A conceptual approach for the rapid screening of the tsunami hazard in Swiss lakes

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Lake tsunamis constitute rare, yet potentially serious peril. The occurrence of historical tsunamis in perialpine lakes has been documented by various studies. Prime examples of tsunamis caused by subaerial and subaqueous gravitative mass movements are the 1963 Vajont tsunami, the 563 AD and 1584 AD tsunami in Lake Geneva, and the tsunamis occurring 1601 AD and 1687 AD in Lake Lucerne. Despite such known examples, to the present day, fundamental information and workflows to rapidly characterise the lacustrine tsunami hazard for multiple lakes on a spatially extensive area such as for the whole country of Switzerland are missing.

We present a first methodological approach for a rapid screening of the lacustrine tsunami hazard (caused by sub-aqueous and subaerial landslides), based on a set of geophysical and geotechnical parameters. Such parameters include the subaerial topography, depth of the lakes, underwater slope gradients, the length of the slopes, and the type and thickness of the subaquatic slope sediments. The parameters are derived from high-resolution topographical datasets, and from results of past high-resolution sedimentological, geotechnical and geophysical studies on Swiss lakes.

Different hazard levels are assigned to the investigated lakes. The here proposed conceptual approach will allow for a first-order identification of areas, where tsunami hazard is likely. The expected results of the extensive characterisation of the tsunami hazard in Swiss lakes should ultimately contribute to a pratice-oriented risk management.