allows us to skill the several models used over our study area. The first step of our statistical downscaling method is an analog approach that uses the daily geopotential height (in its mean daily value) for selecting the analogues; in a second step, we have used multiple regression for simulating the daily temperatures and an empirical probability distribution function – one for every simulated month – for simulating the daily precipitation.

In order to assess how accurate is each used model, the 40-yr ECMWF Re-Analysis (ERA-40) has been used for comparing the results for every used model. We have used several statistical estimators for measuring the behaviour of every used model, as BIAS, MAE, and (for precipitation) probability distribution tests. We have also used some specific meteorological measures (as precipitation days) and measures of pattern similarity. As an approach of the study of extremes, some high percentiles have been also studied and compared.