



Tsunami Wave Generation by the Eruption of Underwater Volcano

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Eruption of volcanoes represent one of important origins of tsunami waves and is responsible for most catastrophic tsunami (Krakatau, 1883; Thira, B.C.). The products of volcano eruption include solids, liquids (lava) and gases. The present article presents hydrodynamic model of relatively slow process of eruption, with domination of liquids. The process of underwater eruption of lava causes the disturbance of ocean free surface. The standard formulation of hydrodynamic problem for incompressible fluid in cylindrically symmetric layer of with rigid bottom and free surface with local hydrodynamic source (volcano) is used. This problem is solved by constructing Green function using methodology of Sretensky. The solution is obtained in the form of an integral and depends on the dynamics of eruption. Real data show that some volcanoes can erupt several millions of tons of lava during several dozens of seconds (Bezimjannij, Kamchatka). The rough estimations for smaller eruption (volume $W=1$ mln. cub.m and duration of eruption $T=10$ sec) show that even deeply located craters can generate substantial perturbation of free surface (for $h=1$ km, $z=1$ km we get the wave height over crater $H=2$ m), while craters on shelves can create catastrophic tsunamis (for $h=200$ m, $z=100$ m we get $H=25$ m. The long waves are more efficiently generated by larger T : these tsunamis can have smaller initial perturbations of free surface, but the waves are long and can transmit their energy over longer distances.