

Investigation of spatio-temporal patterns of seasonal streamflow droughts in a semi-arid region

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Abstract Spatio-temporal patterns of seasonal streamflow droughts were investigated for the semi-arid Karkheh watershed, located in western Iran with an area of 41,470 km², exhibiting different rainfall regimes and topographical features. Streamflow seasonality was based on flow characteristics of rainy and non-rainy seasons. Data included 47–55 years of record from 10 selected hydrometric stations. Seasonal streamflow droughts were identified from streamflow drought characteristics (deficit volume, duration, intensity and statistical properties/distribution). Strong spatial pattern of summer droughts was detected for upper watershed region, based on station relative drought intensity distribution. Weak spatial pattern of winter droughts was detected in lower watershed, with extensions to parts of upper watershed. Temporal patterns of streamflow drought durations were not detected in the study area. For documented drought periods of 1960–1965 and 1998–2002, results showed spatial coherency in summer droughts among upper watershed stations, while winter droughts presented variable events of low intensity levels throughout the watershed. Results were verified using statistical testing and available documented literature. Probabilistic evaluations of extreme deficit volume and relative drought durations did not detect spatial/temporal patterns. Findings of this research, i.e., lack of temporal patterns and detection of strong summer spatial pattern are useful in regional drought mitigation planning.

Keywords Streamflow droughts characteristics · Spatio-temporal patterns · Extreme value analysis

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