

Near-field tsunami forecasting from offshore pressure data in association with the earthquake early warning

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Effective mitigation of tsunami disasters requires tsunami forecasts that are made in real time and the provision of timely evacuation warnings to affected communities. Tsushima et al. (2014) developed tFISH/RAPiD, which is the initial sea surface height distribution estimated from rapidly acquired GNSS data provides robust finite source size information that is incorporated into an offshore tsunami data inversion for reliable tsunami predictions along the near-field coast. In contrast, it is slightly difficult to obtain the reliable initial sea surface height distribution for M7 class earthquakes in the offshore region by RAPiD because of the difficulty of the accurate estimation of small coseismic displacement field compared with more large events.

Based on these backgrounds, we have developed an alternative algorithm that improves near-field tsunami forecasting based on offshore tsunami data after an earthquake by incorporating earthquake early warning (EEW) data. Basic scheme is the same with the tFISH/RAPiD, we estimate the initial sea surface height distribution using the EEW data. We assumed that the single rectangular fault deduced from the scaling law between the earthquake magnitude and the fault dimension.

We retrospectively applied tFISH/EEW to the 2011 Sanriku-Oki earthquake (March 9, 2011, Mw 7.2) based on the actual ocean bottom pressure (OBP) record and EEW information. The predicted results immediately after the earthquake (~2 to 3 min) the arrival times and wave heights of the first tsunami wave along the near-field coast could be predicted more accurately than the estimation based only on offshore tsunami data. After more time, the estimated initial sea surface distribution by the tFISH/EEW had continuously changed, and it was similar to that based on offshore tsunami data alone.

We will discuss more detail characteristic and its ability of the tFISH/EEW algorithm based on the various case studies.

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