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Assessing the accuracy of simulated peak discharges using Self Organizing Maps

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Distributed watershed models constitute a key component in flood forecasting systems. It is widely recognized that models because of their structural differences have varying capabilities of capturing different aspects of the system behaviour equally well. Of course, this also applies to the reproduction of peak discharges by a simulation model which is of particular interest regarding the flood forecasting problem.
In our study we use a Self-Organizing Map (SOM) in combination with index measures which are derived from the flow duration curve in order to examine the conditions under which three different distributed watershed models are capable of reproducing flood events present in the calibration data. These indices are specifically conceptualized to extract information on the peak discharge characteristics of model output time series which are obtained from Monte-Carlo simulations with the distributed watershed models NASIM, LARSIM and WaSIM-ETH.
The SOM helps to analyze this data by producing a discretized mapping of their distribution in the index space onto a two dimensional plane such that their pattern and consequently the patterns of model behaviour can be conveyed in a comprehensive manner. It is demonstrated how the SOM provides useful information about details of model behaviour and also helps identifying the model parameters that are relevant for the reproduction of peak discharges and thus for flood prediction problems. It is further shown how the SOM can be used to identify those parameter sets from among the Monte-Carlo data that most closely approximate the peak discharges of a measured time series.
The results represent the characteristics of the observed time series with partially superior accuracy than the reference simulation obtained by implementing a simple calibration strategy using the global optimization algorithm SCE-UA. The most prominent advantage of using SOM in the context of model analysis is that it allows to comparatively evaluating the data from two or more models. Our results highlight the individuality of the model realizations in terms of the index measures and shed a critical light on the use and implementation of conventional calibration strategies.
Reference:
Herbst, M., and Casper, M. C.: Towards model evaluation and identification using Self-Organizing Maps, Hydrol. Earth Syst. Sci., 12, 657-667, 2008.