Global Sensitivity Analysis and Multi-Objective Optimisation for Estimation of Combined Sewer Overflows – Case Study Linz

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ABSTRACT

The modelling of rainfall-runoff-transport processes in urban drainage systems is well established and extensively applied and described in the literature. While model analysis and model calibration are strongly advocated it is often neglected in general practise. This paper describes the application of state-of-the-art methods of global sensitivity analysis (GSA) and multi-objective model optimisation for assessment and calibration of a SWMM5 sewer model of the city of Linz, Austria. As part of the 7th EU framework programme project SUDPLAN, combined sewer overflow (CSO) efficiencies are assessed according to the current Austrian guidelines on CSO design to eventually evaluate impacts of future climate change scenarios. It is shown that with GSA it was possible to identify and rank the important model parameters influencing the CSO efficiency for dissolved and particulate pollutants. For model calibration, multi-objective optimisation was carried out for five independent storm events. Calibration yielded different quality of results depending on the investigated storm event. A synthetic parameter set was determined from weighting the five obtained parameter sets. Overall satisfying results were obtained and it was shown how the chosen methods can be successfully applied to real world application.

KEYWORDS

Combined sewer overflow, CSO efficiency, global sensitivity analysis, model calibration, model optimisation, sewer system modelling