Hydrology and Earth System Sciences Discussions

Interactive Comment

Interactive comment on "Hydrological model coupling with ANNs" *by* R. G. Kamp and H. H. G. Savenije

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Received and published: 29 January 2007

First we would like to thank referee no 1 for the detailed comments. They are very useful and will help us to improve the paper. We shall answer the general comments, specific comments and technical corrections in the same sequence as used by the referee.

GENERAL COMMENTS (1) This is true. We compared four cascading systems coupled by ANNs with an integrated system formed by four conceptual models. We will rewrite the introduction and the first paragraph. Apparently the description is not clear to the reader. (2) This is correct. We will emphasize the difference between output variables from simulations results and observations. (3) We will consider making a flow chart of all input and output variables of the ANNs and conceptual model. A ta-

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ble may also be a good alternative. (4) The authors believe there are many reasons why such an application would be useful. If we can show that it is possible to simulate an integrated system with ANNs, then it is an alternative way for model coupling. A method of model coupling with ANNs has many advantages above coupling of conceptual models. With this method it is possible to couple models that are made in different software programs and to couple models outside hydrological and hydraulic modelling. There are additional advantages of cost reduction, flexibility and performance. (5) The reader would like to have more detailed information of each separate application. We shall add more detailed information on the simulation models. At the same we feel not all information is necessary and that the details may distract the reader.

SPECIFIC COMMENTS (1) We shall describe the rainfall-runoff model in more detail and refer to previous literature on this subject. We shall give a better description of the input and output variables of the conceptual models. (2) Section 3 Methodology will be revised and anticipated at the beginning of the paper. (3) We can describe the ANN in more detail and give for example the exact number of neurons in each layer. We believe, however, that too much elaboration on what an ANN is, is redundant and will annoy, or distract the reader. We will pay attention to this issue and provide more detailed information in places where it does not disctract the reader too much. (4) Table 1 considers the coupled ANN models. A better description will be given in the final version of the paper. (5) All figures will be cited and described in the text including a detailed caption describing each panel and what it represents.

TECHNICAL CORRECTIONS We will adjust the paper according to the technical corrections. The important corrections are: (p.3631). We tried to emphasize that ANNs are used as input/output machines. It is not possible to design a physical network by changing ANN parameters like neurons and hidden layers. We did not try to put conceptual knowlegde directly into the ANNs by changing its structure or weight sets. (p.3632) a is the slope parameter of the sigmoid function. (p.3635) Cdet is linearly related to Sf/S. (p.3639) The HBV parameters are calibrated.

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