Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Laboratory of Hydraulics,
Hydrology and Glaciology

Master's or Project Thesis
HS 2020

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Impulse wave force on dams

Large mass movements such as rockfalls, landslides, or avalanches can cause large water waves in oceans, bays, natural lakes and reservoirs. Due to the transfer of the kinetic energy from the sliding mass to the water body, so-called impulse waves are generated during such events. These waves can run-up several meters high at the shore and endanger settlements and infrastructure. Since the initial wave heights are significantly larger than those of a tsunami, these events are also known as mega-tsunamis.

In artificial water bodies such as reservoirs, the wave energy arriving at a dam is partly reflected and dissipated, while another part is diverted over the structure. During run-up and overtopping, the wave's water masses exert additional pressure forces on the upstream face of the dam exceeding the hydrostatic load of the still water level. To prevent critical damage or even failure, the dam structure needs to be designed to bear these additional forces.

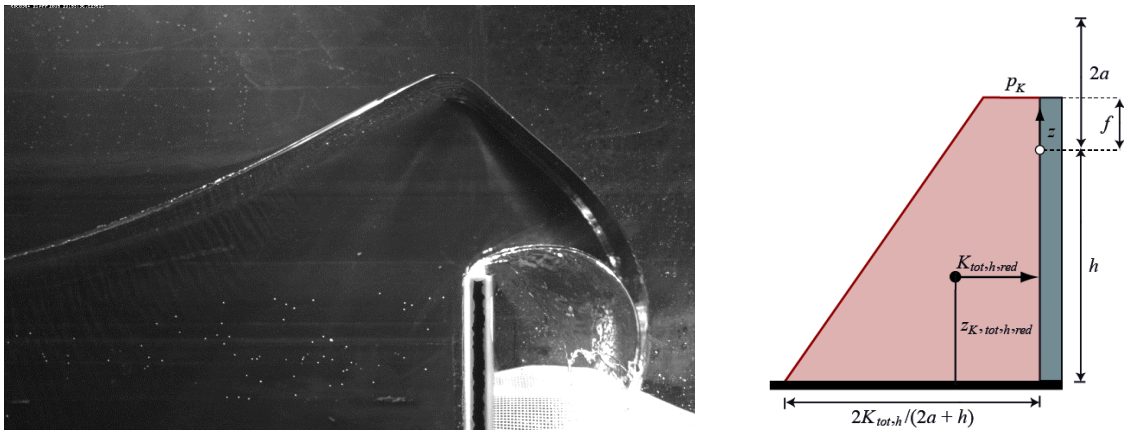

Fig. 1: Impulse wave overtopping in the lab and scheme of theoretical pressure distribution

Within this master's thesis of project work, the hydraulic features of solitary impulse wave generation, run-up, and overtopping are to be investigated with model experiments. A pneumatic piston-type wave generator will be used to generate solitary waves in an 11 m long wave channel. Model parameters such as wave height and still water depth will be systematically varied to cover a broad range of wave loading scenarios. The aim is to extend the understanding of the relevant processes and to derive equations for the quantification of potential events at prototype scale. The results of the work thus contribute to an improved handling of natural hazards.

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Remarks: Hydraulic laboratory experiments;
Individual project