



Climatic drought time-scales show varied spatial and seasonal effects on hydrological droughts in natural basins of U.S.

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We have analysed the response of hydrological droughts to climatic droughts in different natural basins of United States of America. For this purpose we selected 289 complete series from an initial data set of 702 gauging stations, covering the period between 1940 and 2013. Drainage basins were obtained for each gauging station using a digital terrain model, and climate series (precipitation and the atmospheric evaporative demand) were obtained for each drainage series. A number of topographic, edaphic and remote sensing variables were quantified for each basin. A hydrological drought index (The Standardized Stream Flow Index-SSI) was obtained for each basin and the Standardized Precipitation Evapotranspiration Index (SPEI) was used as a metric of climatic drought severity. Relationship between different SPEI time scales and the SSI was quantified using Pearson's correlations and the general patterns of response of hydrological droughts to climatic droughts were identified using a principal component analysis. In general there is a response of SSI to short SPEI time-scales but strong seasonality in this response is also found. Coherent geographic patterns were obtained from the analysis and the factors that control the different responses were analysed by means of a predictive discriminant analysis. Independent analysis for three periods (1940-1964, 1965-1989 and 1989-2013) were also performed and showed not important changes in the response of the SSI to the SPEI in the past 65 years.