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How much value is in climate and geomorphological descriptors for distributed hydrological modelling? A decision tree based approach in North-Western Italy

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Large scale modelling is becoming increasingly important in hydrology, particularly to characterize and quantify changes in the hydrological regime, whose drivers are typically large-scale phenomena, up to the global scale (e.g., climate change). This can be done with distributed models by estimating spatially consistent model parameters, that are parameters having a functional relationship with catchment characteristics. In this study we adopt the newly developed PArameter Set Shuffling (PASS) approach, based on a machine learning decision tree algorithm, for the regional calibration of the SALTO (SAme Like The Others) model. The method exploits observed patterns of locally calibrated parameters and catchment (climatic and geomorphological) descriptors, to derive functional relationships between the variables. The results, for around 100 catchments located in North-Western Italy, demonstrate that the use of regionally calibrated parameter sets results in similarly good performances as for local calibration. This suggests that the predicted parameter sets can be efficiently used for streamflow prediction in ungauged basins or under changing conditions.