Geophysical Research Abstracts
Vol. 17, EGU2015-8169, 2015
EGU General Assembly 2015

Tsunamis generated by 3D granular landslides in various scenarios from fjords to conical islands

Brian C. McFall and Hermann M. Fritz
Georgia Institute of Technology, Civil and Environmental Engineering, Atlanta, United States (fritz@gatech.edu)

Landslide generated tsunamis such as in Lituya Bay, Alaska 1958 account for some of the highest recorded tsunami runup heights. Source and runup scenarios based on real world events are physically modeled using generalized Froude similarity in the three dimensional NEES tsunami wave basin at Oregon State University. A novel pneumatic landslide tsunami generator (LTG) was deployed to simulate landslides with varying geometry and kinematics. The bathymetric and topographic scenarios tested with the LTG are the basin-wide propagation and runup, fjord, curved headland fjord and a conical island setting representing a landslide off an island or a volcano flank collapse. The LTG consists of a sliding box filled with 1,350 kg of landslide material which is accelerated by pneumatic pistons down slope. Two different landslide materials are used to study the granulometry effects: naturally rounded river gravel and cobble mixtures.

Water surface elevations are recorded by an array of resistance wave gauges. The landslide deformation is measured from above and underwater camera recordings. The landslide deposit is measured on the basin floor with a multiple transducer acoustic array (MTA). Landslide surface reconstruction and kinematics are determined with a stereo particle image velocimetry (PIV) system. Wave runup is recorded with resistance wave gauges along the slope and verified with video image processing. The measured landslide and wave parameters are compared between the planar hill slope used in various scenarios and the convex hill slope of the conical island. The energy conversion rates from the landslide motion to the wave train is quantified for the planar and convex hill slopes. The wave runup data on the opposing headland is analyzed and evaluated with wave theories. The measured landslide and tsunami data serve to validate and advance three-dimensional numerical landslide tsunami prediction models.