



Tsunami precursors excited by surface seismic waves during the 2011 Tohoku earthquake

Kirill A. Sementsov (1), Mikhail A. Nosov (2), Sergey V. Kolesov (3), and Hiroyuki Matsumoto (4)

(1) Faculty of Physics, M.V. Lomonosov Moscow State University, Leninskie Gory, Moscow 119991, Russia. E-mail: sebbest@yandex.ru, (2) Faculty of Physics, M.V. Lomonosov Moscow State University, Leninskie Gory, Moscow 119991, Russia. E-mail: nosov@phys.msu.ru, (3) Faculty of Physics, M.V. Lomonosov Moscow State University, Leninskie Gory, Moscow 119991, Russia. E-mail: kolesov@ocean.phys.msu.ru, (4) Earthquake and Tsunami Research Project for Disaster Prevention, Japan Agency for Marine-Earth Science and Technology, 2-15, Natsushima, Yokosuka 237-00061, Japan. E-mail: hmatsumoto@jamstec.go.jp

Weak gravitational waves that preceded the arrival of tsunami were registered by the DONET (JAMSTEC) stations during the 2011 Tohoku earthquake. We shall call these waves tsunami precursors. The amplitude and period of tsunami precursors amounted to 3 cm and 150 s, respectively. Tsunami precursors are clearly manifested in ocean-bottom pressure variations recorded by DONET stations that were in operation during the 2011 event. Being excited immediately after the passage of surface seismic waves the precursors were observed during at least one hour until the arrival of tsunami waves. Ocean bottom seismometers (accelerometers) did not detect any similar signals within the same time-frequency range. We assume physical mechanism of generation of the precursor is related to low-frequency seismic surface waves. Theoretical estimates of parameters of the precursor carried out on the base of this assumption are in a good agreement with the observed values. Results of 3D numerical simulation of tsunami precursors carried out in the framework of linear potential theory are presented and analyzed.

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