

Improving crop simulations by bias reduction of RCM climate change projections: Evaluation on the present climate

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Outputs from regional climate models (RCMs) may present large biases that can make their application to impact models unrealistic. The objective of this work is to evaluate different methods to reduce or correct biases of data from regional climate models regarding their ability to improve the climate change impact simulation on cropping systems.

Four climate ensembles were considered. First, the original set of projections performed by RCMs of ENSEMBLES project. Three other climate ensembles derived from it were used: 1) a recently delivered dataset consisting of the ENSEMBLES projections corrected for temperature and precipitation with E-OBS, a data base that consists of daily observations of temperature and precipitation for the period 1950 to 2008, and spatially averaged on the same grid as the ENSEMBLES RCMs; 2) a new dataset consisting of the ENSEMBLES projections corrected with Spain02, a recent precipitation and temperature dataset built with a network of ~2500 quality-controlled stations (~250 for temperatures) from the Spanish Meteorological Agency (AEMET) spanning the period from 1950 to 2008; and 3) a new dataset consisting of the use of a weather generator to generate future scenarios by applying the change factors derived from the ENSEMBLES mean projected changes to observations. The climate variables used for all ensembles were those required by the crop model, i.e. daily data of maximum, minimum temperature, precipitation and radiation.

Crop simulations were run with the CERES model for irrigated maize in two contrasting locations of Spain where crop models were calibrated and validated with observed climate and field data. Simulated crop yield was then obtained with observed climate data for available periods, and with all the four ensembles of climate for the period 1961-1990.

Potential of the bias reduction techniques for improving projections of climate change impacts on cropping systems is discussed.