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Supplement of

Assessing the adequacy of traditional hydrological models for climate change impact studies: a case for long short-term memory (LSTM) neural networks

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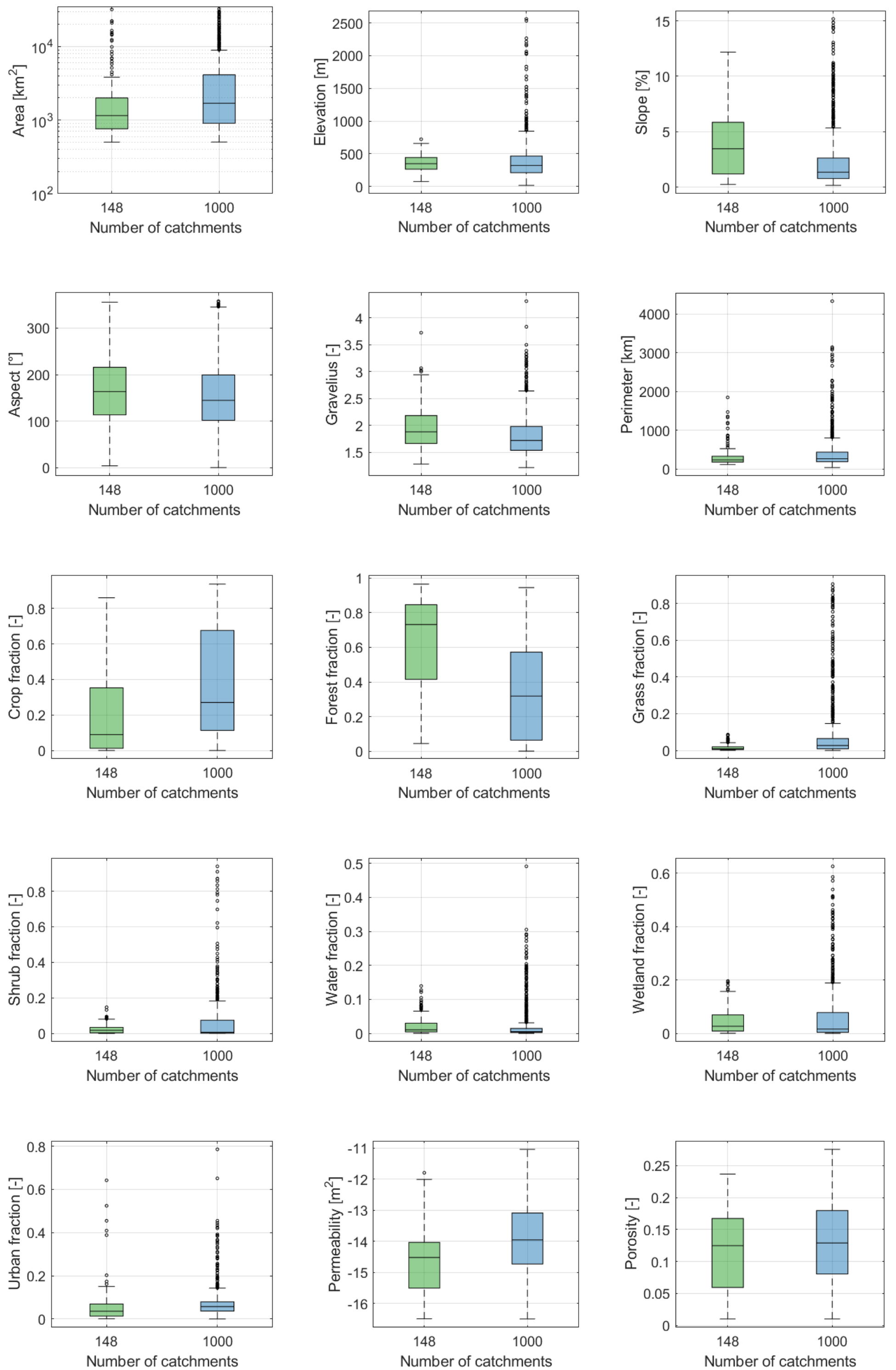

Figure S1: Catchment descriptors for the 148 catchments of this study and for the 1,000 extra donors catchments for the extended LSTM-based model.

