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Hydrology and Earth System Sciences Discussions

Interactive comment on "Dynamic neural networks for real-time water level predictions of sewerage systems – covering gauged and ungauged sites" *by* Y.-M. Chiang et al.

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Comment #2:

1. Indeed, ANN is a powerful tool for data processing. In this paper, the authors use rainfall and water level information as input variables of an ANN. I am curious as to why ANN is applicable to man-made data such as the sewerage water level mentioned in this paper. As known, the water level in sewerage systems varies, dependent upon the operation of pumping stations.

Author Response: The authors agree to the reviewer's statement that the water level in sewerage systems varies and is dependent upon the operations of pumping stations.

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To solve this problem, we try to minimize the influence of pumping operations on the water level by selecting the study site which is located on the upstream of the pumping station. Moreover, one of the input variables of the constructed model is the water level information at previous one step which involves the effect of pumping operations on the water level. Such procedure is considered to be acceptable and was demonstrated its applicability in our previous studies on reservoir operations (Chang and Chang, 2006; Chang and Chang, 2001; Chang and Chang, 2009).

2. I am confused about the difference between validation phase and testing phase shown in Fig.6. I thought both phases could be the same.

Author Response: Generally speaking, the validation phase and the testing phase have the same meaning for traditional models, such as stochastic and physical models. As far as ANN models are concerned, there is a need to have an additional validation phase besides the training and testing phases even though some studies still adopted two datasets. The reason is that there are two sets of parameters need to be determined during model training. The first set of parameters is the number of hidden layers and the number of hidden neurons arranged in each hidden layer. The second set of parameters is the connected weights of the ANNs. The function of validation data not only helps to optimize these parameters but also decides an appropriate ANN structure to effectively prevent the ANN model from being over-trained, and therefore increases the model's generalization capability. The matter of using three sets of data to build ANN models has been widely adopted by many hydrologists in various applications (Coulibaly et al., 2000; Sahoo et al., 2009; Shrestha et al., 2009) and our previous studies (Chiang and Chang, 2009; Chiang et al., 2004). Consequently, the ANN applied in this study was constructed by taking three data sets into account accordingly.

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