

## Master's Thesis FS 2024



Head: Prof. Dr. Robert Boes Supervision: Matthew Halso Dr. David Vetsch

## Development of a new method for computational modeling of dam breaching

Extreme flood events are increasing in both frequency and intensity in many parts of the world. Climate change and other anthropogenic factors (deforestation, urban sprawl, stormwater routing, etc.) are largely to blame. With the increased number and strength of extreme floods, the frequency of embankment dam and dike overtoppings increases. If overtopped, an embankment dam may fail, and the resulting flood can be devastating.

Forecasting the impacts of a potential dam breach flood requires reliable estimation of the breach outflow. The breach outflow hydrograph is dependent on the speed of breach formation, which occurs due to multiple hydrodynamic and morphodynamic processes. These processes are complex and intertwined, and a computational model can be used to depict how each process influences one another.

Computational modeling of dam breaching is often performed with a parametric model (Fig. 1, left). A parametric model uses a simplified representation of the breach geometry and "0.5-D" numerical methods.

The goal of this Master's thesis is to develop a new method for parameter modeling, based on recent findings from large-scale laboratory experiments (Fig. 1, right). This new method seeks to utilize a unique representation of the dam breach geometry, which may allow for a more simplified numerical procedure.

We seek a student who is interested in computational hydraulics and morphodynamics. Prior expertise on dam breaching and computational modeling is not necessary. Some coding experience (e.g. python, Matlab, C++) would be beneficial.



Fig. 1: Parametric model (left) and large-scale laboratory experiment (right) of dam breach

Contact:	Matthew Halso
	VAW, HIA D51
	<u>halso@vaw.baug.ethz.ch</u>

**Remarks:** Communication and report in English, prior coding experience (e.g., Python, Matlab, C++) beneficial; topic can only be distributed once