Geophysical Research Abstracts
Vol. 21, EGU2019-10998, 2019
EGU General Assembly 2019

Towards regional consistent parameters of distributed hydrological models

Ralf Merz, Larisa Tarasova, and Stefano Basso

Helmhotz Centre for Environmental Research UFZ, Department for Catchment Hydrology, Halle (Saale), Germany (ralf.merz@ufz.de)

One of the main challenges in applying distributed conceptual hydrological models to a large set of catchments is finding regional consistent parameters, i.e. parameters that vary according to changes of landscape or climate characteristics among catchments. Often regional calibration is applied, i.e. calibration is performed on regional functional relationships between model parameters and catchment characteristics instead that on the parameters themselves. However, what catchment characteristics should be selected to define regional functional relationships is not clear. In this study we present a parameter set shuffling approach, which does not require prior assumptions on the relationship between predictors and response variable.
Lumped parameter sets are initially calibrated for each catchment, and all sets providing good model efficiency (e.g., the best 5%, of parameter sets in terms of model efficiency) are retained. In a second step, one set for each catchment is selected and a machine learning approach (in this study decision forests) is applied to detect relations between parameters and catchment characteristics for a group of training catchments. Based on the relationships regional consistent parameters are predicted and their model performances are calculated In a third step other combinations of good parameter sets are tested until a satisfactory improvement in the model efficiency for all training catchments is achieved. In a last step the relationships are used to predict parameters for the distributed model.
The approach is applied to find regional consistent parameter sets for a conceptual 15-parameters distributed hydrological model applied to 300 German catchments at daily time step and on a 8x8km grid scale. Several regional consistent parameter sets with a median Kling-Gupta model efficiency of about 0.7 could be found. The approach performs similarly well in predicting distributed parameter for ungauged catchments. The relationships between model parameters and catchment characteristics are then discussed in terms of regional hydrological processes.