3D numerical model of tsunami generation in consideration of water compressibility

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The most of nowadays existing models of tsunami generation do not take into account the compressibility of water layer. In order to describe the motion of compressible water layer in an arbitrary topography basin caused by small bottom coseismic deformations we developed 3D numerical model. The model is based on the linear potential theory of ideal homogeneous compressible fluid in the field of gravity. The explicit finite-difference scheme on rectangular grid is used to solve the problem. The non-reflective boundary conditions for acoustic waves are specified at open-sea boundaries. Along the coast line the normal velocity is set to zero. Normal velocity at absolutely rigid bottom is used as disturbance source. Free surface condition is imposed on the top of calculation domain. The model allows calculating water surface displacement and fields of water velocity and dynamical pressure. Exact analytical solutions obtained for flat bottom domain were used to verify the numerical model. The numerical calculations performed for Tokachi-Oki 2003 and Kuril Islands 2006 tsunamigenic earthquakes.