Predicting Combined Sewer Overflow discharges as boundary condition for oceanographic models

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ABSTRACT

In coastal scale oceanographic models, land boundary discharges have a significant impact on the water quality assessment and should not be ignored when modelling maritime processes at this small scale. Unfortunately, detailed hydrodynamic sewer models require excessive calculation times and can therefore not be integrated directly in oceanographic models. However, the real-time integration of predicted CSO spills can be achieved when using a conceptual model.

The conceptual model proposed is based on a reservoir-type schematization of the sewer network. Parameter calibration is performed based on CSO volumes simulated by a detailed, physically based sewer network model as often measurements on CSO discharges are lacking.

The modelling protocol is applied to the case study of Barcelona city where four CSOs spill directly into the ocean. For this case study, it is shown that CSO discharges predicted by the simple conceptual model match well results obtained by the detailed physically based model (1-32% difference in cumulative CSO volume, Nash-Sutcliffe model efficiency of 74-93%). When taking the uncertainty in the results of the detailed, physically based model into account, it can be concluded that the conceptual model provides nearly the same level of accuracy in simulating the magnitude and the timing of CSO events.

KEYWORDS

Barcelona, conceptual sewer model, CSO, liner reservoir model