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Evaluation of local adaptation strategies to climate change of maize crop in Andalusia for the first half of 21st century

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The objective of this work is to generate and analyse adaptation strategies to cope with impacts of climate change on cereal cropping systems in Andalusia (Southern Spain) in a semi-arid environment, with focus on extreme events.

In Andalusia, located in the South of the Iberian Peninsula, cereals crops may be affected by the increase in average temperatures, the precipitation variability and the possible extreme events. Those impacts may cause a decrease in both water availability and the pollination rate resulting on a decrease in yield and the farmer's profitability. Designing local and regional adaptation strategies to reduce these negative impacts is necessary.

This study is focused on irrigated maize on five Andalusia locations. The Andalusia Network of Agricultural Trials (RAEA in Spanish) provided the experimental crop and soil data, and the observed climate data were obtained from the Agroclimatic Information Network of Andalusia and the Spanish National Meteorological Agency (AEMET in Spanish). The data for future climate scenarios (2013-2050) were generated by Dosio and Paruolo (2011) and Dosio et al. (2012), who corrected the bias of ENSEMBLES data for maximum and minimum temperatures and precipitation. ENSEMBLES data were the results of numerical simulations obtained from a group of regional climate models at high resolution (25 km) from the European Project ENSEMBLES (http://www.ensembles-eu.org/).

Crop models considered were CERES-maize (Jones and Kiniry, 1986) under DSSAT platform, and CropSyst (Stockle et al., 2003). Those crop models were applied only on locations were calibration and validation were done.

The effects of the adaptations strategies, such as changes in sowing dates or choice of cultivar, were evaluated regarding water consumption; changes in phenological dates were also analysed to compare with occurrence of extreme events of maximum temperature. These events represent a threat on summer crops due to the reduction on the duration of grain filling period with the consequent reduction in yield (Ruiz-Ramos et al., 2011) and with the supraoptimal temperatures in pollination.

Finally, results of simulated impacts and adaptations were compared to previous studies done without bias correction of climatic projections, at low resolution and with previous versions of crop models (Mínguez et al., 2007).

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