



## **Using artificial neural networks to forecast monthly rainfall and runoff over the central highland, Vietnam**

**T. D. Nguyen** (1,3), C. Uvo (2), D. Rosbjerg (1) and K. Q. Nguyen (3)

(1) Institute of Environment & Resources, Technical University of Denmark, (2) Department of Water Resources Engineering, Lund University, Sweden, (3) Faculty of Planning & Management of Water Resources Development Systems, Water Resources University, Hanoi, Vietnam (tdn@er.dtu.dk / Fax: +45 4593 5850 / Phone: +45 4525 1455)

The variation of the monthly rainfall/runoff over the Vietnamese central highland (VCH) is strongly correlated with water use in both livelihoods and agricultural production in the region. Improvement of the rainfall/runoff forecast over the VCH would contribute significantly to water resources planning and management in terms of, e.g., improved reservoir operation, agricultural practice and, in particular, mitigation of drought effects.

In this study, Artificial Neural Networks (ANN) are employed to estimate monthly rainfall and runoff in three basins in the VCH at the beginning of the rainy season. The network is designed with three layers: one hidden layer with one neuron, one neuron in the output layer, and the number of neurons the input layer equal to the number of input parameters. The neural network is trained based on 21 years of data and verified by cross-validation.

The results reveal the influence on the rainfall in different parts of the VCH by both the sea surface temperature in the Pacific Ocean and local climatic patterns. The highest correlation coefficient between observed and estimated time series is found at stations in the south of the VCH with a value of 0.84 for three rainfall stations and 0.89 for a discharge gauging station. The results corroborate and improve the results obtained in previous work using singular value decomposition and canonical correlation analysis.