Influence of spatial variation in precipitation on artificial neural network rainfall-runoff model

André Dozier[1]
Department of Civil and Environmental Engineering, Colorado State University

Abstract. Rainfall-runoff processes are very complex. Modeling such processes accurately requires more data than can ever be collected due to time, money, and technology constraints. Physically-based and conceptually-based modeling attempts have varying degrees of success and required resource. Artificial neural networks (ANNs) are modeling tools that can quickly adapt and learn input-output relationships for many different engineering problems. An Elman-type recurrent ANN was trained to simulate observed streamflow for Fountain Creek at Pueblo, CO using varying amounts of spatial precipitation information. Nine zones were originally delineated within the watershed draining to Fountain Creek at Pueblo based on estimated overland flow travel time. Five different spatially varying scenarios were modeled: scenarios containing 9 zones, 6 zones, 3 zones, 2 zones, and 1 zone. Each scenario was trained and simulated 100 times, each with randomly generated initial weights. Performance of ANN simulated runoff weakens from the training dataset to the validation dataset to the testing dataset. Spatial variability in the input data has little influence on general model performance during the training period, but much more negative influence during validation and testing periods due to ANN over-training.

[1] Civil Engineering Department
Colorado State University
Campus Delivery 1372
Fort Collins, CO 80523-1372
Tel: (970) 491-7510
e-mail: andre.dozier@rams.colostate.edu