

Parameterization of a rainfall-runoff model based on the utility of the forecasts for a specific stakeholder

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The work presents the application of a new method for calibration of an hydrological rainfall-runoff model, based on the use of utility functions. The utility function is defined on the basis of the specific purpose of the desired predictions, according to the needs of the stakeholders that will use them: in the present case, the purpose is the identification of the future streamflow occurrences that will surpass an assigned threshold runoff, thus helping the stakeholder in the decisions concerning the issuance of flood watches and warnings in the operation of a flood forecasting system. The chosen utility function is based on both the absolute error of the model and the values of the observed streamflow.

In addition to the parameterization developed using the utility function, in an application referred to a mid-sized mountain watershed in Tuscany (Italy), the model response was studied, as a term of comparison, also using traditional mono- and multi-objective calibration approaches. The results, evaluated also using skill scores based on false and missed alarms as well as on the probability of detection and frequency of hits of the threshold runoff (widely adopted when assessing the value of both meteorological and hydrological forecasts in real-world flood warning systems), demonstrate that the proposed approach may allow an improvement of the model performances, if compared with traditional mono-objective and multi-objective calibration procedures, in respect to the actual utility of the forecasts for a specific stakeholder.