Making the most of hydrological data

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ABSTRACT

In this presentation I will argue that making the fullest and most creative use of existing hydrological data should be one of our key strategies in the coming decade for learning about hydrological processes. Hydrological modellers have an insatiable thirst for measured data, frequently wishing for increased spatio-temporal resolution and coverage, or observations of new variables. There is no doubt that more detailed observations can change our conceptual models of hydrological systems and dominant processes. But the collection of hydrological data can be expensive and time consuming, so an important consideration is whether we have yet made the most of our existing observations. Understanding the full value of data will equally allow us to collect 'best value' data where budgets are limited, and target our efforts at remaining gaps in our knowledge. This presentation will discuss some of the opportunities that model diagnostics offer to get better value from hydrological data. An overview of our recent work will show how new diagnostic analyses can improve our evaluation of model structure and parameters. This type of approach elevates data sources such as runoff measurements from a means of model performance testing, to a valuable insight into catchment behaviour. Examples from New Zealand and the UK will demonstrate how additional value can be gained by combining a variety of data streams, such as rain, flow, soil moisture and tracer data. Because diagnostics enrich our understanding of data, they have an important role in comparative hydrology. I will show how comparisons of runoff response diagnostics across international experimental basins can allow process understanding to be shared and contrasted. At the same time that we seek to get the best value from hydrological data, we must take care not to draw unwarranted conclusions. Uncertainty in observed data is a key control on the value of model diagnostics, and the modelling decisions that stem from them. Signatures that draw from multiple data streams or from fast-response processes may be at particular risk. I will discuss examples of the vulnerability of different diagnostic types to data uncertainty. This last point illustrates the linkages between diagnostic data interpretation and uncertainty assessment; which is typical of the interconnected nature of the proposed targets and science questions for the new decade. I will conclude with comments on how this call to 'make the most of our data' can fit into and enrich the new IAHS Science Initiative.