



Multivariate calibration of a water and energy balance model in the spectral domain

Valentijn Pauwels and Gabrielle De Lannoy

Ghent University, Hydrology and Water Management (LHWM), Ghent, Belgium (valentijn.pauwels@ugent.be, +32-9 264 62 36)

The objective of this paper is to explore the possibility of using multiple variables in the calibration of hydrologic models in the spectral domain. A simple water and energy balance model was used, combined with observations of the energy balance and the soil moisture profile. The correlation functions of the model outputs and the observations for the different variables have been calculated after removal of the diurnal cycle of the energy balance variables. These were transformed to the frequency domain to obtain spectral density functions, which were combined in the calibration algorithm. It has been found that it is best to use the square root of the spectral densities in the parameter estimation. Under these conditions, spectral calibration performs almost equally well as time domain calibration using least-squares differences between observed and simulated time series. Incorporation of the spectral coefficients of the cross-correlation functions did not improve the results of the calibration. Calibration on the correlation functions in the time domain led to a worse model performance. When the meteorological forcing and model calibration data are not overlapping in time, spectral calibration has been shown to lead to an acceptable model performance. Overall, the results in this paper suggest that, in case of data scarcity, multivariate spectral calibration can be an attractive tool to estimate model parameters.