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Impulse Wave Analysis at Chehalis Lake

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 runup several meters high at the shore and endanger settlements and infrastructure (Fig. 1). Since the initial wave heights are significantly larger than those of a tsunami, these events are also known as mega-tsunamis.

On December 4, 2007, a landslide with a volume of 3 million cubic meters generated impulse waves in Chehalis Lake, Canada, which reached run-up heights of up to 38 meters on the opposite shore. The run-up at the entire lake shore was documented in detail in the aftermath of the event. These data offer the possibility to check and validate methods for the prediction of impulse wave generation and propagation. One such method is the prediction with generally applicable equations developed from hydraulic model tests. At VAW, several equations for the estimation of the individual processes such as wave generation, propagation, and run-up were summarized in the manual 'Landslide-generated impulse waves in reservoirs – Basics and computation'. Since the dimensions of Chehalis Lake are similar to those of alpine reservoirs, the prototype data collected there are suitable as a benchmark for the VAW methodology.



Fig. 1: Chehalis Lake, Canada, after landslide and impulse wave run-up (max. 38 m)

Within the scope of this project work, the impulse wave event in Chehalis Lake will be analyzed. The field measurements are to be compared to values predicted with the computation methodology of the impulse wave manual and other approaches. This work aims to improve the overall process understanding and to assess the sensitivity of individual parameters to the prediction quality of the entire process chain. The results of the work thus contribute to an improved handling of natural hazards.

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Remarks: