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Impact of Climate Change on Water Resources in the Duero River Basin

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Climate change has lead to a generalized decrease of precipitation and an increase of temperature in the Iberian Peninsula during the last decades. These changes will be more intense over the course of the 21th century according to global climate projections. As a consequence, water resources are expected to decrease, particularly in the Duero River Basin.

This study is focused on the hydrological response of the Duero River Basin to the climate change. For this end, firstly, the implementation of the Variable Infiltration Capacity (VIC) model in the Basin has been carried out. The VIC model has been calibrated with a dataset of daily precipitation, temperature and streamflow. Precipitation and temperature data are extracted from SPAIN02, a dataset that covers the Peninsular Spain at 0.11º of spatial resolution. Streamflow data are gathered for all the gauging stations in the Basin, choosing a representative subset for the calibration process. These data are provided by the Spanish Center for Public Work Experimentation and Study (CEDEX, Centro de Estudios y Experimentación de Obras Públicas). Subsequently, the VIC model was validated in order to verify that the model outputs fit well with the observational data.

After the validation of the VIC model for present climate, secondly, the effect of climate change on the Duero River Basin is analyzed by developing several simulations of the streamflow for future climate. Precipitation and temperature data are obtained in this case from future projections coming from high resolution (at 0.088º) simulations carried out with the Weather Research and Forecasting (WRF) model for the Iberian Peninsula. These last simulations are driven under two different Representative Concentration Pathway (RCP) scenarios, RCP 4.5 and RCP 8.5, for the periods 2021-50 and 2071-2100.

The first results of this work are focused to show if the VIC model outputs are in good agreement with the observed streamflow, for both the calibration and validation periods. In the context of climate change, a generalized decrease in surface and subsurface water resources is expected in the Duero River Basin. The results of this study could be of interest for water policy makers and practitioners in the next decades.

Keywords: Climate change, Water resources, Duero Basin, VIC model, streamflow, projections.

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