Stochastic investigation of the uncertainty in common rating-curve relationships

Panayiotis Dimitriadis, Theano Iliopoulou, Andreas Efstratiadis, Panos Papanicolaou, and Demetris Koutsoyiannis

Department of Water Resources and Environmental Engineering, School of Civil Engineering, National Technical University of Athens, Greece

A common issue in the river analysis is that most discharges measurements are taken from stage measurements and then an empirical expression is applied often called rating curves. There are several empirical relationships to determine the rating curves in order to estimate the river discharge when the water-surface is known and vice versa. Here, we investigate the stochastic uncertainty induced in empirical expressions of common rating curves. For this, we perform exhaustive Monte-Carlo experiments by assuming a theoretical stochastic structure (with or without fixed trends) for the river stage and we estimate the change in the dependence structure and marginal distribution of the river discharge. We further perform a sensitivity analysis on the input parameters of the common stage-discharge expressions in order to identify and estimate the overall induced uncertainty. Finally, we discuss on the results and we derive some preliminary conclusions on whether a stochastic structure (including trends) empirically estimated in terms of stage can be arbitarily translated into discharge.