

Drought Prediction of Eastern and Central Regions of Iran by Using Time Series and Markov Chain Models

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In this research, time series and the first order Markov Chain models used to drought prediction in arid and semi-arid of central and eastern of region of Iran. For this purpose, rainfall data from 69 synoptic and climatology stations of study area for 1975 to 2005 were used to calculate the SPI index in three, six and 12 months for all stations. The principal component analysis based on SPI time series were used to regionalized target area into few distinctive homogeneous sub-regions. The SPI (3 and 12 months) and SPI (6 months) consider two and three distinctive homogeneous sub-regions respectively. The resultant were considered as the regional SPI time series for drought prediction using Box-Jenkins time series model in each identified sub-region. The probability of occurrences of dry, normal and wet events were also predicted for all the considered stations using Markov chain model and the results were spatially mapped and analysed. The expected drought number and drought length of the predicted drought events were also estimated and mapped to spatially display their results in order to ease their spatial variability comparison. Furthermore, different time series models were fitted to the Regional SPI series to identify the best fitted model for each region in order to use for drought forecasting. The result shows that the ARMA is the best fitted model for SPI time series at 3 and 6 months time scales while for the 12 months time scales the SARIMA model is the best fitted model. Using the identified models the magnitude of the SPI was forecast for leading times. The result shows that the time series model can favorably forecast SPI values for three months ahead, whereas the predicted results for more than three months ahead is not reasonably accurate.