EXPLICIT NEURAL NETWORK IN SUSPENDED SEDIMENT LOAD ESTIMATION

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Abstract: Correct estimation of sediment volume carried by a river is very important for many water resources projects. Traditionally, artificial neural networks (ANNs) are used as black-box models without understanding what happens inside the box. The question is that, how anyone who may be unfamiliar with ANNs can apply this kind of models in any other study, while the model has not been formulated. This paper proposes an explicit neural network (ENN) formulation which is simple and can be used, by anyone who is even not familiar with ANNs, for modeling daily suspended sediment-discharge relationship. The daily streamflow and suspended sediment data from two stations on Tongue River in Montana are used as case studies. Two different sediment rating curves (SRC), multi-linear regression (MLR) and nonlinear regression (NLR) are also applied to the same data. The ENN estimates are compared with those of the SRC, MLR and NLR models. The root mean square errors (RMSE), mean absolute errors (MAE), correlation coefficient (R) and model efficiency (E) statistics are used to evaluate the performance of the models. The comparison results reveal that the suggested model performs better than the conventional SRC, MLR and NLR.

Key words: *Suspended sediment load, explicit neural networks, rating curves, modeling*

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1. Introduction

Modeling suspended sediment concentration is vital important for many water resource projects related with channel navigability, reservoir filling, hydroelectric-equipment longevity, river aesthetics, fish habitat and scientific interests (Kisi et al. 2006). The estimation of suspended sediment is enormously difficult because it is closely related to flow and the mechanism of their relationship is non-linear

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