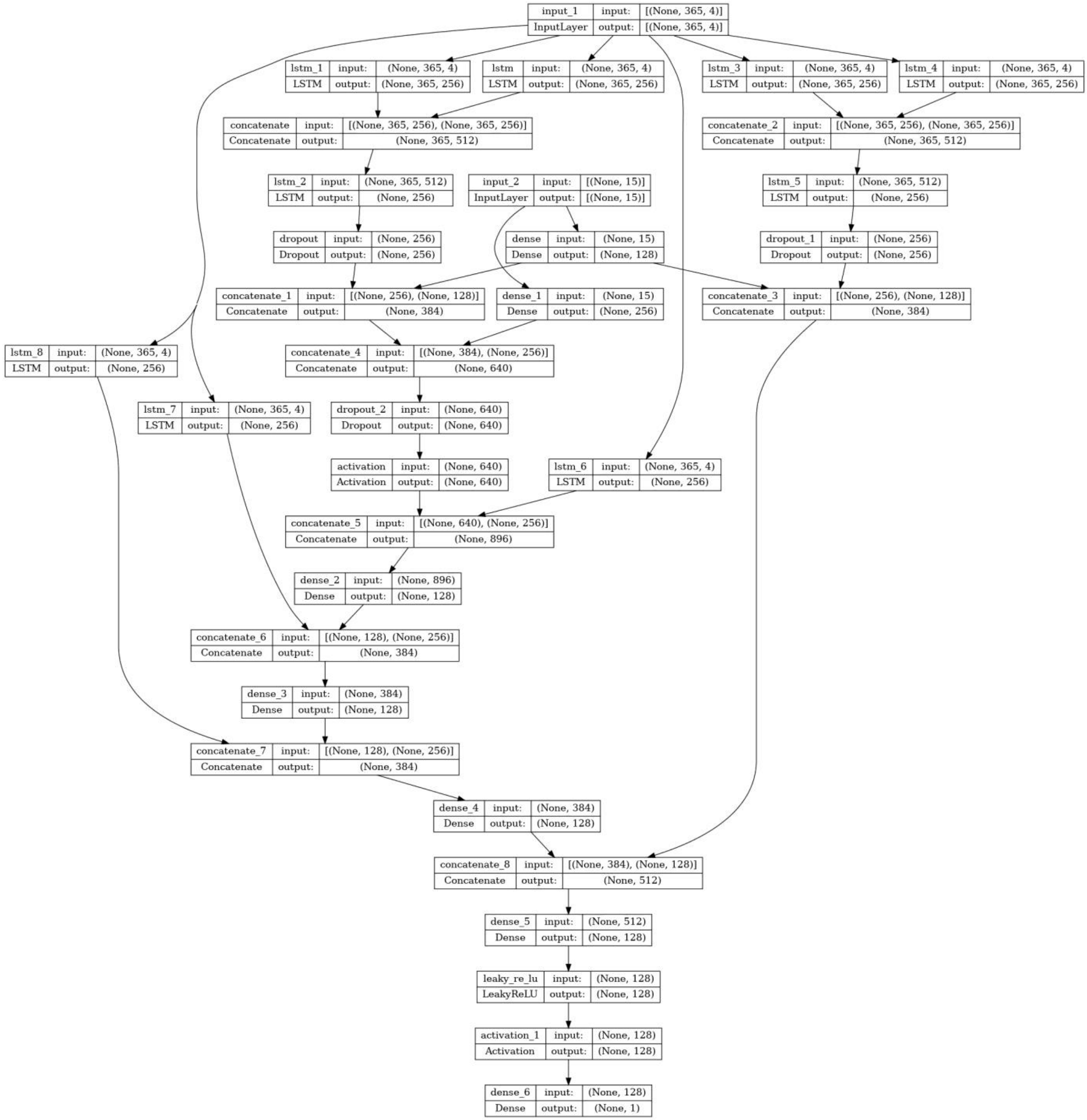

Figure S2: LSTM-based model structure developed and implemented in this study.

