Geophysical Research Abstracts
Vol. 18, EGU2016-14705, 2016
EGU General Assembly 2016

Sensitivity analysis of the threshold level approach on streamflow drought evaluation

Athanasios Loukas, Lampros Vasiliades, and George Sarailidis

University of Thessaly, Dept. of Civil Engineering, Lab. of Hydrology and Aquatic Systems Analysis, Volos, Greece (aloukas@civ.uth.gr)

Nowadays, streamflow drought characteristics have been widely studied for the design of hydrotechnical projects and water resources planning and management. Furthermore, information on the magnitude and frequency of low flows is very important for streamflow drought analysis at operational level in public water supply systems. The objective of this study is to investigate the sensitivity of the threshold level approach in the derivation of low flow severity-duration-frequency (SDF) curves. Low flow severity is defined as the total water deficit volume to the target threshold for a given drought duration. Four (4) threshold level methods (fixed, seasonal, monthly and daily) were employed and compared to assess the sensitivity of the threshold level method (fixed or variable) in the estimation of derived streamflow deficits and durations at Yermasoyia watershed, Cyprus using a thirty year daily discharge dataset. The 50th and 70th percentile values of the flow duration curve are selected as the threshold choices for all study methods which are suitable for semiarid catchments where zero runoff occurs during summer months. Then, the four threshold approaches are applied and three pooling procedures are applied to derive independent sequences of low-flow events. Application of the three pooling algorithms showed that the inter-event time and volume criterion is the most unbiased pooling method and this method was selected to estimate the duration and the deficit volume or severity of the identified drought events. Finally, the SDF curves are developed based on annual maximum severities for fixed durations at 30, 60, 90, 180 and 360 days. Based on individual probabilistic analysis, the best theoretical probability distribution is selected for each threshold method and then the SDF curves for the four thresholds were developed to quantify the relationship among the severities, durations, and frequencies or return periods. These curves also integrate the return period–duration curve to quantify the extent of the threshold method. Hence, based on typical drought characteristics (deficit volume and duration) and threshold levels, this study develops quantitative relationships among drought parameters using fixed, seasonal, monthly and daily threshold levels.

Key words: hydrological droughts, low flows, severity–duration–frequency (SDF) curves, streamflow deficits, threshold level method.