



Standardised Precipitation-Evapotranspiration Index clustering in Spain

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Over the last decades the severity of drought episodes has increased in Spain, causing environmental, agricultural-livestock, social and economic major damage. The definition of quantitative indices, as the Standardised Precipitation-Evapotranspiration Index (SPEI), is necessary in order to objectively quantify the characteristics of drought episodes. The SPEI uses the monthly (or weekly) difference between precipitation and evapotranspiration, providing a simple climatic water balance which is aggregated at different time scales to obtain the SPEI.

The objective of this work is to obtain the different drought regimes and their spatial distribution in Spain in order to furtherly study the seasonally behaviour of the Spanish droughts. Four SPEI datasets are used, covering Spain in a 5.5km resolution grid on a weekly basis from 1962 to 2014. Each dataset comprises a different time period for the computation of the weekly SPEI values of 1, 3, 6 and 12 months prior to the corresponding week.

SPEI clustering is performed for the datasets using the k-means technique, which assigns each time series to a cluster by minimizing the distance from the time series to the mean series (also known as centroid) of its assigned cluster. Low impact of the computation period on the mean within-cluster sums of point-to-centroid distances is obtained. The number of clusters used in the k-means technique range from 2 to 15 in order to identify the optimum number. As the number of clusters increases, the mean within-cluster sums of point-to-centroid distances diminishes following a potential behaviour which allows to establish five or six as the optimum number of clusters. Moreover, regardless the number of clusters, non-significant differences about spatial distribution are found when the four datasets are compared. In all cases the clusters are found to be well-defined with clear interfaces between them. Taking these results into account, the seasonally study of the Spanish drought regimes can be carried out by means of a single SPEI instead of the four SPEI datasets used.