Numerical simulation of the submarine landslides and tsunami occurred at Port Valdez, AK during 1964 Alaska Earthquake with Landslide-HySEA model

Jose M. González-Vida (1), Sergio Ortega (2), Jorge Macías (3), Manuel J. Castro (3), and Cipriano Escalante (3)

(1) University of Málaga, Dpt. Applied Mathematics, 29071 Málaga, Spain, (2) University of Málaga, Unit of Numerical Methods, 29071, Málaga, Spain, (3) University of Málaga, Dpt. Mathematical Analysis, 29071, Málaga, Spain

This is a benchmark problem recently proposed in the framework of the Landslide Tsunami Model Benchmarking Workshop organized by the NTHMP (National tsunami Hazard mitigation program –USA-) at Galveston (USA). The benchmark is based on the historical event which occurred at Port Valdez, AK during the Alaska Earthquake of March 27, 1964. The great disaster during the M_w9.2 Alaska Earthquake happened in the dock and harbour area of Port Valdez, where a massive submarine landslide generated a tsunami, inundating the waterfront up to two blocks inland. Then, a second wave crossed the waterfront 10-15 minutes after the first wave, carrying a large amount of the debris. It has been described as a violent surging wave only slightly smaller than the first. It is believed that the second wave which flooded the waterfront was originated at the other side of the Port Valdez near the Shoup Bay moraine. The benchmark consists in simulating with the (GPU based) Landslide-HySEA model the extent of inundation for two slide events, based on before and after bathymetry data, eye-witness observations of the event, and observed runup distribution. First, both landslides have been simulated separately, studying time series of the water waves at determined locations, runups at different areas and the extent of inundation around the first two blocks inland of Port Valdez. Then, the two landslides are triggered at the same time and the joint effect is studied. Obtained results are satisfactory and they agree with the existing observations.

References

- Castro, M. J., Fernández-Nieto, E. D., González-Vida, J. M., Parés, C. (2011). *Numerical Treatment of the Loss of Hyperbolicity of the Two-Layer Shallow-Water System*. Journal of Scientific Computing, 48(1):16-40.

- Fernández, E.H., Bouchut, F., Bresh, D., Castro, M.J. and, Mangeney, A. (2008). *A new Savage-Hutter type model for submarine avalanches and generated tsunami*. J. Comp. Phys., 227: 7720-7754.

- Fernández-Nieto, E.D., Castro, M.J., Parés, C. (2011). *On an Intermediate Field Capturing Riemann Solver Based on a Parabolic Viscosity Matrix for the Two-Layer Shallow Water System*. J. Sci. Comp. 48:117-140.

- Macías, J., Vázquez, J.T., Fernández-Salas, L.M., González-Vida, J.M., Bárcenas, P., Castro, M.J., Díaz-del-Río, and V., Alonso, B. (2015). *The Al-Boraní submarine landslide and associated tsunami. A modelling approach*. Marine Geology, 361:79-95.