Hydraulics of Dike Breaching

Dikes along rivers protect a valley from submersions. However, many dikes were not improved during decades and overtopping has caused large damages in the past. Currently, the hydraulics of dikes overtopped by a flood are poorly understood. This project would like to add to the understanding of dike safety in larger river systems, therefore.

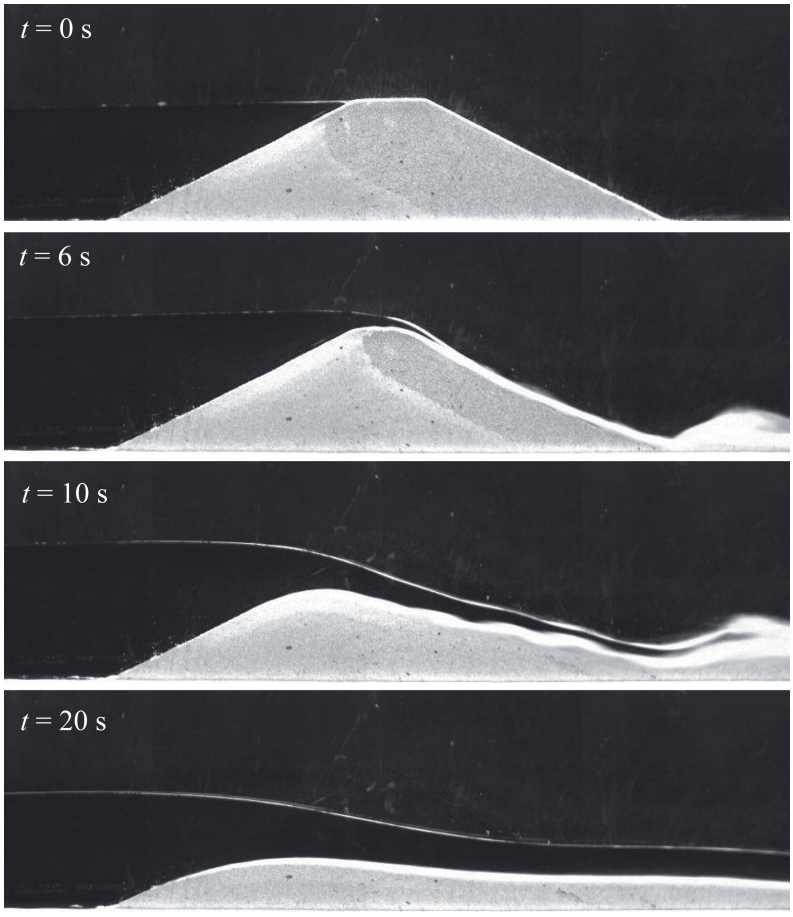

Fig. 1: Temporal progress of dike erosion at various times t

Two hydraulic models are currently available at VAW for conducting the test phase of this project. The first channel is only suitable for plane erosion tests given its limited width of 0.40 m. It has a discharge capacity of some 20 l/s and dikes of 0.30 m maximum height can be model-tested. The temporal progress of both the water and the sediment surfaces are recorded through the side glass wall using a CCD camera (Fig. 1). It will be used in the first project phase to verify some basic breach quantities. The second channel is well suited for 3D breaching-tests, as it allows to insert dikes of 0.70 m height and of 1.0 m width.

The basic complication of this project is the simultaneous definition of the water and the sediment surfaces during a hydraulic breach test. Because the flow depths especially during the initiation and the end of the overtopping phases are relatively small, the data have to be collected with a non-intrusive approach, given the perturbation of both variables otherwise. The so-called AICON-method refers to videometry recording the sediment surface below the water flow during a test. Bed forms and spatial erosion are therefore available at any time of the dike breach process.

Main goals

- Understanding the mechanism of dike breaching
- Investigating plane and spatial dike failure due to overtopping
- Quantifying the sediment erosion during the breach process

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