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ANN modelling for flood warning in the Eure's river (France)

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The hydrological prediction of extreme runoff is crucial for flood warning and flood impacts mitigation. Since 2003 a new state service (e.g. SCHAPI at national level and SPC at regional level) has been created in France to link meterological and flood forecasting. This state service uses a set of hydrological models to adapt flood warning to local or regional watersheds. Our contribution is presenting the results of our scientific cooperation with the SPC of Normandy (France). This research is based on developing an ANN (e.g. Artificial Neural Network) applied to flood forecast in the river Eure's basin. This hydrological unit is quite complex: karst impacted hydrology, surface of 6000 sq.km, natural flood peak reduction and retention by large fluvial sheets (up to 2km wide), ungauged sub-basins… Even with a good hydrological data set (i.e. more than 40 years of hydrological data, 10 runoff stations, 20 rainfall stations...) the watershed complexity remains a huge gap that has not been bridged yet with "conventional" hydrological tools provided by the SCHAPI.
Our contribution discusses about data base management and ANN modeling for the Eure's basin by comparing different forecast lag-time, results and model sensitivity using the more accurate and recent rainfall/runoff data available (e.g. the official SPC Normandy near-realtime monitoring network starting from 1993). We will also discuss the integration of historical data (e.g. 20th century daily heights) in flood forecasting by introducing more flood events into the ANN learning-validation phases. This two ANN modeling approaches (e.g. rainfall-runoff and rainfall-water heights) are following the same objective of predicting flood warning thresholds to prevent municipalities from major flood occurrence. Our conclusions will confirm the potential of ANN modeling as an efficient predictive model for near-realtime flood forecasting and warning in a complex watershed.