

Merging modelling and experimental approaches to advance ecohydrological system understanding

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Abstract In this paper the need to merge model development and empirical experiments to improve the understanding of ecohydrological systems is emphasised. An ecohydrological model is used as an example to: (1) classify models in ecology and hydrology according to the level of process detail and understanding of system behaviour, followed by (2) a description of the beneficial interactions between model development and manipulative experiments. It is concluded that the development of a grey box model denotes both the starting and “end point” of a cycle of scientific discovery where the design of future empirical and manipulative experiments is governed by model-based hypotheses and uncertainty analyses. Empirical results feedback to the model development process through re-calibrating or re-structuring of the initial model.

Key words ecohydrology; model development; experimental design; white box; grey box; black box; scientific discovery