PHD THESIS

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Method for reduced uncertainty in stage-discharge curves

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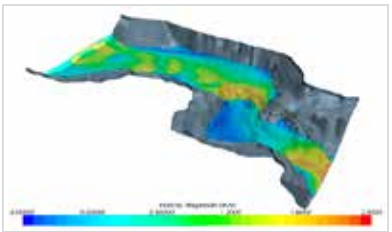
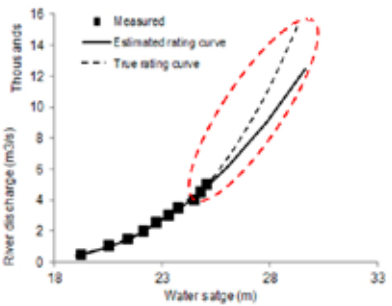
Background

Getting reliable stage-discharge data under extreme flood conditions is essential for good predictions of future flood events. At the same time, the discharge data used for prediction often have a high level of uncertainty. Getting more reliable flood predictions are potentially worth millions in saved costs for construction of dams and infrastructure, as well as in preventing damaging floods. This thesis aims to develop methodology for reducing the uncertainty in stage-discharge curves using a hybrid-modelling approach. Hybrid-modelling involves combining a physical scale-model with a numerical CFD-model. The PhD-program is part of the Flom-Q project, which goal is to create a better flood-prediction framework for Norway. The figure shows a stage-discharge curve used for calculating discharge from a measured water level at a gauging station. Measurements of the stage-discharge relations typically are done for a range of discharges from low flow to flood conditions. At larger floods, measuring discharges directly can be both difficult and dangerous, and by definition these floods are rarely occurring events. Because of this, discharge data for extreme floods often stem from stage-discharge curves extrapolated well beyond the measured range. The goal of this PhD is to develop a method to obtain better data for the extrapolation.

This figure shows a scale-model of the Eggafossen gauging station site



The above figure shows a visualization of the Eggafossen CFD-model



Source: Di Baldassarre et al. 2012