Neil Viney

Comparison of methods for predicting Australia-wide streamflow generation.

This paper presents a comparison of several models and methods for estimating continental-scale streamflow generation in Australia. It assesses three techniques for deriving or enhancing streamflow predictions in ungauged catchments: nearest-neighbour regionalisation of locally calibrated models, global calibration, and model averaging using multi-model and multi-donor approaches. Eight models are considered, including five lumped rainfall-runoff models (AWBM, IHACRES, Sacramento, Simhyd and SMAR-G) and three continental scale models (AWAP, AWRA-L and CABLE). The lumped models are assessed by separate calibration on 408 unimpaired catchments and are validated using nearest-neighbour regionalisation. The continental-scale catchments are applied to the same 408 catchments using default parameter values. Results show that the regionalised lumped models can provide better streamflow predictions than the continental-scale models. Prediction accuracy can be improved further by multi-model averaging–even when the relatively poorly performing continental scale models are included in the averaging scheme—and by multi-donor averaging of the lumped models. One of the continental-scale models is shown to produce substantially improved predictions when it is calibrated (to obtain a single set of model parameters) against half the catchments and evaluated on the remainder. This procedure yields streamflow predictions that are almost as good as the regionalised lumped models. However, it is shown that the performance of the nearest-neighbour regionalisation scheme deteriorates with increasing regionalisation distance. Even the use of relatively small regionalisation distances renders the predictions of the lumped models as inferior to those of the globally-calibrated continental-scale model.