The title (العنوان):

Drought assessment and characterization using SPI, EDI and DEPI indices in northern Algeria

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Abstract :

The average annual precipitation values in the Cheliff-Zahrez basin range from 80 to 600 mm/an, indicating a semi-arid climate. This work revolves around a new drought exceedance probability index (DEPI), a standardized precipitation index (SPI) and effective drought index (EDI) in different time scales (3, 6, 9, 12 and 24) derived from monthly precipitation series stretching from September 1970 to August 2015. The latter aims to analyze the performance, similarities and differences between the most used drought indices such as SPI and EDI and to compare their results with those obtained using DEPI. The results indicated that the majority of selected stations tend to a decline in annual rainfall, with a dominant break in series between 1970 and 1980. The Mann–Kendall test result showed that the monthly rainfall trend had significantly decreased in the majority of studied stations. Furthermore, the SPI and EDI series showed persistent monthly drought conditions from January 1970 to March 2010 with an extreme drought peak of −3. However, the DEPI index showed monthly drought events (< 0.5) of different classes beginning from March 1980 to December 2010. In the study area, the coefficient of determination explained a high variation (> 80%) between SPI and EDI at the time scale of 24 months. At the 9- and 12-month scale, the coefficient of determination showed a variance greater than 50% over the entire basin. On the other hand, the coefficients of determination results between SPI and EDI for the time scale of 3 to 6 months are characterized by a gradient from the northeast to southwest or from 10 to 90%. The stations of the Coastline 2 basin have revealed that the relationship between SPI and DEPI as well as EDI and DEPI is not significant, being allowed between 10 and 30% on time scales of 3, 6, 9, 12 and 24 months. The results of this work and information on the severity and persistence of droughts will be essential to enable managers to adopt an integrated and sustainable management of scarce resources and aim at minimizing agricultural production losses in the region.

Key words : Monthly rain ; SPI ; EDI ; DEPI ; Drought mapping ; Mann–Kendall test