Geophysical Research Abstracts
Vol. 13, EGU2011-6265, 2011
EGU General Assembly 2011

Hydroacoustic resonance in the 2003 Tokachi-oki tsunami source

Mikhail Nosov (1), Anna Bolshakova (1), Shusaku Inoue (2), Sergey Kolesov (1), Hiroyuki Matsumoto (3), and Tatsuo Ohmachi (2)

(1) M.V.Lomonosov Moscow State University, Faculty of Physics, Moscow, Russian Federation (m.a.nosov@mail.ru), (2) Department of Built Environment, Tokyo Institute of Technology, Japan (ohmachi@enveng.titech.ac.jp), (3) Japan Agency for Marine-Earth Science and Technology, Japan (hmatsumoto@jamstec.go.jp)

In recent years, when JAMSTEC (Japan Agency for Marine-Earth Science and Technology) deployed a real-time observatory at the continental slope close to the islands of Japan, it became possible to investigate a tsunami formation, including hydroacoustic phenomena, just at its source. The Tokachi-oki earthquake of 2003 turned out to be the first strong tsunamigenic seismic event, the epicentre of which was located in the immediate vicinity of the JAMSTEC sensors. Spectral analysis of variations of bottom pressure recorded during the earthquake provided a unique opportunity to reveal the hydroacoustic resonance – manifestations of compressibility of water in tsunami source. In present study, we provide a joint analysis of 10 Hz bottom pressure dataset and 100 Hz ocean-bottom seismometers dataset recorded during the 2003 Tokachi-Oki earthquake. In particular, it is shown that the hydroacoustic resonance is clearly manifested in both datasets: bottom pressure and up-down (UD) bottom acceleration. Moreover, we reveal the frequency band ("Forced oscillations") within which a nearly ideal coincidence of spectra of bottom pressure and UD bottom acceleration is observed. Numerical experiments aimed at reproducing bottom pressure variations in the Tokachi-Oki 2003 tsunami source by means of 3D numerical simulation technique taking into account dynamic bottom deformations and water compressibility are also described. A reasonable agreement between amplitudes and dominating frequencies of numerically simulated and in-situ recorded bottom pressure variations is achieved. Special attention is paid to the influence of the rise time on the amplitude of bottom pressure variations.