Geophysical Research Abstracts
Vol. 17, EGU2015-14075, 2015
EGU General Assembly 2015

A generic framework for the identification of hydrological droughts through the propagation of runoff generation mechanisms in semi-arid catchments

Ioannis Paraskeuas, Lampros Vasiliades, and Athanasios Loukas
Laboratory of Hydrology and Aquatic Systems Analysis, Department of Civil Engineering, University of Thessaly

Hydrological drought characteristics have been extensively studied for the design of hydrotechnical projects and water resources planning and management during the last decade. Information on the magnitude and frequency of low flows is very important for hydrological drought analysis at operational level in public water supply systems. The objective of this study is to investigate the propagation of runoff generation mechanisms for the identification of hydrological droughts with the use of the HBV rainfall-runoff model. A methodological framework is developed based on the classical variable threshold method suitable for semiarid catchments where zero runoff occurs at summer months. The procedures included in the framework contain calibration and validation of the HBV model in lumped and semi-lumped modes based on the elevation zones of the study watershed for estimating the spatial distribution of rainfall into the runoff components for the whole watershed and each elevation zone. Then, the monthly variable threshold method is applied and the inter-event time and volume criterion was selected as a pooling method to derive independent deficits of the study variables. Two analyses are performed in the derived deficits. Firstly, a qualitative analysis is applied to identify the lags between the rainfall, the soil moisture, the runoff components (quick, intermediate and slow runoff) and the total discharge. The lag time between the occurrences in the different components is examined and analyzed through cross-correlation and event to event analyses. Secondly, a quantitative probabilistic analysis is applied in the derived deficit characteristics (volume and duration deficit) for each variable. The probabilistic analysis provides an overall characterization of the basin concerning the drought events and is orientated to long term drought management and infrastructure design such as reservoir management and regulation. Moreover, the drought events are being characterized based on their connection to hydrological droughts and quantified based on the deficit volume and duration and different return periods are estimated for the study variables. The above framework is demonstrated for a semiarid catchment theYermasoyia watershed at Cyprus.