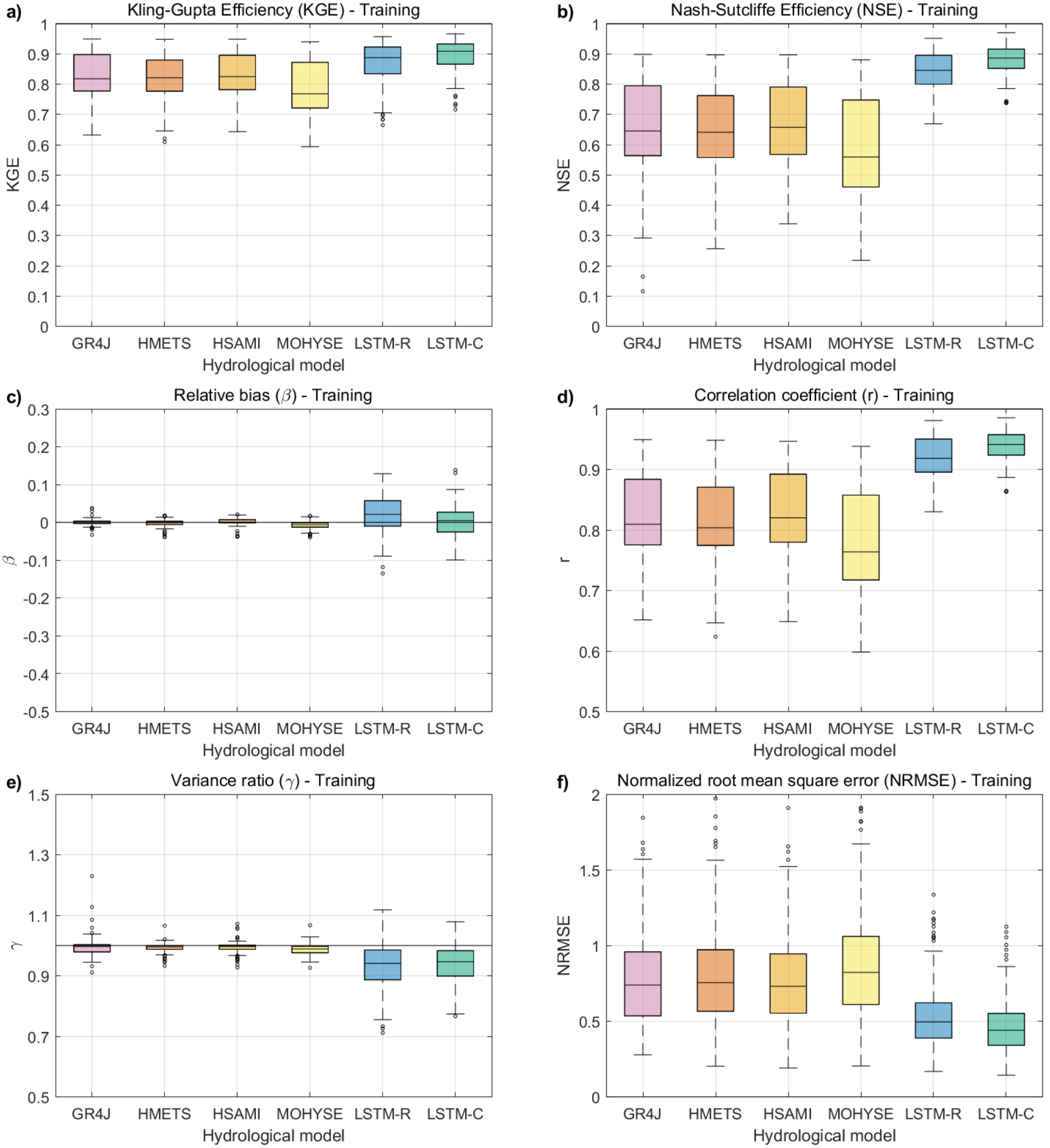

Figure S3: Kling-Gupta Efficiency (KGE; a), Nash-Sutcliffe Efficiency (NSE; b), relative bias (*β*; c), correlation coefficient (*r*; d), variance ratio (*γ*; e), and normalized root mean square error (NRSME; f) metrics over the independent 5-year training period (1983-2002).

