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Catchment water storage: Models vs Measurements

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Recent years have seen a great deal of progress in development of hydrological models that can simulate both the dynamic streamflow response and the hydrochemical flux response of a catchment. In general terms, streamflow response is driven by water deficit in the catchment, whereas hydrochemical response is driven by water storage. Therefore, models that can simultaneously predict both responses must succeed in representing these two related, but different, quantities.

This presentation will consider how much information we can gain from field studies to quantify the joint deficit/storage state of a catchment. In particular, examples from two New Zealand experimental catchments in lowland and high country locations will be used to link typical measurements available with the information required by hydrological – hydrochemical models.

I will then use the example catchments to assess how well the structure of a typical hydrological-hydrochemical model is supported by field measurements. In particular, can we quantify catchment storage and link this to flow response? Can we incorporate our knowledge of plant water use into such a model, including timing and depth of water withdrawn by the plant? What can field measurements tell us about spatial variability in hydrological-hydrochemical response and can this be represented in the model? I will conclude by discussing what we can learn from field data about the major challenges ahead in catchment storage modelling.