Geophysical Research Abstracts, Vol. 8, 02121, 2006
SRef-ID: 1607-7962/gra/EGU06-A-02121

Regional calibration at multiple scales

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The most common application of regional calibration of hydrologic models is the regionalisation of model parameters into regions where streamflow data is unavailable. The main goal of this study was to evaluate a model performance and parameter uncertainty of the iterative regional calibration procedure (IRC). In comparison to traditional calibration, where the model parameters are adjusted to local measurements of runoff and eventually other variables (like groundwater levels or snow cover data), the applied IRC uses in parameter optimisation, additionally to local information, the constraints based on regionally transposed model parameters. Based on daily simulation of hydrologic balance in period 1976-1997, we evaluated the runoff and snow cover model efficiency and judged the parameter uncertainty of regionally calibrated model parameters over 320 Austrian catchments. The ensemble of 320 catchments include catchments with the area from 10 km^2 to 9 770 km^2, and covers diverse hydroclimatic regions of Austria. For the efficiency estimation we performed split sample test in the terminology of Klemes (1986). We used the 11-year periods in turn for calibration and validation, and compared the model performances from both arrangements. We judged the parameter uncertainty by comparing the model parameters calibrated for the 1976-1986 period with those calibrated for the 1987-1997 period. The results showed that the iterative regional calibration enables a reliable calibration of conceptual hydrologic model at multiple scale. The evaluation of spatial variability of model parameters demonstrated the benefits of IRC in the reduction of noise in poorly identified model parameters. The assessment of parameter uncertainty indicated that constraining the model parameters to regionally transposed values reduces the scatter between model parameters optimised for two different 11-years calibration periods.

Klemes V. 1986. Operational testing of hydrological simulation models. Hydrological Sciences Journal 31: 13-24.