Geophysical Research Abstracts
Vol. 18, EGU2016-13215, 2016
EGU General Assembly 2016

Real-time determination of the worst tsunami scenario based on Earthquake Early Warning

Takashi Furuya (1), Shunichi Koshimura (2), Ryota Hino (3), Yusaku Ohta (3), and Takuya Inoue (4)

(1) Graduate School of Engineering, Tohoku University, Sendai, Japan (takasi.furuya.t7@dc.tohoku.ac.jp), (2) International Research Institute of Disaster Science, Tohoku University, Sendai, Japan (koshimura@irides.tohoku.ac.jp), (3) Graduate School of Science, Tohoku University, Sendai, Japan (hino@m.tohoku.ac.jp, yusaku.ohta.d2@tohoku.ac.jp), (4) KOKUSAI KOGYO CO., LTD., Tokyo, Japan (takuya_inoue@kk-grp.jp)

In recent years, real-time tsunami inundation forecasting has been developed with the advances of dense seismic monitoring, GPS Earth observation, offshore tsunami observation networks, and high-performance computing infrastructure (Koshimura et al., 2014). Several uncertainties are involved in tsunami inundation modeling and it is believed that tsunami generation model is one of the great uncertain sources. Uncertain tsunami source model has risk to underestimate tsunami height, extent of inundation zone, and damage. Tsunami source inversion using observed seismic, geodetic and tsunami data is the most effective to avoid underestimation of tsunami, but needs to expect more time to acquire the observed data and this limitation makes difficult to terminate real-time tsunami inundation forecasting within sufficient time.

Not waiting for the precise tsunami observation information, but from disaster management point of view, we aim to determine the worst tsunami source scenario, for the use of real-time tsunami inundation forecasting and mapping, using the seismic information of Earthquake Early Warning (EEW) that can be obtained immediately after the event triggered. After an earthquake occurs, JMA's EEW estimates magnitude and hypocenter. With the constraints of earthquake magnitude, hypocenter and scaling law, we determine possible multi tsunami source scenarios and start searching the worst one by the superposition of pre-computed tsunami Green's functions, i.e. time series of tsunami height at offshore points corresponding to 2-dimensional Gaussian unit source, e.g. Tsushima et al., 2014.

Scenario analysis of our method consists of following 2 steps. (1) Searching the worst scenario range by calculating 90 scenarios with various strike and fault-position. From maximum tsunami height of 90 scenarios, we determine a narrower strike range which causes high tsunami height in the area of concern. (2) Calculating 900 scenarios that have different strike, dip, length, width, depth and fault-position. Note that strike is limited with the range obtained from 90 scenarios calculation. From 900 scenarios, we determine the worst tsunami scenarios from disaster management point of view, such as the one with shortest travel time and the highest water level.

The method was applied to a hypothetical-earthquake, and verified if it can effectively search the worst tsunami source scenario in real-time, to be used as an input of real-time tsunami inundation forecasting.