



Modelling the rainfall-runoff relationships in a large catchment dominated by olive orchards in Southern Spain

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Water balance models at the monthly scale are commonly used for planning purposes due to the relative simplicity of their parameterization and the more common availability of monthly versus daily data. The aim of this study was to evaluate the performance of three hydrological models: one multiple linear regression (MLR) model and two water balance models (one with daily and the other with monthly time step). Runoff, in both the monthly (named SIMPA) and daily (named CNWB) water balance models, was calculated based on the Curve Number approach.

The evaluation was conducted on a large catchment of 308 km², whose main land use is olive crops, using a daily rainfall-runoff dataset of nine years (1996-2005). Validation of the models was based on monthly runoff data; calibration and sensitivity analysis of the water balance models were based on monthly data and Monte Carlo simulation of the most important parameters: maximum infiltration to the aquifer; maximum water volume stored in the soil; coefficient of the threshold of soil water for the runoff generation; recharge coefficient of the aquifers in the case of SIMPA, and Curve Number and recharge coefficient of the aquifers for CNWB.

SIMPA and CNWB performed better than the MLR model. SIMPA results were strongly dependent on the parameter soil water storage capacity, although showed the best adjustment to measured data according to the Nash-Sutcliffe Efficiency (equal to 0.78 and 0.66 for calibration and validation, respectively). Although CNWB performed similarly to SIMPA with the calibration dataset, its validation Nash-Sutcliffe Efficiency (0.42) was lower than that obtained with SIMPA (0.66). Inconsistent parameterization could be obtained in both SIMPA and CNWB when the aquifer recharge coefficient was included in the set of parameters to be calibrated. The advantage of CNWB against SIMPA is that soil storage capacity is physically meaningful in the former and dependent on rainfall distribution in the later. Finally, extreme values were responsible for most simulated-measured runoff deviations for the three models. Despite the good performance and conceptual advantages of SIMPA and CNWB, they should not be applied without previous analyses of available datasets.