



## **Diagnostic tests for model structure**

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It is common knowledge that hydrological models based on inappropriate conceptualisations of the catchment can still be calibrated to give good performance in reproducing discharge records. Calibrated models of this type are unsuitable for many of their intended uses. To improve model conceptualisations and allow models to be tailored for individual applications and catchments, modellers need a toolbox of diagnostic tests for model structure. These tests would use a range of field measurements to allow hydrological modellers to test hypotheses about different aspects of model structure.

This presentation demonstrates how multiple datasets (rain, flow, soil moisture, tracer studies) can be used to develop perceptual and conceptual models; using a case study in the intensively monitored Mahurangi catchment in New Zealand. Our emphasis is on the use of field data to target individual modelling decisions, and hence to draw conclusions relevant to model building at the catchment scale. The goal is to "bridge the gap" between experimental studies and larger-scale model simulations.

The model building decisions are then tested using the FUSE multi-model framework. The framework allows independent control of model choices in representing a range of storages and fluxes. We compare structural diagnostics from field data, realistic and unrealistic model structures, with the aim of untangling the effects of model structure and parameterisation.