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Influence of the temporal observation interval on the implementation of artificial neural networks for streamflow prediction

E. Toth and A. Brath

DISTART - University of Bologna (elena.toth@unibo.it/Fax. +39-051-331446)

Artificial neural networks have been widely applied by hydrologists in the recent years for the prediction of river flows, either with and without the use of exogenous input (rainfall depths and, rarely, other meteorological variables) in addition to past observed flows. This study concentrates on the aspect of the length of the temporal observation interval of input and output variables, analyzing the networks and the corresponding performances when considering increasing time steps; the objective is to understand which time scales are most adequate for the identification of the watershed characteristics, through a model that is both parsimonious and precise. The analyses are carried out on the data registered in a medium-sized watershed located on the Apennine mountains, where hourly streamflow and meteorological data are available over an 8-year period. For both modelling approaches, that is with and without the use of exogenous input, hourly observations are aggregated over increasing time steps, modelling networks are identified and streamflow forecasts are compared. ANN models are implemented for the prediction of streamflow not only in the closure section but also in an internal section, this latter corresponding to a halved drainage area, to test the influence of the watershed spatial extension on the results.