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Predicting the daily streamflow of ungauged catchments in Sicily by regionalising the parameters of a lumped conceptual rainfall-runoff model

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The water resource management usually requires models able to simulate daily streamflow also in ungauged basins. Modelling daily streamflow becomes more and more difficult in the semi-arid catchments of Mediterranean area because of the ephemeral behaviour of the most of the rivers. A possible solution for this challenge is represented by the regionalization of a simple hydrologic model. Here, a lumped conceptual rainfall-runoff model suitable for the estimation of the daily streamflow in semi-arid climatic areas has been used: the IHACRES model. The rainfall-runoff processes are represented by two modules: (1) a non linear loss module transforms precipitation to effective rainfall by considering the influence of the temperature, and (2) a linear module based on the classical convolution between effective rainfall and the unit hydrograph to derive the total streamflow. Four different unit hydrograph with decreasing complexity has been here considered. The model has been calibrated in 23 catchments in Sicily (Italy) using Monte Carlo simulations. This procedure, exploring the model parameters space, allows to identify which set is the best simulator when results are compared with real data.
After the calibration, the relationships between model parameters and morphoclimatic descriptors of catchments (at site characteristics) are investigated using a linear regressions. The derived relationships between model parameters and geomorphic attributes are in some case not well defined, especially for over-parameterized model configurations. Thus only the model with the lower parameters number has been used to predict the daily streamflow. This approach allows the estimation of daily flows in the region using simple morphological information and records of rainfall and temperature. Afterwards the regional model has been satisfactorily validated on two Sicilian catchments.