Geophysical Research Abstracts
Vol. 12, EGU2010-2456-2, 2010
EGU General Assembly 2010

Numerical simulation of explosive tsunami wave generation and propagation in Karymskoye lake, Kamchatka, Russia

Tomas Torsvik (1), Raphaël Paris (2,7), Ira Didenkulova (3), Efim Pelinovsky (4), Alexander Belousov (5), Marina Belousova (5,6)

(1) Uni Recearch, Bergen Center for Computational Science, Bergen, Norway (tomas.torsvik@uni.no, +47 5558 4295), (2) Clermont-Université, GEOLAB, France, (3) Institute of Cybernetics, Tallinn University of Technology, Tallinn, Estonia, (4) Department of Nonlinear Geophysical Processes, Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia, (5) Earth Observatory of Singapore, Nanyang Technological University, Singapore , (6) Institute of Volcanology & Seismology, Petropavlovsk-Kamchatsky, Russia, (7) CNRS, France

Karymskoye caldera lake is a nearly circular body of water with a diameter of approximately 4 km and a depth of up to 60 m. The sublacustrine, Surtseyan-type eruption in the lake on January 2-3 1996 included a series of underwater explosions. A field survey conducted the following year showed signs of tsunami wave runup around the entire coast line of the lake, with a maximum of 29 m runup at the north shore near the source of the eruption. The runup height decreased regularly as the distance to the source increased, and was reduced to 2-4 m runup at locations on the east and south shore far away from the source.

The tsunami has been simulated using the numerical long wave model COULWAVE. Effort was made to reconstruct a realistic pre-eruption bathymetry. The tsunami source was chosen as suggested by Le Mehaute (1971) and Pelinovsky (1981). The initial wave was prescribed by a parabolic shape depression with a radius of R = 200 m, and a height of 23 m at the rim of the parabola. Simulations were conducted to show principle directions for wave propagation, wave speed and arrival time for the leading wave group at the shore, and the distribution of wave height throughout the lake. Comparison with runup data show qualitative similarities in the wave height distribution, but indicate that the initial wave source in the simulation should be reduced by half to give realistic results. Wave height records at different locations show that the long waves always arrive first, but the maximum wave usually arrives at a later time.