

# The Quest for an Improved Dialog Between Modeler and Experimentalist

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Multi-criteria calibration of runoff models using additional data, such as ground-water levels or soil moisture, has been proposed as a way to constrain parameter values and to ensure the realistic simulation of internal variables. Nevertheless, in many cases the availability of such 'hard data' is limited. We argue that experimentalists working in a catchment often have much more knowledge of catchment behavior than is currently used for model calibration and testing. While potentially highly useful, this information is difficult to use directly as exact numbers in the calibration process. We present a framework whereby these 'soft' data from the experimentalist are made useful through fuzzy measures of model-simulation and parameter-value acceptability. The use of soft data is an approach to formalize the exchange of information and calibration measures between experimentalist and modeler. This dialog may also greatly augment the traditional and few 'hard' data measures available. We illustrate the value of 'soft data' with the application of a three-box conceptual model for the Maimai catchment in New Zealand. The model was calibrated against hard data (runoff and groundwater-levels) as well as a number of criteria derived from the soft data (e.g., percent new water, reservoir volume). While very good fits were obtained when calibrating against runoff only (model efficiency = 0.93), parameter sets obtained in this way showed, in general, poor internal consistency. Inclusion of soft-data criteria in the model calibration process resulted in lower model-efficiency values (around 0.84 when including all criteria) but led to better overall performance, as interpreted by the experimentalist's view of catchment runoff dynamics.

## INTRODUCTION

Many different conceptual models of catchment hydrology have been developed during the last few decades [Singh, 1995]. These models have become valuable tools for water management problems (e.g., flood forecasting, water bal-

ance studies and computation of design floods). The increasing awareness of environmental problems has given additional impetus to hydrological modeling. Runoff models have to meet new requirements when they are intended to deal with problems such as acidification, soil erosion and land degradation, leaching of pollutants, irrigation, sustainable water-resource management or possible consequences of land-use or climatic changes. Linkages to geochemistry, ecology, meteorology and other sciences must be considered explicitly and realistic simulations of internal processes become essential.

