



Evaluation of different drought indices using data from future climate simulations in the Iberian Peninsula

Emilio Romero, Matilde García-Valdecasas Ojeda, Patricio Yeste Donaire, Sonia R. Gámiz-Fortis, Yolanda Castro-Díez, and María Jesús Esteban-Parra

Universidad de Granada, Facultad de Ciencias, Departamento de Física Aplicada, Granada, Spain (emiliorj@ugr.es)

Climate change is expected to have a significant impact in the Iberian Peninsula. One of its effects could be the increase of drought events, which could lead to important ecological, social and economic consequences in the future. The aim of this study is to predict the magnitude of future droughts in various Iberian catchments, analysing different drought indices and studying their adequacy depending on the physical characteristics of each basin.

A considerable amount of drought indices have been proposed in the literature, which consider different variables in order to obtain their values. Some of these indices use meteorological primary variables such as the precipitation (as the Standardized Precipitation Index, SPI) and also taking into account the temperature through the potential evapotranspiration (as the Standardized Precipitation Evapotranspiration index, SPEI); additionally, others incorporate hydrological variables (as the Standardized Streamflow Index, SSI, or the Standardized Wetness Index, SWI). Some methodologies have been proposed to study the adequacy of indices depending on the available data and the characteristics of the region. Due to this work being devoted to obtaining of projected drought indices for the future, the data used as the primary variable to compute them are provided by future simulations performed with the Weather Research and Forecasting (WRF) model. Therefore, the choice of a drought index is not limited by the amount of available variables, but by the physical characteristics of the basin.

The influence of the behaviour of certain variables related to drought on the final results has been assessed. Additionally, the different approaches, for example in the formulation to calculate the value of reference evapotranspiration -e.g. Hargreaves, Penman Monteith- have been also analysed. Note that in some cases, the results may vary significantly depending on the chosen procedure. Therefore, a sensitivity analysis has been carried out for such variables, trying to identify which formulation and index are able to generate more suitable results.

The results from this analysis may help decision makers in the future regards the water resources management, taking into account that the Iberian Peninsula is expected to be one of the European areas where the effects of climate change will be more severe.

Keywords: drought index, WRF projections, climate change, Iberian Peninsula.

ACKNOWLEDGEMENTS: This work has been financed by the projects P11-RNM-7941 (Junta de Andalucía), CGL2013-48539-R (MINECO-Spain, FEDER) and CGL2017-89836-R (MINECO-Spain, FEDER).