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Combined use of SOM-classification and Feed-Forward Networks for multinetwork streamflow forecasting

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The contribution presents the results of a modular approach for real-time streamflow forecasting, that applies different rainfall-runoff models, on the basis of the hydro-meteorological situation characterising each forecast instant. Modular neural networks or multi-network modelling for streamflow forecasting have been successfully applied in the recent years (e.g. Abrahart and See, 2000; Corzo and Solomatine, 2007; Parasuraman and Elshorbagy 2007). The hydrological and meteorological conditions of the watershed in the instant in which the forecast is issued determine, in fact, which hydrological processes will be dominant in the following period: the future evolution of the streamflow values is then simulated with a rainfall-runoff model that is specific for each forecast instant, parameterised on the basis of the evolution of the similar situations observed in the past. In the present work, the hydro-meteorological conditions are classified with a clustering technique based on unsupervised artificial neural networks, namely self-organisation maps (SOMs) or Kohonen networks. Following the SOM classification, the streamflow forecasts for an Italian mid-sized mountain watershed are issued by specific multilayer feed-forward artificial neural network (FFN). The results confirm that an adequate distinction of the hydro-meteorological conditions characterising the basin at the forecast instant, thus including additional knowledge on the forthcoming hydrological processes, may considerably improve the rainfall-runoff modelling performance.