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Multimodel evaluation of twenty lumped hydrological models under contrasted climate conditions

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The research project proposes a methodology to interpret hydrological projections in a climate change context and to quantify model suitability as well as their potential transposability in time. This is achieved by applying the Differential Split Sample Test procedure on twenty lumped conceptual models, for two different catchments, in the Province of Québec (Canada) and in the State of Bavaria (Germany). First, a calibration/validation procedure was applied on four historical non-continuous periods with contrasted climate conditions. Then, model efficiency was quantified individually (for each model) and collectively (for the model ensemble). The individual analysis evaluated model performance and robustness. The ensemble investigation, based on the average of simulated discharges, focused on the twenty-member ensemble and all possible model subsets. Results showed that using a single model without performing a Differential Split Sample Test may provide hazardous results in terms of climate transposability. Overall, some models turned out as a good compromise in terms of performance and robustness, but never as much as the twenty-model ensemble. Model subsets offered yet improved performance and structural diversity, but at the expanse of spatial transposability.