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## **Using data from research basins to identify appropriate model structures**

Concepts of diagnostic signatures are changing the approach of the hydrological community to model performance assessment. Through diagnosis of parameter sets, and then of model structure, hydrologists now seek models which are consistent with multiple observed data sets, analysed according to particular aspects of hydrological process. The aim of model structure improvement is essential to the PUB goals, since models whose structures are consistent with catchment function will be much better placed to make predictions in ungauged catchments.

This presentation explores some of the opportunities and challenges we found when putting ideas of model structure diagnostics into practice, to recommend preferred model structure in the experimental Mahurangi catchments in New Zealand. We show examples where competing model structures can be clearly differentiated, but also where different diagnostic tools can be interpreted to give conflicting recommendations for structure. In some cases this apparent conflict can be traced to the effects of spatial scale; and hence diagnostic signatures can be used to give us a window into changes of dominant processes with scale. An example using the scaling properties of percolation in the Mahurangi shows how diagnostics can inspire new interpretations of existing data and lead to improved model design.

Finally we demonstrate the use of diagnostics from subcatchments of varying scale, topography and vegetation within the Mahurangi. By examining the reasons for differences in these diagnostics, we take a step towards the goal of linking model structure to catchment characteristics.