

## ***Interactive comment on “Multi-criteria validation of artificial neural network rainfall-runoff modeling” by R. Modarres***

**R. Modarres**

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RC S2283, Referee #1

1. Page 3454 Line 5: The observation was divided into training, validation and cross-validation. Two questions are arisen here: (i) We know that “training data set” is used to calibrate the model and “validation data set” to test. What for is used the “crossvalidation data set”? (ii) What percentage of the total data is used in each data set? Please note that these three data sets are mentioned in Page 3455 Line 6 for a second time.

REPLY: (i) A brief description was given in the text for cross-validation. (ii) The percentage of them was given and the line in page 3455 was omitted.

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2. Page 3454 Lines 18-19: The term &#8217;normalized&#8217; in Line 19 should be &#8217;standardized&#8217; as in Line 18. REPLY: The term &#8217;standardized&#8217; was replaced.

3. Page 3456 Line 8: Insert following paragraph after &#8217;... different models.&#8217; and cite the references provided below in the text and list them among the references.

It is noted that Unal et al. (2004) validated simulation models by using statistical characteristics such as average, standard deviation, skewness coefficient, autocorrelation coefficient, maximum and minimum values, and performance criteria such as relative error, absolute error, frequency of success, ranges of relative and absolute errors. Very recently Aksoy and Dahamsheh (2009) used a multi-criteria validation of ANN models developed for Jordan by using graphical and numerical measures including the forecasted and observed time series, scatter diagram, the residual time series between the forecast and observation, mean absolute and relative errors between the forecast and observation, dimensionless mean absolute error and dimensionless mean relative error between the forecast and observation. Additionally following performance measures are adopted: Determination coefficient to quantify the linearity between the forecast and observation, mean square error, mean absolute error; and a and b (the slope and the intercept) in the best-fit linear line of the scatter diagram between the forecast and observation. NE Unal, H Aksoy, T Akar, 2004, Annual and monthly rainfall data generation schemes, Stoch. Environ. Res. Risk Assess., 18: 245-257. H Aksoy, A Dahamsheh, 2009, Artificial neural network models for forecasting monthly precipitation in Jordan, Stoch. Environ. Res. Risk Assess., DOI 10.1007/s00477- 008-0267-x (in press and online available). (USE VOLUME, ISSUE AND PAGE TO PAGE INFORMATION FOR THIS REFERENCE IF IT IS PUBLISHED BEFORE THIS MANUSCRIPT IS PRODUCED.) REPLY: The paragraph and references were added.

4. Page 3457 Line 4: Provide a reference after the Blom&#8217;s method is mentioned. REPLY: The reference was added.

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5. Page 3457 Line 24: What does Table 2 say? Explain in brief. REPLY: On page 3460, we have explained it. On page 3457, the sentence before parenthesis (see table 2) has described. However, in the parenthesis, the reader is referred to section 6.2.2 for more details).

6. From Line 22 in Page 3458 to Line 4 in Page 3459: &#8217;Table 3 represents the global ... is the best network.&#8217; I could not link statements in this paragraph with Table 3. I think the table should be re-arranged to correspond what the text says. REPLY: The author tries to give all measurement for all MLP networks and for all percentile groups. But as there are lots of measurements, the author has tried to highlight the difference performance of different measurement for different MLP networks and show the best network according to each measurement in order to compare the networks as well as the measurement. The author does not understand which part of the table or the text is not clear. Please give more details of your comments or give any suggestion the referee suppose will improve the quality of the paper.

Technical Corrections: Abstract: Page 3450 Line 8: Delete &#8217;but&#8217; at the end of the line. Page 3450 Line 13: for low, medium and Page 3450 Line 14: for low, medium and Page 3450 Line 15: statistics, the empirical (Delete &#8217;but&#8217;) Page 3450 Line 16: of low, medium and 3 Multi-layer perceptron

From Page 3453 Line 2 to Page 3454 Line 2: Variables are all should be lowercase both in the text and in the equations. Only E, N and M in Equation (5) are capital. All other variables should be lowercase. Please pay a particular Delete &#8217;but&#8217; at the end of the line.

4 Model development Page 3455 Line 8: Correct as &#8217;Propagation&#8217; Page 3455 Line 13: Use &#8217;validation&#8217; instead of &#8217;testing&#8217;

5 Empirical model Page 3455 Line 23: Insert as &#8217;... in Fig. 3 for the validation data set.&#8217;

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6 Comparison of the models Page 3456 Line 23: Delete  $\text{but}$  as  
the models, they do not ... Page 3459 Line 2: Use sub-index  $i$   
with  $N$  as  $Ni$ . Page 3460 Line 11: Correct as  $\text{significance level}$ ;

References Page 3464 Line 15: Correct as  $\text{An artificial ...}$ ;

Table 1 0.92 for  $CE(\%)$  in Regression model should be 92.xx Use equal number of digits for  $CE(\%)$  in all model types. Use equal number of digits for  $IoAD$  in all model types. Use equal number of digits for  $PI$  in all model types. Fig. 4 (Caption) Use lower case in ... box-plots ...;

REPLY: All technical corrections were applied.

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Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 5, 3449, 2008.

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