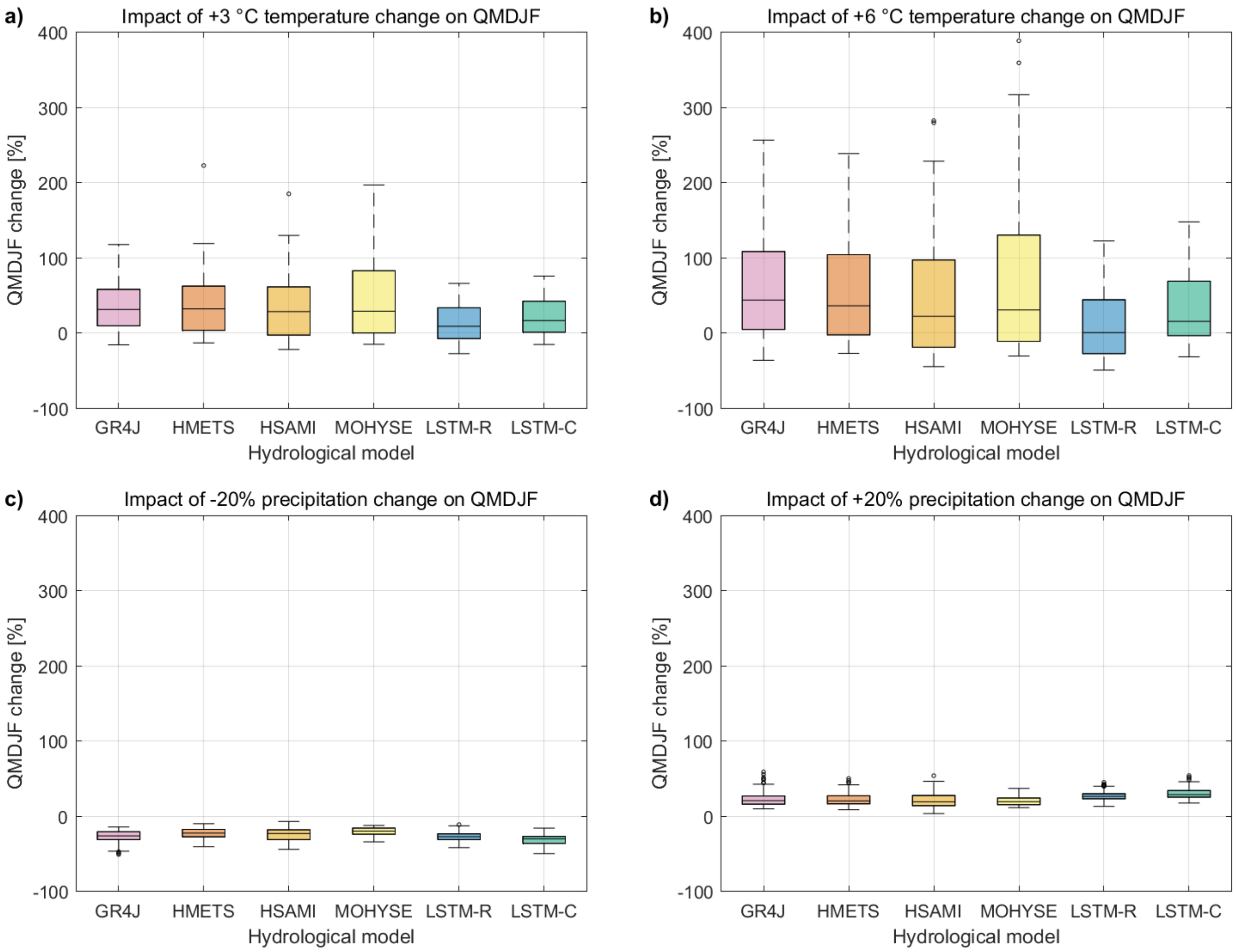

Figure S4: Projected mean winter streamflow (QMDJF) changes for the 4 sensitivity scenarios: temperature increase of +3 °C (a) and +6 °C (b) and precipitation relative change of -20% (c) and +20% (d).

