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Hydrology and Earth System Sciences Discussions

Interactive comment on "River flow forecasting with Artificial Neural Networks using satellite observed precipitation pre-processed with flow length and travel time information: case study of the Ganges river basin" *by* M. K. Akhtar et al.

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We thank the reviewer for the valuable comments. The replies to the comments are summarised as follows.
We agree with the reviewer on the inclusion of a comment about "the generalization of the modelling approach". We indeed think that this is a particular case and that the findings here can be tested and extended in another research. In particular we plan to test this methodology on smaller catchments, and then benchmark it together

with other methodologies reported in literature, in order to see the effect of distributed rainfall input more clearly. We have added this as further research to the Conclusions section.

We agree that the shift in the time series forecast results is a concern, and therefore, we commented on this issue in line 25 page 3397. However, it is not the intention of this paper to focus on the analysis of the "shift error" in the forecast with ANN models.

We agree with the reviewer that for a more elaborate analysis of the rainfall input methodology and its effect on ANN, additional results, such as ANNs with only rainfall as input, could be helpful. However, because of the case study focus, as the reviewer is pointing out, we have chosen to present the best performing models. This will be more clearly stated in the paper on p. 3395 line 22, including a reference to other analyses performed before in Akhtar, 2006. The models with only rainfall as input performed worse, as expected (Toth 2008, Elshorbagy et al., 2009).
The comparative use of other models, such as quasi-physical-based models was indeed considered. A SWAT (Soil Water Assessment Tool) model was built with the available data and using different optimization techniques for calibration of model parameters. However, the results of such model did not achieve an acceptable result. It seemed that crucial data about the catchment and river system characteristics were missing. A comment on the results of the SWAT model will be included in the results.
The references and related studies mentioned are included in the introduction as part of the review. Indeed we have found that they strengthen the value of the publication.
It would be interesting to make an optimization analysis of the different time lags to be used, e.g. excluding the precipitation with large time lags. However, we think a starting step is to look at the overall analysis of the information lagged according to its travel time in the river basin.
To complement the information provided in the paper, the mean, standard deviation,

PERS and Coe, are included.
For the agreement between the training and validation a probability plot of both time series have been included. This graph is done for the input and output variables.
About the last graph, indeed, it represents only the high flows and therefore there are gaps in between the series presented. An improved graph is included.

References,

Akhtar, M. K.: Flood Forecasting for Bangladesh with satellite Data, Msc Thesis ,UNESCO-IHE, Delft, The Netherlands, 2006.
Toth, E. (Editor), 2008. Data-Driven Streamflow Simulation: The Influence of Exogenous Variables and Temporal Resolution. Practical Hydroinformatics, 68. Springer, 113-125 pp.
Elshorbagy, A. Corzo, G., Srinivasulu, S. and Solomatine, D. 2009. Experimental investigation of the predictive capabilities of soft computing techniques in hydrology. CANSIM Series Report No. CAN-09-01, Centre for Advanced Numerical simulation (CANSIM), Department of Civil Geological Engineering, University of Saskatchewan, Saskatoon, SK, Canada, pp. 49.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 3385, 2009.