

**ON THE USE OF NEURAL NETWORKS AND NON-PARAMETRIC  
METHODS FOR IMPROVING REAL-TIME FLOOD FORECASTING  
OBTAINED THROUGH CONCEPTUAL HYDROLOGIC MODELS**

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The application of time-series analysis techniques for improving the real-time flood forecasts issued by a deterministic conceptual-type rainfall-runoff model is presented. The most significant improvement in the effectiveness of a flood warning system may be gained when a quantitative rainfall forecasting is available. In addition, all operational hydrologic real-time forecasting systems benefit by a procedure for the continuous correction (*updating*) of the forecasts, based on the discrepancies between the latest forecasts and real-time observed discharges. An improved real-time flood forecasting system may thus be obtained with the use of time-series analysis techniques for forecasting short-term rainfall depths to be processed as input to the rainfall-runoff model. The simulated discharges are then updated, again through time-series analysis techniques. For both rainfall forecasting and discharge updating we here propose, along with a comparison with traditional linear stochastic models, stationary (ARMA) and non-stationary (ARIMA), the use of non-linear models: Artificial Neural Networks (ANN) and the “nearest neighbour” method, a non-parametric regression methodology. The proposed techniques, and especially ANN, allow a remarkable improvement over the null or persistent rainfall hypothesis, which are the rainfall prediction approaches more often adopted in the hydrological practice, and over the not- updated flood forecasts.