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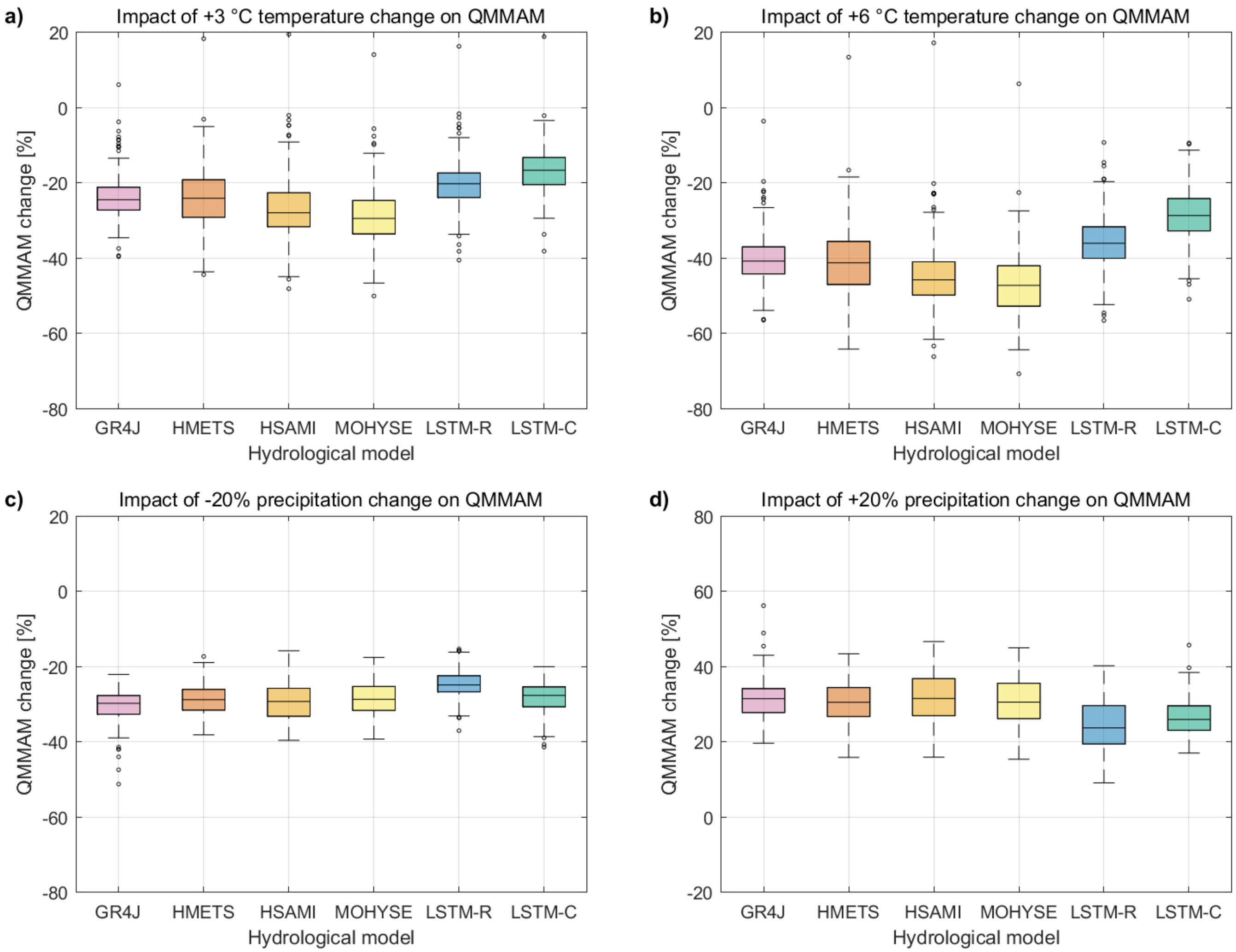
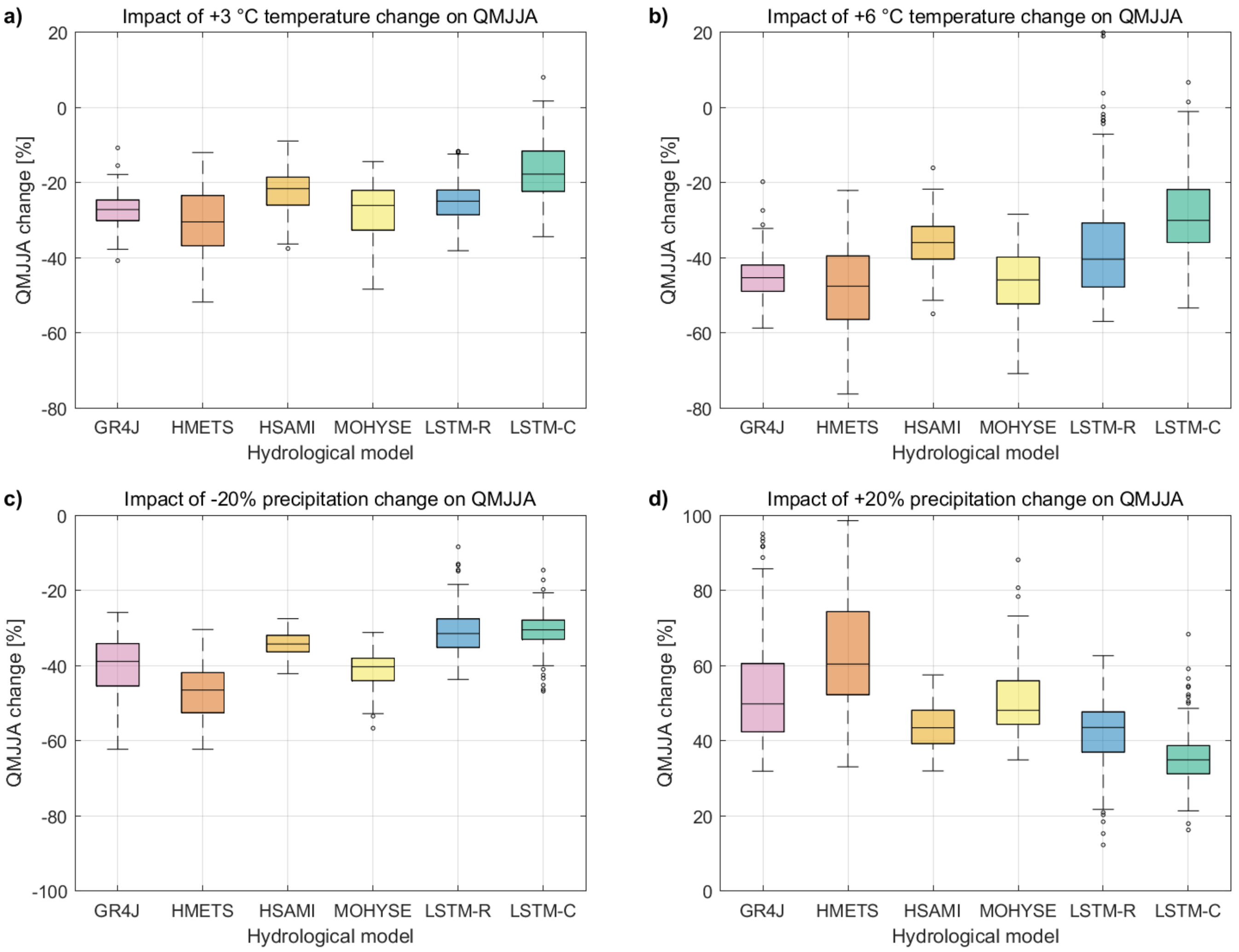


Figure S5: Same as Figure S4, but for mean spring streamflow (QMMAM).



