Assessing drought hazard under non-stationary conditions on South East of Spain

S.G. García Galiano¹, J.D. Giraldo Osorio¹, M.A. Urrea Mallebrera², A. Mérida Abril², C. Tetay Botía¹
¹Technical University of Cartagena, Cartagena, Spain; ²Confederación Hidrográfica del Segura (CHS), Murcia, Spain

The Segura River basin, located in South East Spain, is becoming more and more vulnerable to rainfall variability. This implies uncertainties in agricultural activities due to the scarcity of water. Increasing the knowledge about plausible trends of drought events will allow to improve the adaptation and mitigation measures in order to build "adaptive capacity". The non-stationary character of hydrometeorological series, based on climate and anthropogenic changes, is the main criticism of traditional frequency analysis. An innovative methodology for non-stationary analysis of droughts events, applying GAMLSS (Generalized Additive Models for Location, Scale and Shape), which allows the prediction of regional trends associated to several return periods, is presented. The analyses were based on Regional Climate Models (RCMs) provided by the European ENSEMBLES project and observed data. A non-stationary behaviour of the annual series of maximum length of dry spells (AMDSL), is reflected in temporal changes in mean and variance from observed data (time period 1950-2009), through modeling GAMLSS. An intensification of drought events in headwater catchments, while a decrease of them in coastal areas and lower zones of the basin, are identified. By adjusting pdf, applying GAMLSS and boostrapping techniques, to series of AMDSL, hazard maps of drought are built. The findings of this study allow the assessment of the uncertainties associated with climate predictions, while drought hazard maps are useful for stakeholders in order to justify decisions taken in planning and management of water resources.