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Application of the SWAT model to an endorheic watershed in the Central Spanish Pre-Pyrenees: Methodological approach and preliminary results

Leticia Gaspar (1), Sue White (1), Ana Navas (2), Manuel López-Vicente (2), and Leticia Palazón (2)

(1) Cranfield University, Cranfield Water Sciences Institute, Cranfield, United Kingdom (l.gasparferrer@cranfield.ac.uk), (2) Estación Experimental de Aula Dei (EEAD-CSIC), Department of Soil and Water, Avda. Montañana 1005, 50080. Zaragoza, Spain

Modelling runoff and sediment transport at watershed scale are key tools to predict hydrological and sediment processes, identify soil sediment sources and estimate sediment yield, with the purpose of better managing soil and water resources. This study aims to apply the SWAT model in an endorheic watershed in the Central Spanish Pre-Pyrenees, where there have been a number of previous field-based studies on sediment sources and transfers.

The Soil and Water Assessment Tool (SWAT) is a process based semi-distributed watershed scale hydrologic model, which can provide a high level of spatial detail by allowing the watershed to be divided into sub-basins. This study addresses the challenge of applying the SWAT model to an endorheic watershed that drains to a central lake, without external output, and without a network of permanent rivers. In this case it has been shown that the SWAT model does not correctly reproduce the stream network when using automatic watershed delineation, even with a high resolution Digital Elevation Model (5 x 5 metres). For this purpose, different approaches needed to be considered, such as i) user-defined watersheds and streams, ii) burning in a stream network or iii) modelling each sub-watershed separately. The objective of this study was to develop a new methodological approach for correctly simulating the main hydrological processes in an endorheic and complex karst watershed of the Spanish Pre-Pyrenees. The *Estanque de Arriba* Lake watershed (74 ha) is an endorheic system located in the Spanish Central Pre-Pyrenees. This watershed holds a small and permanent lake of fresh water (1.7 ha) and is a Site of Community Importance (European NATURA 2000 network). The study area is characterized by an abrupt topography with altitude range between 679 and 862 m and an average slope gradient of 24 %. Steep slopes ($>$ 24 %) occupy the northern part of the watershed, whereas gentle slopes ($<$12 %) are located in the southern part bordering the lake, and are used mainly for cultivation.

The complex topography and endorheic system of this watershed are limitations to SWAT watershed delineation for the study area. This work attempts to investigate the usefulness of SWAT model for assessing overland flow at watershed scale and understand the dynamics of runoff generation in endorheic watersheds. The model will be validated using continuous lake level data from the *Estanque de Arriba* Lake and with the available soil redistribution rates quantified with ^{137}Cs in the study area from previous research. The information gained from this research will be of interest for application of the SWAT model in other endorheic watersheds, which pose a particular challenge for the model