

**Improving the prediction capabilities of catchment streamflow models
(ARC Discovery grant proposal submitted in 2006)**

The aim of this project is to examine how multi-objective (model) structure selection and calibration of hydrological catchment models, with more systematic and effective use of prior knowledge, can be used to improve a model's predictive capability. Sensitivity assessment and the concept of Pareto optimality will be incorporated as basic tools to achieve this aim. By predictive capability we mean that we take into account the relevant multiple objectives and usefully capture a measure of the associated "variability" of the model structure, inputs and parameters and their effect on the flows and any other predicted outputs. We avoid the term "uncertainties" to recognise that we cannot capture all of these. Our more modest aim is to improve prediction of flows at gauged and ungauged sites through use of multi-objective calibration methods, and simultaneous, coupled calibration at a number of gauged sites. Presently there are two main approaches to catchment modelling: simple, empirical and/or conceptual models, lumped in space over the whole catchment; or elaborate, fully or semi-distributed models representing water loss, storage and flow processes in some conceptual and/or physics-based detail (*e.g.* Wheater *et al.*,1993).

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