A fuzzy-autoregressive model of daily river flows

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A model for the identification of daily river flows has been developed, consisting of the combination of an autoregressive model with a fuzzy inference system. The AR model is devoted to the identification of base flow, supposed to be described by linear laws. The fuzzy model identifies the surface runoff, by applying a small set of linguistic statements, deriving from the knowledge of the physical features of the non linear rainfall-runoff transformation, to the inflow entering the river basin. The model has been applied to the identification of the daily flow series of river Volturno at Cancello-Arnone (Southern Italy), with a drainage basin of around 5560 km2, observed between 1970 and 1974. The inflow was estimated on the basis of daily precipitations registered during the same years at six rain gauges located throughout the basin. The first two years were used for model training, the remaining three for the validation. The obtained results show that the proposed model provides good predictions of either low river flows or high floods, although the analysis of residuals, which do not turn out to be a white noise, indicates that the cause and effect relationship between rainfall and runoff is not completely identified by the model.