Geophysical Research Abstracts
Vol. 18, EGU2016-8861, 2016
EGU General Assembly 2016

Probabilistic stability evaluation of submerged slopes in Lake Zurich (Switzerland) and seismic triggering scenarios

Michael Strupler (1), Michael Hilbe (2), Flavio S. Anselmetti (2), Achim J. Kopf (3), Timo Fleischmann (3), Michael Strasser (1,4)

(1) Geological Institute, ETH Zurich, Zurich, Switzerland (michael.strupler@erdw.ethz.ch), (2) Institute of Geological Sciences and Oeschger Centre for Climate Change Research, University of Bern, Switzerland, (3) MARUM - Center for Marine Environmental Sciences, Bremen, Germany, (4) Institute of Geology, University of Innsbruck, Innsbruck, Austria

The consequences of subaquatic slope failures both in the marine and the lacustrine realm can be very serious. For hazard assessments, stability analyses of submerged slopes are therefore crucial steps, yet very complex ones, as they require knowledge of several geotechnical and morphological factors.

Traces of subaquatic mass movements are often used to extract paleoseismological information. For Lake Zurich, a perialpine lake in Northern Switzerland, coeval subaquatic landslide occurrences along distinct time-correlative horizons have been previously interpreted as earthquake-triggered. The ‘Oberrieden’ study area ($\sim$2 km^2) shows three distinct, dated subaquatic landslides with well-defined headscarps, translation areas and mass-transport deposits. The respective failures have been assigned to different trigger mechanisms ranging from human-induced shore loading to earthquake shaking. However, the local shaking intensities leading to slope failures are unknown.

A 3.5 kHz pinger seismic reflection dataset and a 300 kHz multibeam bathymetric dataset (1 m grid) were used for the detection of landslide features and for the layout of a coring campaign and *in situ* geotechnical testing. A total of 8 Kullenberg-system piston cores (4 cores /km^2) and 22 short gravity cores (11 cores /km^2) were taken and 39 in situ Cone Penetration Tests (CPT) ($\sim$20 CPT /km^2) were performed. The high density of sediment cores and CPT sites in a well-known area allows us to include the spatial variability in the slope model.

With a probabilistic back analysis of the earthquake-triggered $\sim$2210 BP subaquatic landslide and an assessment of the actual stability of the neighbouring, unfailed sediment drape, we analyse different scenarios of slope stability under static conditions and under seismic shaking in order to quantitatively constrain failure mechanisms and triggers. We apply a Monte Carlo two-dimensional limit-equilibrium infinite-slope stability model that includes a sediment-mechanical stratigraphy constructed from a high-resolution geotechnical dataset.The results can be used to complement the existing regional paleoseismic analysis and give insight into possible future seismically triggered failure scenarios in the study area. The findings from this lacustrine environment, aiming at establishing subaquatic hazard maps, can also be transferred to applications in the marine realm.