35 **Figure S6: Same as Figure S4, but for mean summer streamflow (QMJJA).**

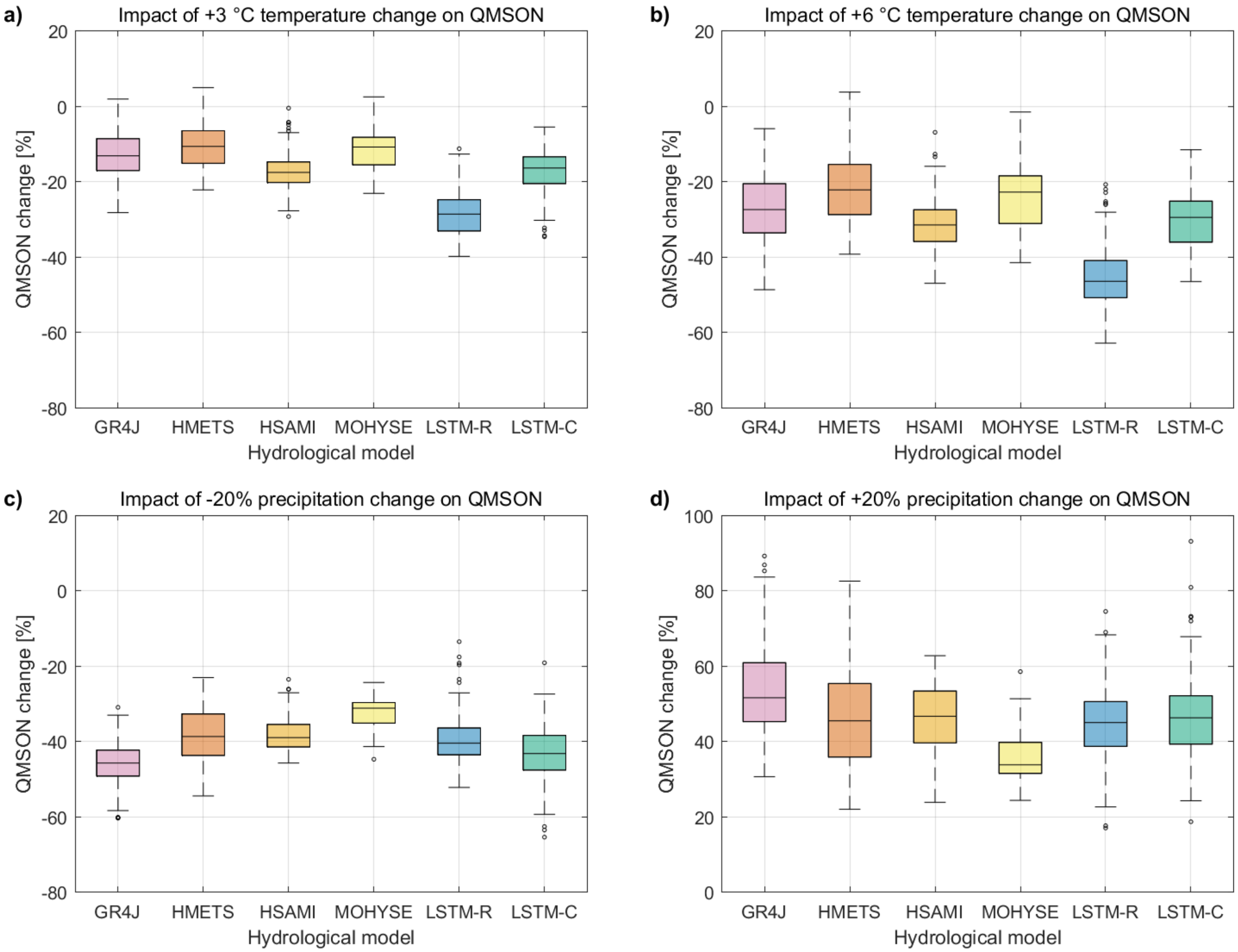
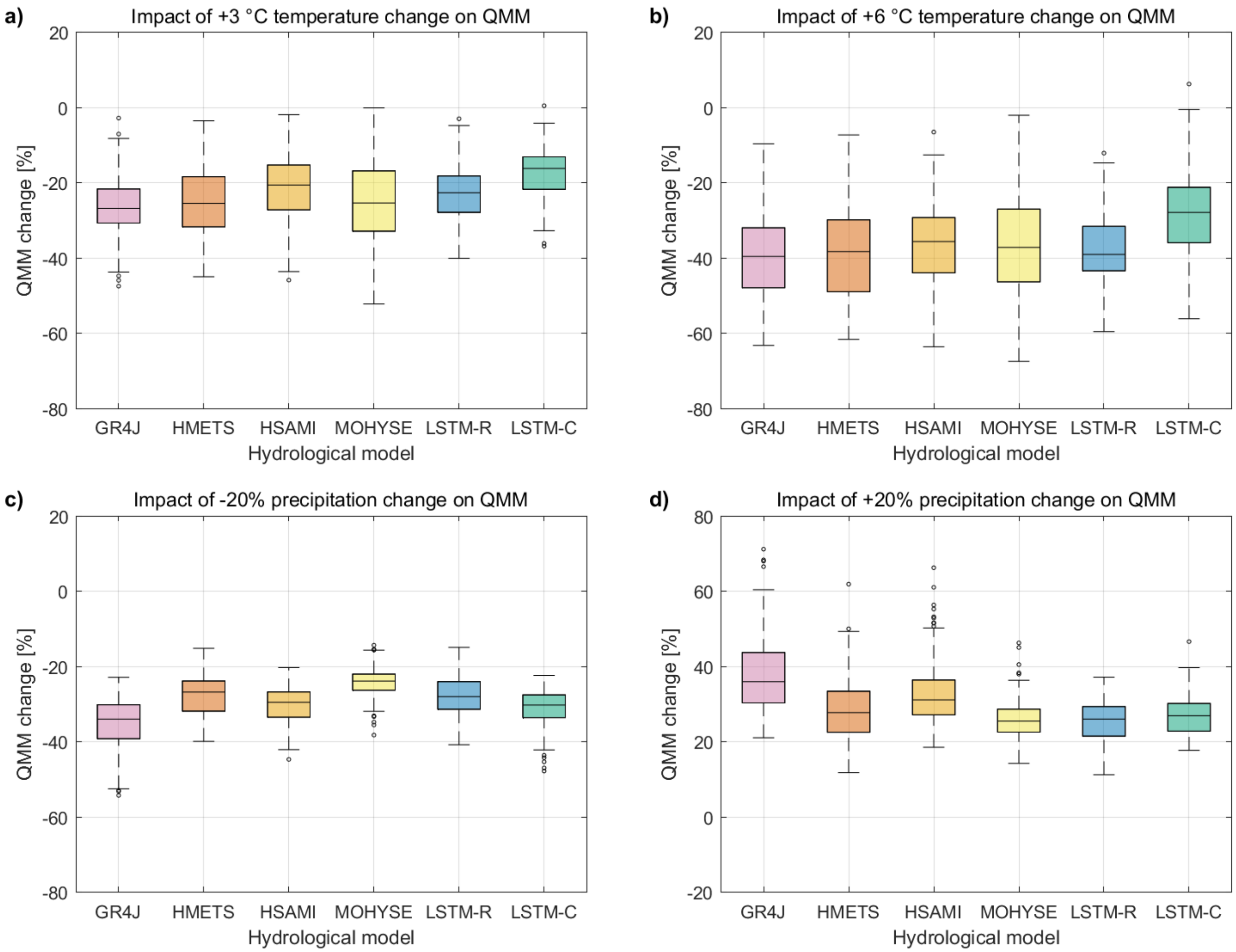


