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Assessing spatial patterns of extreme droughts associated to return periods from observed dataset: Case study of Segura River Basin (Spain)

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In basins of South-eastern Spain, such as the Segura River Basin (SRB), a strong decrease in runoff from the end of the 1970s has been observed.
In the SRB, due to intensive reforestation aimed at halting desertification and erosion, added to climate variability and change, the default assumption of stationarity in water resources systems cannot be guaranteed. Therefore there is an important need for improvement in the ability of monitoring and predicting the impacts associated with the change of hydrologic regime. It is thus necessary to apply non-stationary probabilistic models, which are able to reproduce probability density functions whose parameters vary with time.
From a high-resolution daily gridded rainfall dataset of more than 50 years (1950-2007 time period), the spatial distribution of lengths of maximum dry spells for several thresholds are assessed, applying GAMLSS (Generalized Additive Models for Location Scale and Shape) models at grid site. Results reveal an intensification of extreme drought events in some headbasins of the SRB important for water supply.
The identification of spatial patterns of drought hazards at basin scale, associated to return periods, contribute to designing strategies of drought contingency preparedness and recovery operations, which are the leading edge of adaptation strategies.