Geophysical Research Abstracts
Vol. 16, EGU2014-327, 2014
EGU General Assembly 2014

Groundwater balance estimation in karst by using simple conceptual rainfall-runoff model

Ivana Željković, Ana Kadić, and Vesna Denić-Jukić

University of Split, Faculty of Civil Engineering, Architecture and Geodesy, Hydrological studies, Split, Croatia (ivana.zeljkovic@gradst.hr)

The objective of this work is the study of Opačac karst spring which geographically lies in Dalmatia (Croatia). Numerous studies have been carried out in karst aiming the investigation of groundwater regime. The karst spring hydrograph can reflect the groundwater regime and consequently the analysis is based on them. A simple conceptual rainfall-runoff model is proposed for the estimation of groundwater balance components including the influences of time invariant catchment boundaries and intercatchment flows. The proposed parameter estimation procedure merges the soil-moisture balance and the groundwater balance approaches to obtain the complete groundwater budget. The effective rainfall is calculated by using mathematical model based on soil-moisture balance equations i.e. Palmer's fluid mass balance method. The parameters of model of effective rainfall are determined by using simple conceptual rainfall-runoff model consisting of two linear reservoirs representing the fast and slow flow component of the recession. The weight coefficient between the fast and slow component is determined by using BFI (Base Flow Index) analysis of hydrograph. Recession coefficient of the slow flow component and the weight coefficient are determined from hydrograph analysis. Available data from nearby meteorological station includes on daily basis daily average discharge, the amount of precipitation, the average temperature and the humidity from 1995-2010. The average catchment area is also estimated with the average yearly runoff deficit using Turc's method and compared with the values obtained from the application of the rainfall-runoff model. Nash–Sutcliffe model efficiency coefficient for simulated hydrograph is applied to assess the predictive power of model. Calculated groundwater balance shows that the Opačac Spring aquifer contains a significant storage capacity. The application of series of linear reservoirs is a classical and common technique, but the proposed simple approach enables the estimation of the components of groundwater balance in karst areas.