Geophysical Research Abstracts
Vol. 12, EGU2010-2358, 2010
EGU General Assembly 2010

Tsunami formation as a result of resonant pumping of energy into the compressible water column

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Strong bottom earthquakes that excite gravitational tsunami waves give rise to hydroacoustic waves as well. Co-seismic bottom shaking in a tsunami source involve both high-frequency trembling as well as relatively long-lasting process of residual bottom deformation. Ousting the water, this residual bottom deformation results in long gravitational waves - tsunamis; whereas the high-frequency trembling is mostly responsible for the formation of hydroacoustic waves. Under certain conditions, bottom trembling may provide a resonant pumping of energy to the compressible water column. Due to non-linearity, intensive elastic oscillations may provide additional contribution to tsunami energy. The aim of this work is to examine effectiveness of hydroacoustic resonance in a tsunami source. Thereto we perform 3D numerical simulation of compressible water column excited by realistic dynamic co-seismic bottom oscillations modeled with the QSGRN/QSCMP software. We consider various earthquake magnitudes (Mw = 6, 7, and 8) and various ocean depths ranging from 100 m to 10000 m. We demonstrate that for the Mw=8 earthquake, mass water velocity in elastic oscillations reaches value of 5 m/s. Contribution of hydroacoustic non-linear effects to tsunami energy and amplitude is estimated as well.