The title (العنوان):

Assessing Spatial Variability and Trends of Droughts in Eastern Algeria Using SPI, RDI, PDSI, and MedPDSI—A Novel Drought Index Using the FAO56 Evapotranspiration Method

APA Citation (توثيق APA):

Merabti Abdelaaziz, Darouich Hanaa, Paredes Paula (2023). Assessing Spatial Variability and Trends of Droughts in Eastern Algeria Using SPI, RDI, PDSI, and MedPDSI—A Novel Drought Index Using the FAO56 Evapotranspiration Method. *Water* , vol 15 (n°4), p.1-19. DOI ou URL : https://www.mdpi.com/2073-4441/15/4/626

Abstract : Drought is one of the most severe natural disasters worldwide, but with a particular emphasis in sub-humid and semi-arid climates. Several indices have been created to appropriately identify drought's characteristics and variability. The main objectives of this study consisted of analyzing the behavior of different indices applied in northeast Algeria and comparing them across a long-term data set (1961–2014). The SPI and RDI at 9-month time scales were compared to the PDSI and MedPDSI based on 123 rainfall stations and gridded PET data interpolated to all the locations. A principal component analysis (PCA) in S-mode with varimax rotation (RPC) was applied to the monthly values of all indices to analyze the spatiotemporal patterns of droughts. Two principal components were retained, which identified two sub-regions with coherent differences related to their distance from the Mediterranean Sea and the UNEP aridity index. Trends in the RPC scores were assessed using the modified Mann–Kendall (MMK) test and Sen's slope estimator, which showed a fundamental difference between the two sub-regions. The RPC of all drought indices showed trends of decreases in the frequency and severity of droughts in the northern sub-region, and trends of increases in the frequency and severity of droughts in the southern region, where the climate is mostly semi-arid and arid. Only a few cases were statistically significant, mostly when using the PDSI and MedPDSI for the southern sub-region. The spatial patterns of moderate, severe, and extreme drought occurrences were similar for the SPI and RDI pair of indices based on the probability of rainfall anomalies, and for the Sc-PDSI and MedPDSI pair based on water balance anomalies. The interpretation of the spatial variability of droughts, mainly of the extreme ones, was supported by an analysis of semi-variograms. The novel index MedPDSI compared well with the other indices and showed advantages of performing the soil water balance following the FAO56 dual K_c method with the actual olive evapotranspiration instead of PET, and of better explaining the spatial variability of extreme droughts; in addition, the trends detected were significant for both the northern and southern sub-regions.

Key words : Drought patterns; Trends; PDSI; MedPDSI; SPI; RDI; Algeria