



Multi-step strategy of analyzing time series collected at infiltrating rivers

O.A. Cirpka (1), E. Hoehn (1), M. Hofer (1), A. Tessarini (1)

(1) Swiss Federal Institute of Aquatic Science and Technology (Eawag), Überlandstr. 133, CH-8600 Dübendorf, Switzerland (olaf.cirpka@eawag.ch)

Time series of hydraulic head, temperature, and electric conductivity, collected in rivers and adjacent monitoring wells, contain information about the hydraulic exchange between the river and the aquifer. We have installed data-loggers in an infiltrating section of river Thur (Switzerland), four adjacent monitoring wells and a pumping station, where we have collected data over the last two years at a temporal resolution of $1h$.

We follow a multi-step strategy to analyze the data. In the first step, we perform cross-correlation of the various time series. The river-data are increasingly smoothed. The combination of time-shift and amount of smoothing with maximum correlation indicates the mean advective travel time and dispersion. In the second step, we deconvolute the time series to extract a linear transfer function. For regularization, we assume that the transfer function is autocorrelated, and we enforce nonnegativity by the method of Lagrange multipliers. In the third step, we allow for temporal changes in the heat- and mass-transfer characteristics by calibrating one-dimensional transport models driven by transient hydraulic gradients. In the final step, we allow for lateral shifts of travel paths with time by multi-dimensional transient simulation of flow and transport.