Figure S7: Same as Figure S4, but for mean fall streamflow (QMSON).



40 **Figure S8: Same as Figure S4, but for mean annual maximum streamflow (QMM).**

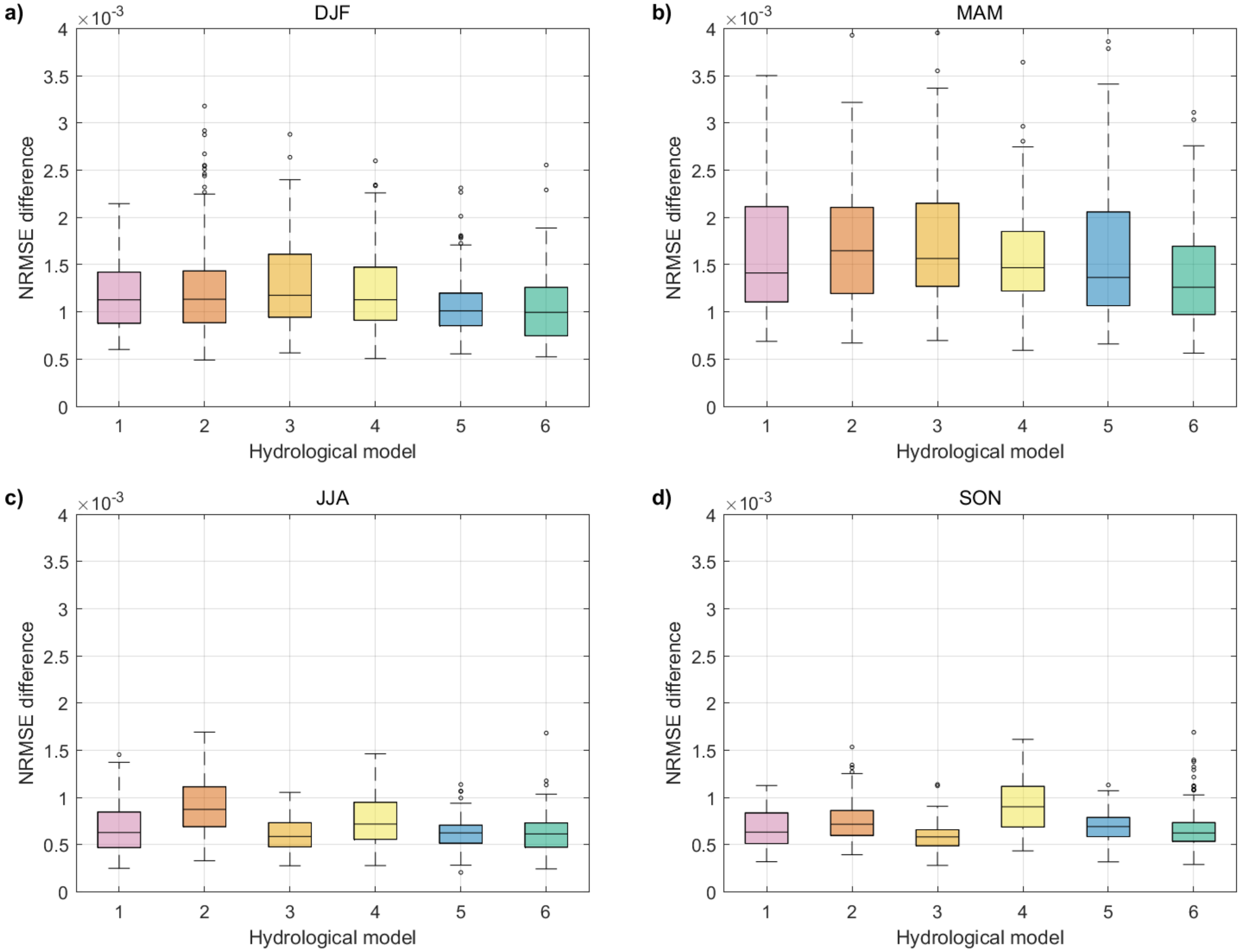


Figure S9: Seasonal NRMSE difference between the annual mean hydrograph and the mean of the 10 closest analogue catchments out of the 1,000-donor population. The boxplots are drawn from the 148 NRMSE values, one for each catchment. Each catchment value represents the average across all 22 GCMs.

