Hydrology and Earth System Sciences Discussions

Interactive comment on "Classification of heterogeneous precipitation fields for the assessment and possible improvement of lumped neural network models for streamflow forecasts" *by* N. Lauzon et al.

N. Lauzon et al.

We want to thank D. Solomatine for his detailed review of our manuscript. In this reply, we are addressing his specific comments. Of course, we will address all the Referee's specific comments and technical corrections if we are advised by the editorial board to submit a revised version of the paper.

1. We will use the term "clustering" instead of "classification".

2. This comment refers to pages 210 and 213. Hydrological models, whether deterministic or data driven, need data at several stages of their implementation. Such stages include training (and sometimes stop training), model selection, and testing. In a research context, it is important that the results be not greatly affected by the climatic

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variability within each sub data sets to ensure robust conclusions. The best way to achieve this involves using as much data as possible for training. As well, NN are interpolators and not extrapolators, and it is therefore important that the testing data set have statistical characteristics similar to the training data set. The similarity between training and testing data sets is assured through a random selection within each clusters. It must be noted that few studies go into so much efforts on that respect. However, the Referee's interpretation is correct. This approach implies that the testing data set is also used for model selection. We will make sure that this point is more clearly stated in the manuscript.

3. We agree with the Referee that input selection is a vital issue in any NN models. Here, the daily time step leads to very simple networks and prevent the use of any more sophisticated means of determining appropriate time lags. Nonetheless, one has to keep in mind that NN are non linear tools and that linear correlation matrices could be of limited interest in devising a useful NN. We will make sure than the lag selection issue be discussed with more details even if it is not a major concern in this work.

4. We agree with the Referee that the proposed model is dependent on adequate streamflow observations. We will add a discussion of this issue in the manuscript.

5. Again, the referee raises an interesting issue. Converting rainfall pattern clusters into time series is indeed challenging (this issue is also raised by the other Referee). Our goal is clear: describing the heterogeneity of precipitation fields within a watershed. Of course, some challenges and shortfalls may arise by doing that. However, as stated by the referee: "the data used does not have a high temporal resolution, so this must be the reason this alternative approach was not used here." This issue will be dealt in more details.

6. The references to the figures in the text and the numbering of the figures will be reviewed and corrected, and Figure 4 will be improved.

7. Streamflow and precipitation data are expressed in mm. The units for RMSE are

thus also in mm.

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