Geophysical Research Abstracts
Vol. 13, EGU2011-13274, 2011
EGU General Assembly 2011

Performance evaluation of a theoretical model for the description of the water balance and runoff dynamics in Southern Italy river basins

Andrea Gioia (1), Salvatore Manfreda (2), Vito Iacobellis (1), and Mauro Fiorentino (2)

(1) Politecnico of Bari, Water Engineering and Chemistry Department, Italy (a.gioia@poliba.it, +39 0805963414), (2) Dipartimento di Ingegneria e Fisica dell'Ambiente, Università degli Studi della Basilicata, Italia

Dynamics of soil moisture in time and space is governed by complex interactions between climate, soil and vegetation over a river basin, providing a fundamental connection between hydrological and ecological processes. Recently, Manfreda and Fiorentino (2008) and Manfreda (2008) developed a model able to analytically describe the relative soil saturation and the runoff production of a river basin. The method describes watershed heterogeneity including the effect of spatial variability of water storage capacity adopting the same schematization used by Zhao et al. (1980) for the Xinanjiang conceptual model. In the previous version of the model, the soil water storage distribution was set with a minimum value of zero. This implies that the relative saturated portion of the river basin areas has an infinitesimal probability to be zero and consequently runoff rate is equal to rainfall rate. This approach has been generalized adopting a distribution of soil depths bounded between two non zero-values allowing to reproduce the condition of zero runoff under some rainfall events. The model, characterized by parameters that depend on soil, vegetation and basin morphology, allowed the analytical derivation of the probability density function of the relative saturation, portion of the saturated area and the surface runoff of a basin.
Its application over a set of river basins in Southern Italy, with climatic conditions ranging from humid to semiarid, provides a formal description of the role played by climate, soil, and vegetation in soil moisture and runoff production. Runoff time series obtained using two different baseflow separation methods have been used to test model performances and also to investigate on the correct strategy to adopt physically based filters. It was found that the water loss coefficient (a parameter accounting for both evapotranspiration and leakage losses) is a controlling factor for the probability distribution of runoff.