Geophysical Research Abstracts
Vol. 17, EGU2015-7206, 2015
EGU General Assembly 2015


# Modelling runoff and soil water content with the DR2-2013© SAGA v1.1 model at catchment scale under Mediterranean conditions (NE Spain)

Dr. Manuel López-Vicente (1), M.Sc. Leticia Palazón (1), M.Sc. Laura Quijano (1), Dr. Leticia Gaspar (2), and Dr. Ana Navas (1)

(1) EEAD-CSIC, Department of Soil and Water, Zaragoza, Spain (mvicente@eead.csic.es), (2) Research Laboratory Building, University of Northern British Columbia, UNBC. Prince George, V2N 4Z9, Canada

Hydrological and soil erosion models allow mapping and quantifying spatially distributed rates of runoff depth and soil redistribution for different land uses, management and tillage practices and climatic scenarios. The different temporal and spatial [very small (< 1 km2), small (1–5 km2), medium (5–50 km2) and large catchments (50–1000 km2) or river basins (>1000 km2)] scales of numerical simulations make model selection specific to each range of scales. Additionally, the spatial resolution of the inputs is in agreement with the size of the study area. In this study, we run the GIS-based water balance DR2-2013© SAGA v1.1 model (freely downloaded as executable file at http://digital.csic.es/handle/10261/93543), in the Vandunchil stream catchment (23 km2; Ebro river basin, NE Spain). All input maps are generated at 5 x 5 m of cell size (924,573 pixels per map) allowing sound parameterization. Simulation is run at monthly scale with average climatic values. This catchment is an open hydrological system and it has a long history of human occupation, agricultural practices and water management. Numerous manmade infrastructures or landscape linear elements (LLEs: paved and unpaved trails, rock mounds in non-cultivated areas, disperse and small settlements, shallow and long drainage ditches, stone walls, small rock dams, fences and vegetation strips) appear throughout the hillslopes and streams and modify the natural runoff pathways and thus the hydrological and sediment connectivity. Rain-fed cereal fields occupy one third of the catchment area, 1% corresponds to sealed soils, and the remaining area is covered with Mediterranean forest, scrubland, pine afforestation and meadow. The parent material corresponds to Miocene sandstones and lutites and Holocene colluvial and alluvial deposits. The climate is continental Mediterranean with two humid periods, one in spring and a second in autumn that summarizes 63% of the total annual precipitation. We created a synthetic weather station (WS) from the Caseda and Uncastillo WS. The effective rainfall that reaches the soils (after canopy interception and slope correction) was 85% on average from the total rainfall depth (556 mm yr–1) and the average initial runoff, before overland flow processes, was 320 mm yr–1. The simulated effective runoff (CQeff) ranged from 0 until 29,960 mm yr–1 and the corresponding map showed the typical spatial pattern of overland flow pathways though numerous disruptions appeared along the hillslopes and the main streams due to the presence of LLEs. The total depth of annual runoff corresponds to 37.8% of the total effective rainfall (TER) and 32.0% of the total rainfall depth (TR). The remaining volume of water, the soil water content (Waa) associated with the runoff and rainfall events, meant 62.2% and 52.7% of the TER and TR, respectively. The map of the Waa presented a different spatial pattern where the land uses play a more important role than the processes of cumulative overland flow. Significant variations in the monthly values of CQeff and Waa were described. This study proves the ability of the DR2-2013© SAGA v1.1 model to simulate the hydrological response of the soils at catchment scale.