Achieving optimal model complexity through objective selection and simplification of alternative structures

Albert I.J.M. van Dijk

CSIRO Land and Water, Canberra ACT, Australia (albert.vandijk@csiro.au)

A formal method was developed to achieve optimal model complexity where alternative conceptual structures exist or there are several free model parameters. The method was applied to alternative lumped model structures for surface runoff prediction and for baseflow recession estimation, respectively. The objective performance measure is based on Aikake's Information Criterion (AIC), which attempts to account for the effect of the number of free parameters in the calculation of model prediction error. Model simplification involves stepwise reduction of the least important free parameters, either by removing it or replacing it by a single prior estimate. The model with the optimal performance among all structures and variants is selected as having the optimal trade-off between model complexity and parsimony. Caveats of the method are associated with the assumptions in the AIC model, how telling the used error statistic is, and how representative the data available for performance assessment.