Modelling past landslide-induced tsunami in Lake Geneva to evaluate the present threat

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In the south-eastern part of Lake Geneva, in the community of Meillerie, France, is located a forested depression, which indicates that a landslide occurred at this place in a distant past. It is a partially submerged slide composed of Trias to Jurassic carbonates. As its volume is greater than 10 mio m3, we assume that a potential brusque failure would have generated an impulse wave able to spread across the lake and reach the location of contemporary cities.

Since this type of events is still likely to occur nowadays, this study aims to characterise the tsunami triggered by the past landslide event in order to know the potential wave height in populated places around the lake for events of similar magnitude.

The volume of the displaced mass is estimated using the inverse Sloping Local Base Level (SLBL) by subtracting the pre-failure topography (built with the SLBL) to the actual one. In order to model landslide-triggered tsunami, it is necessary to be able to simulate the generation, the propagation of the wave in the lake and on the shores. This task is performed using a two-dimensional numerical model based on the shallow water equations. The Lax-Friedrichs scheme is used for the numerical stabilisation.

The preliminary results indicate that the wave propagated across the lake up to distant places. As the shores are today extensively urbanised, in a similar case, they would be subject to catastrophic consequences. Thus, sensitivity tests are conducted for variation of the size and the velocities of the landslide in the model in order to give a distribution of the associated risks.