

Aligning hydrological response spaces for prediction in ungauged catchments

The ungauged catchment problem may be posed in terms of hydrological response spaces, for example the three-dimensional space defined by ranges of values of baseflow index, runoff coefficient and hydrograph peakedness. Different (but usually overlapping) spaces can then be defined: the space containing responses from a population of real catchments; the space containing observed or regionalised data; the space mapped from a model's parameter space; and the space mapped from a model structure space. The problem is then one of creating, shaping and aligning these spaces so that: a suitable model is achieved; suitable observations are collected to discriminate between models; suitable information is included in the regionalisation; and useful uncertainty estimates are made. One interesting situation arises when the regionalised information can be mapped onto the parameter space of many models, leading to model equifinality and the conclusion that ideally more or better information is needed. Perhaps more interesting, is the situation where all the pieces of regionalised information cannot be simultaneously mapped onto the parameter space of the proposed model, implying mis-information and/or scope to refine the model structure. Unsatisfactory distance between the observed and regionalised responses is another possible outcome. These problems are illustrated using case studies and ways forward are proposed.