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Assessment of climate change impacts on meteorological and hydrological droughts in the Jucar River Basin

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Extreme natural phenomena, and more specifically droughts, constitute a serious environmental, economic and social issue in Southern Mediterranean countries, common in the Mediterranean Spanish basins due to the high temporal and spatial rainfall variability. Drought events are characterized by their complexity, being often difficult to identify and quantify both in time and space, and an universally accepted definition does not even exist. This fact, along with future uncertainty about the duration and intensity of the phenomena on account of climate change, makes necessary increasing the knowledge about the impacts of climate change on droughts in order to design management plans and mitigation strategies.

The present abstract aims to evaluate the impact of climate change on both meteorological and hydrological droughts, through the use of a generalization of the Standardized Precipitation Index (SPI). We use the Standardized Flow Index (SFI) to assess the hydrological drought, using flow time series instead of rainfall time series. In the case of the meteorological droughts, the Standardized Precipitation and Evapotranspiration Index (SPEI) has been applied to assess the variability of temperature impacts.

In order to characterize climate change impacts on droughts, we have used projections from the CORDEX project (Coordinated Regional Climate Downscaling Experiment). Future rainfall and temperature time series for short (2011-2040) and medium terms (2041-2070) were obtained, applying a quantile mapping method to correct the bias of these time series.

Regarding the hydrological drought, the Témez hydrological model has been applied to simulate the impacts of future temperature and rainfall time series on runoff and river discharges. It is a conceptual, lumped and a few parameters hydrological model. Nevertheless, it is necessary to point out the time difference between the meteorological and the hydrological droughts.
The case study is the Jucar river basin (Spain), a highly regulated system with a share of 80% of water use for irrigated agriculture. The results show that the climate change would increase the historical drought impacts in the river basin.

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