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Data and model uncertainties in flood-frequency estimation for an urban Swedish catchment

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Floods are extreme events that occur seldom, which means that there are relatively few data of weather and flow conditions during flooding episodes for characterisation of flood frequency. In addition, there are often practical difficulties associated with the measurement of discharge during floods. In this study we used a combination of monitoring and modelling to overcome the lack of reliable discharge data and be able to characterise the flooding problems in the highly urbanised Riseberga Creek catchment in eastern Malmö, Sweden. The study is part of a project, GreenClimeAdapt, in which local stakeholders and researchers work with finding and demonstrating solutions to the flooding problems in the catchment.

A high-resolution acoustic doppler discharge gauge was installed in the creek and a hydrologic model was set up to extend this short record for estimation of flood frequency. Discharge uncertainty was estimated based on a stage-discharge analysis and accounted for in model calibration together with uncertainties in the model parameterisation. The model was first used to study the flow variability during the 16 years with available climate input data. Then it was driven with long-term climate realisations from a statistical weather generator to estimate flood frequency for present climate and for future climate changes through continuous simulation. The uncertainty in the modelled flood-frequency for present climate was found to be important, and could partly be reduced in the future using longer monitoring records containing more and higher flood episodes. The climate change scenarios are mainly useful for sensitivity analysis of different adaptation measures that can be taken to reduce the flooding problems.