



## **High-spatial resolution probabilistic analysis of drought events in Spain: 1961-2015**

Sergio Martín Vicente Serrano (1), Miquel Tomás-Burguera (2), Santiago Beguería (2), Marina Peña-Gallardo (1), M. Yolanda Luna (3), Ana Morata (3), Fernando Domínguez-Castro (1), Ahmed El Kenawy (1), and José C. González-Hidalgo (4)

(1) Instituto Pirenaico de Ecología, Procesos geoambientales y Cambio Global, Zaragoza, Spain (svicen@ipe.csic.es), (2) Estación Experimental de Aula Dei, Consejo Superior de Investigaciones Científicas (EEAD-CSIC), Zaragoza, Spain (mtomas@eead.csic.es), (3) Agencia Estatal de Meteorología, Madrid, Spain (mlunar@aemet.es), (4) Departamento de Geografía, Universidad de Zaragoza, Zaragoza, Spain (jcgh@unizar.es)

Drought is one of the hydroclimatic hazards having more negative impacts in Spain. There are several studies that have analysed drought in Spain from different perspectives, showing a general increase in the frequency, duration and severity of drought events associated to changes in precipitation and the atmospheric evaporative demand. Nevertheless, there are not previous studies analysing the different probability of the drought event occurrence considering different drought indices and time-scales. Here we use a new high-spatial resolution gridded data set of drought indices or Spain (<http://monitordesequia.csic.es>) to identify drought events at the spatial resolution of 1 km<sup>2</sup> and weekly temporal frequency between 1961 and 2015. We focused on 1-, 3-, 6- and 12-month Standardized Precipitation Index (SPI) and the Standardized Precipitation Evapotranspiration Index (SPEI). Drought events were identified considering a threshold equal to zero for both indices and series of drought duration and severity were obtained from the drought indices. Once series of events were obtained we applied the extreme value theory to identify spatially the drought hazard. We analysed the role of using different thresholds to generate the peak-over-threshold drought severity and magnitude series in the probability calculations, and assessed the selection of different three-parametric distributions to fit the series (Generalized Pareto, General Extreme Value, Log-logistic and Pearson-III). We have showed that series of drought magnitude and duration fit in general to a Generalized Pareto distribution, and better agreement between observed and modelled frequencies is found using upper percentiles used to generate the peak-over-threshold series. Estimations show a higher probability of extreme drought events in south and inner areas of Spain with pronounced spatial gradients to the northern and eastern regions. Nevertheless, strong differences are found between SPI and SPEI and mostly between drought time-scales. The methodology followed in this study has allowed to obtain for the first times maps of drought hazard frequency for Spain, which can be useful for the drought risk assessment in the region.