



Comparison of methodologies for flood rainfall thresholds evaluation

V. Montesarchio, F. Napolitano, M. Rianna, E. Ridolfi, F. Russo, and S. Sebastianelli

DICEA, Dipartimento Ingegneria Civile, Edile e Ambientale, Sapienza Università di Roma, Rome, Italy
(francesco.napolitano@uniroma1.it, +39 0644 585058)

A flood warning system based on rainfall thresholds allows to overcome classical real time flood forecasting systems, that generally require to run in real time a hydrological model. This approach is useful when dealing with medium and small size basins, often characterised by a very rapid response to the storms, leaving only a short lead time for events mitigation. Rainfall thresholds values specify the precipitation amount for a given duration that generates a critical discharge in a given cross section. The overcoming of these values could produce a critical situation in river sites exposed to alluvial risk. Rainfall thresholds values depend on soil moisture conditions and spatial and temporal distribution of rainfall. In this study a comparison of methodologies for estimating rainfall threshold values is presented. Critical precipitation amounts are evaluated using both hydrological simulation and probabilistic methods. The study is focused on three medium-small sized basins (areas ranging from 125 to 800 square kilometres) located in North Lazio Coastal Region, in Central Italy. For each catchment a semi-distributed hydrological model is calibrated and validated with rain gauge and weather radar data. Then the optimal simulation models are used to evaluate critical rainfall depths for 1, 3, 6 and 12 h duration. In the probabilistic approach rainfall thresholds values result from the evaluation of the joint probability function of rainfall depth of a given duration (1, 3, 6 and 12 h) and the corresponding flow peak value, combined with an utility function minimisation. Two kind of utility function are examined, one following the Bayesian decision theory, the other the informative entropy concept. Finally, to assess the performance of each methodology, contingency table are constructed to highlight the system skill score, i.e. the capacity of correctly issuing warning against false and missed alarms.