Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Laboratory of Hydraulics,
Hydrology and Glaciology

**Master's Thesis HS 2021**
**Project Based Research Work**

Examiner: Prof. Dr. Robert Boes
Supervision: Dr. Frederic Evers
Maximilian Kastinger
Partner: Dr. Helge Fuchs (BFE)

# Impulse waves at shallow impact angles

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 (Fig. 1). 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.

Generally applicable equations derived from hydraulic model tests are a fast and often sufficiently accurate method to estimate the impact of landslide-generated impulse wave events at prototype scale when applied within their experimental parameter limitations. Outside these parameter limitations, the uncertainties related to the target quantities increase. At prototype scale, the lower limitation of the slide impact angle has been identified to be too steep for certain scenarios.

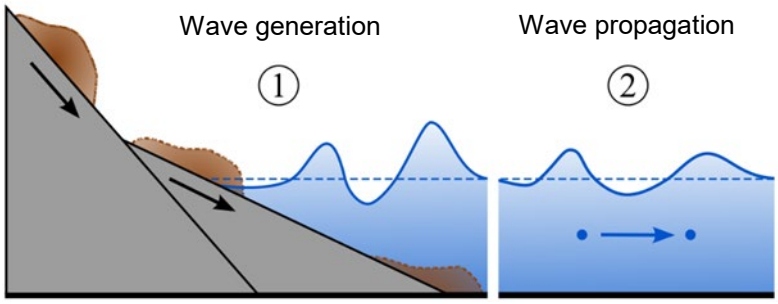


Fig. 1: Impulse wave generation and propagation at shallow slide impact angles

Within this Master's thesis or project based research work, the hydraulic features of impulse wave generation and propagation at shallow slide impact angles are to be investigated with laboratory experiments. A pneumatic landslide generator will be used to generate impulse waves in an 11 m long wave channel. Model parameters such as slide impact angle, slide impact velocity, slide density, and slide mass will be systematically varied to cover a broad range of wave generation scenarios. The aim is to advance the understanding of the relevant processes and to extend existing equations for the quantification of potential events at prototype scale. The results of the work thus contribute to a more differentiated handling of natural hazards.

**Contact:** Dr. Frederic Evers
HIA C 52.2
044/633 08 77, evers@vaw.baug.ethz.ch

**Remarks:** Hydraulic laboratory experiments;
individual project