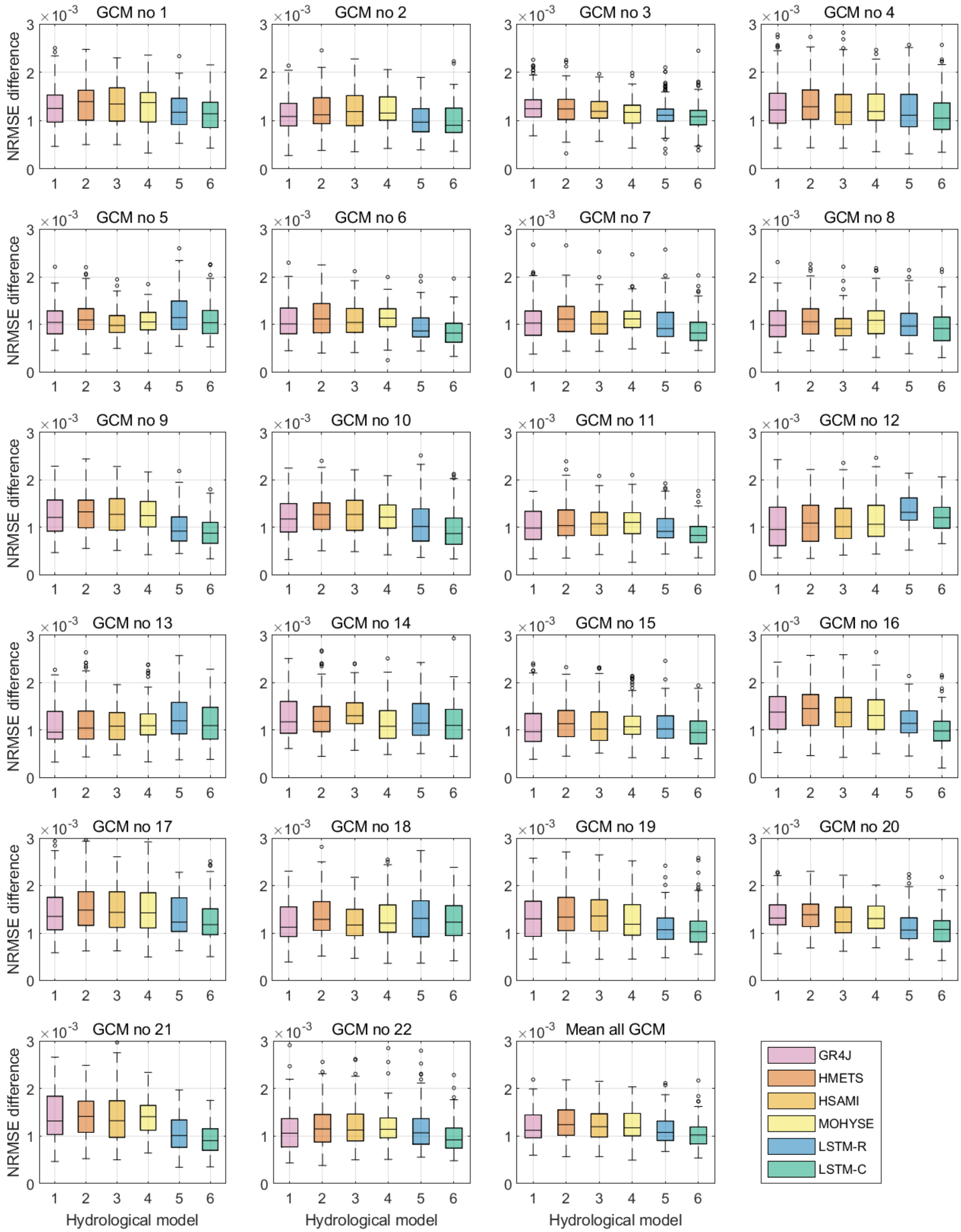


Figure S10: NRMSE difference between the annual mean hydrograph and the mean of the 10 closest analogue catchments out of the 1,000-donor population. The boxplots are drawn from the 148 NRMSE values, one for each catchment. There is one boxplot for each individual GCM, and one last boxplot showing the average across all 22 GCMs (same as Figure 9 of the paper).