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ERB Medal Lecture

Observation and Modelling – The never-ending struggle of a hydrologist

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Abstract

The monitoring of hydrological processes, or hydrologically relevant state variables respectively, is a key target of each experimental research basin. It supports (1) the quantification of water balance components, (2) the understanding and perception of subprocesses and their interrelation and (3) enables the mathematical description in governing equations, computer codes and models. But even the measurement of basic hydro-meteorological variables like rainfall, evapotranspiration or surface runoff exhibit pronounced errors – especially in the extreme range – and so do other variables describing the soil-vegetation and atmosphere interaction. This is due to spatio-temporal variations and it is not easy to detect representative values for a basin domain.

As an example of strongly variable measurement procedures, the riverbed infiltration processes along parts of the Austrian Leitha River will be introduced. For groundwater management purposes, the knowledge of the recharge quantities is essential. So different techniques like differential discharge measurements, ring-infiltrometer experiments, implementation of a riverbed lysimeter, sediment experiment in the lab and empirical formulas based on soil particle distribution were carried out and compared. It could be shown, that the applied observations varied in the orders of magnitude. The verification of the estimated riverbed recharge was done by an inverse groundwater modelling approach.

The speech will also briefly address the frequently used misconception of hydrological models. Conceptual models are widely applied for numerous environmental studies not questioning, if the underlying concepts really reflect the processes of interest. An alternative modular model concept with the focus on dominant processes will be introduced and discussed.