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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.

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First of all we wish to thank E. Toth for the careful examination of our paper and the very detailed review she provided. In our reply we are focusing on her 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. The referee's first comment adequately highlights that the production of input time series respecting the heterogeneity of the precipitation is subjective (this issue is also raised by the other Referee). This subjectivity is stated in page 215 (line 8), and we will make sure to clarify issue also earlier in the paper.

2. (section 4.2, p. 213) We elected not to give detailed results of the input selection

phase since the model is limited to two inputs. However, such an analysis was performed as stated at the top of page 213 in the manuscript. “Pertinent input vectors for Bas-en-Basset one day-ahead streamflow forecasts are the streamflow and the precipitation of the previous day. These have been identified in a step-wise manner, as in Anctil et al. (2004b), from a pool of candidates consisting of streamflow, mean areal rainfall and potential evapotranspiration with time-lags of one to three days.” The number of hidden neurons is set at 5 during this input selection phase. Following the input selection, refinement of the neural networks involves optimizing the number of hidden neuron, as stated in the manuscript in page 213. “At this stage of input selection, the number of hidden neurons is set at 5. After the input selection, the number of hidden neurons is optimized by trial and error from 2 to 35.” We will modify the manuscript to increase the clarity of this information.

3. (section 4.2 & Table 3) The Referee correctly identifies the persistence index as one of the best tool for goodness-of-fit measurement. The SSE calculation is given here for completeness. We are assessing the partitions of a dataset, and the overall SSE is the sum of the SSEs of all partitions. The SSE (and RMSE) also describes how the overall error is distributed between the partitions of the dataset, and this information that is not as clearly provided by the persistence index. Obviously heteroscedasticity explains part of our results. However, as stated in page 214 (line 20): “The SSEs and RMSEs must also be weighted with respect to the amount of precipitation and streamflow level (e.g. group 3 in both the 3- and 6-group classifications), as they usually become larger as the average precipitation and streamflow increase.” As a whole, we aim at providing readers with the most complete information possible. The Referee argues that the good persistence index of group 3 shows that the model is somehow able to take into account the heterogeneity of the precipitation field. We are in complete agreement, and this is exactly what we are trying to express in the paper. For example, we have written in page 215 that: “the results demonstrate that [the models] have a capacity to accommodate heterogeneous precipitation fields.” We will try to improve the manuscript to avoid any misinterpretations.

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4. (page 215, lines 4-7) We will more clearly identify groups with degrading performance.

5. (page 215, lines 8-10) We all agree here. 6. (page 215, lines 11-16) The Referee is proposing more testing. However, we feel that enough analyses to fulfill the objective of this manuscript. As stated by the title, the objective is: “Classification of heterogeneous precipitation fields for the assessment and possible improvement of lumped neural network models for streamflow forecasts.” The issue of an ensemble of models is mentioned in the discussion for completeness but is beyond the objective.

7. (page 215, lines 17-19) The apparent divergence of opinion has already been clarified in point 3 above.

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