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Hydroinformatics: moving from rags to riches

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This paper reviews past and present developments in hydroinformatics. It argues for the development of more 'joined-up thinking'. This philosophical standpoint implies that the individual elements should be viewed as part of a whole - or in other words - as a system composed of different elements that should perhaps cooperate or could pool resources to produce a better result. It is argued that important changes are required to further the science and practice - or application - of data-driven modelling. Most published investigations are designed to unveil the potential merit(s) of some specific tool or method. Yet the application of innovative methodologies to either one or two isolated catchments or datasets seldom if ever produces universal insight(s). The reported methodologies are seldom if ever revisited or applied to a different set of catchments or datasets in a purposeful and constructive manner. This means that the published results from one investigation cannot be compared in a direct sense with other findings produced from another investigation in an unbiased manner since although the specified problem might well be similar in certain respects it is no longer identical. The specific challenge(s) in each individual scenario will be different such that it is impossible to differentiate with precision the extent to which the published result is based on the method as opposed to the 'problem situation'. The suspected reasons for such one-shot mentalities might be: a fascination with the latest gadgets and gizmos; non-recognition of the need to develop a solid scientific foundation; a natural reluctance on the part of hydrologists to share datasets; or perhaps something more fundamental and personal to do with the fear of being upstaged at some later point. Yet this problem is handicapping the progressive development of superior solutions since each individual modeller is to some extent left floundering and confused. If the reported experiments cannot be repeated, or the reported findings confirmed, it also devalues the original investigation on two counts since [1] excessive reliance must be placed on personal trust models and [2] each outcome must be viewed as an isolated or individualistic 'single-case-based' result. This is not to devalue the two main roles of

single-case-based studies: [1] to act as 'awareness demonstrators' and [2] to support the formulation of 'fresh ideas', for later, more rigorous, experimentation. The point is that if little or no attempt is made to repeat specific experiments, or to confirm published findings in the manner of reported scientific outputs, then the original material will have nothing to support it. The scientific method demands that effective comparisons be established and that studies be repeated. It is important to have experiments that can be reproduced and for results to be corroborated. Modern advances in communications and computing, the advent of the internet, and the proliferation of high-speed connections and servers have produced unprecedented improvements in business collaborations and productivities. The present challenge is to harness the technologies that can streamline the capture and release of useful resources for the benefit of an international group of hydrological modellers both at present and in the future. There are many different ways in which this can be achieved. The most common method is to broadcast findings in open-access outlets. The publication of scientific papers is one of the main avenues to furthering the science and practice of a chosen field. However, to ensure maximum impact, a more direct approach would be to publish the research inputs and outputs in digital format on a download site for other scientists to draw upon. This would provide a common ground for subsequent investigations. The paper concludes with a strategic vision: a 'collective modelling environment' comprising open-access repositories for international datasets and archived model outputs.