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Hydrodynamic behaviour of a semiarid Mediterranean watershed, under changing hydrological conditions

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ABSTRACT

The study analyzes the changes in the rainfall-runoff process as a result of land cover changes occurred between 1990-2018 in the Guadalest Reservoir basin with an area of 122.5 km², using the model of the HEC-HMS model at daily scale and to capture the complex hydrological dynamics based on GIS information. The purpose is to analyze the spatial-temporal evolution of the hydrological response in 12 sub-basins and the dynamics of land use/land cover changes for the years 1990, 2000, 2006, 2012 and 2018.

The findings reveal a change in the type of sclerophyll vegetation (forests of *Quercus* (*calliprinos*, *ilex*, *rotundifolia*, *suber*, etc.) from 81.56% in the 1990 initial stage, to natural grasslands by 81.55% in the 2018 stage; a decrease in agricultural areas and their conversion into coniferous forests and natural grasslands by approximately 60% in the same period; if exists an increase of coniferous forest to the detriment of the agriculture, implies that the evapotranspiration will increase and the run-off will decrease with an increase in runoff in principle but as time goes by it decreases bringing as a consequence a deficit in water supply. The results of land use change detection between the years 1990-2018 were corroborated with the values of the curve numbers obtained.

The cyclical and trend analysis of the historical series of precipitation allows evidencing a five-year cycle and a decreasing trend from 1984 to 2018.

The HEC-HMS model implementation at a daily scale and GIS-based tools have proven to be useful in achieving the study objectives. Within the HEC-HMS, the SCS Curve Number model and the Muskingum method were suitable for solving the rainfall-runoff conversion and flood propagation equations, respectively.

The researching work developed is intended to identify the impact derived by the anthropic action in the change of land use and its vegetable coverage, and how this may impact on the evotranspiration, surface run-off, and the post hydrological drainage of The Guadalest Reservoir

which will use for the Integral Management of the Basin. These findings provide to the water management planners very useful information about the effects of flash floods, which have human lives cost in the ravine basin studied in recent years.

KEYWORDS

Land use change, evapotranspiration, runoff, HEC-HMS hydrological model, basin, Mediterranean