

Limits and failures in hydrology: examples and lessons learned from three decades of process oriented hydrological modelling

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In hydrological sciences there have been rather many attempts to develop new mathematical analysis and modelling tools. Some (or even many?) of them failed or were at least only partially successful. Unfortunately, such unsuccessful attempts are hardly reported on, because our common academic recognition is based on reports about success only. With all due respect to successful attempts, the scientific community could benefit a lot from reports of unsuccessful attempts or unexpected results.

Therefore, in this contribution, the author presents examples of modelling failures from his own experiences during the last three decades. Emphasis is given on results obtained from process-oriented hydrological models, where the “right answer” was obtained “for the wrong reasons”. Such examples comprise, for instance, modelling infiltration experiments at the plot scale, modelling runoff generation from hillslope scale and in experimental catchments and modelling runoff from glaciated catchments

It is explained how the “wrong reasons” could be identified and what was learned from such failures. It is argued that failures, which causes can be identified by the modeller or anybody else, could significantly contribute to a progress in hydrological system understanding or – at least – to the identification of research needs. Identification of causes of failure may even contribute more to scientific progress than brute force modelling of parameter sensitivity and uncertainty.