Geophysical Research Abstracts, Vol. 7, 06458, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06458

Time series analysis for computing the river discharge using an ELMAN artificial neural network

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A simplified lumped hydrological model has been developed using a recurrent artificial neural network (ANN) or ELMAN network. The discharge in a point of the river basin is computed using as input of the algorithm the closest rain-gauge measurement that are located in the upstream direction. The mean of the rain measurement in the previous 15 days is considered too for taking into account the amount of rain that infiltrates into the ground. This last term acts in reducing the bias of the algorithm. Comparing the result of a simple MULTI LAYER FEED FORWARD ANN with those of an ELMAN ANN it is evident that the recurrent network gives a better estimation of the river discharge. This demonstrates the importance of the information coming from the time series analysis of the rain-gauge data included in the ELMAN ANN. The simple lumped model presented here is suitable for now-casting purposes and it could be quite useful in case of flash-flood forecast.