Abstract

Drought is a natural phenomenon with harmful effects on ecosystems and human related activities, mainly agriculture. The objective of this thesis is the analysisandprediction of drought in northeastern Algeriausingmonthly precipitation data of 123 rainfallstationsfrom1960 to 2013 andrespective interpolated temperature data from1979 to 2013. Seven indices of drought thatuse precipitation dataas single input werecompared; One was the Standardized Precipitation Index (SPI)which is more preform for all types of climate at various time scales. The Markovian forecasting modelsfor the order I and II were used to estimate the differentprobabilities of drought appearance in theseven plains for both annual and seasonal time scales based on the results of the SPI-12 and SPI-3. The probabilityof havingtwo successive dry events in the southern plains was higherparticularly on Batna where itreached68%,and contrarily to the plains of Annaba(48%) and Setif (43%)located in a sub-humid region, where the probability was smaller.The results of the order II process were similarto the order I. To better identify and analyze the behavior of drought, other indices that include other parameters thanprecipitationwere used. The RDI index based on the ratio of precipitation topotential evapotranspiration wasalso used with SPI forthe time scales of 3-, 6- and 12-months. Spatial and temporal patterns of droughts were obtainedusing Principal Component Analysis in S-Mode with Varimax rotation applied to both SPI andRDI.For all time scales of indices, twomain components were retained; the first one identified the northern region characterized by a humid and moist sub-humid climate,and explained more than 40% and 43% of the drought spatial variability in SPI and RDI,respectively. The second componentexplained 27% and 28% for the same indices,representing the southern plains with arid and semi-arid climate. The Modified Mann-Kendall test was used to assess trends of the RPC scores, showinggenerally notsignificant trends for decreasing drought occurrence and severity in bothidentified drought sub-regions for all time scales.

Keywords: Drought forecasting, Drought Index, Markov Process, Principal Component Analysis,ModifiedMann-Kendall test, Climate change, Northeastern Algeria.