

CONCEPTUAL MODEL IMPROVEMENT BY INCLUSION OF CATCHMENT-SCALE PROCESS DESCRIPTIONS AND LANDSCAPE ATTRIBUTES

M. Sivapalan and C. Zammit

Centre for Water Research, University of Western Australia, 35 Stirling Highway,
Crawley WA 6009, Australia
sivapalan@cwr.uwa.edu.au/Fax: +61 8 9380 1015

The main drawback of conceptual hydrological models is the number of parameters that need to be estimated by calibration. Due to the scarcity of streamflow data for calibration (95% of the catchments of the world are ungauged), application of such models to predict ungauged catchments is not feasible without substantial improvements to the modeling framework. In this paper, we present improvements of the LASCAM model (large catchment model of streamflow, salinity, sediments and nutrients), which are realized by step-by-step approach based on the introduction of catchment scale process descriptions and catchment physical attributes. Based on considerable fundamental work carried out at the Centre for Water Research, under the label of the downward approach, the description of the soil hydrology of the surface soil layer was improved using a VIC-type model based on measurable soil depths. Due to the importance of the unsaturated zone delay the unsaturated zone description has also been improved. Finally a conceptual physical description of the deeper groundwater system has been implemented. The results show that: i) the number of parameter to be calibrated can be drastically cut down; ii) most of the parameters have a “physical” meaning and can, in principle, be estimated *a priori*; iii) the conceptual stores now have a more physical description and meaning; and iv) the application of the model on different catchments shows that the observed hydrographs are well reproduced, with an improved accuracy and efficiency of computation.