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The February 2010 Chilean tsunami recorded on bottom pressure gauges

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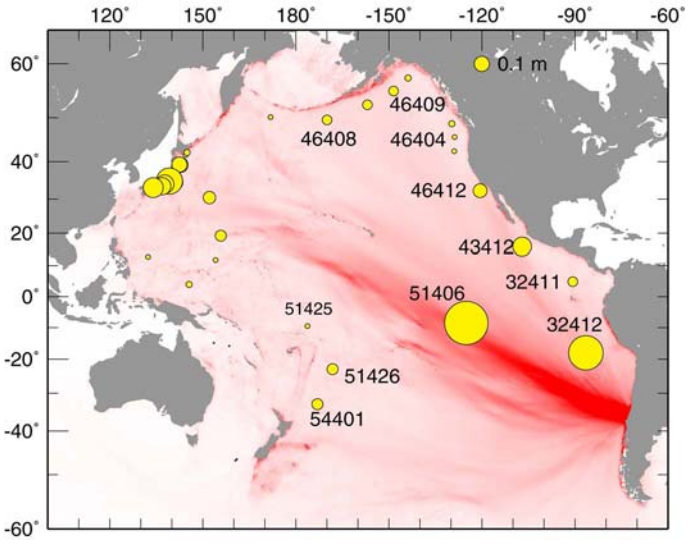
The Chilean earthquake on February 27, 2010 (06:34:14 UTC, 35.931S, 72.784W, 35 km, M 8.8 according to USGS) generated tsunami, which propagated across the Pacific to reach Japan. The tsunami was recorded at 25 tsunameters of DART (Deep Ocean Assessment and Reporting of Tsunamis) system operated by NOAA and 16 stations on submarine cables around Japan. The maximum amplitude was 20 cm at station 32412 far off Peru, and 28 cm at station 51406 toward Hawaii, but a few to several cm at other stations. Around Japan, the amplitudes were 3-4 cm off Kushiro (JAMSTEC), about 10 cm off Kamaishi (ERI, Univ. Tokyo) and off Boso (JMA). In Sagami Bay (NIED and JAMSTEC stations), the amplitudes increase from 7 to 17 cm as water depth becomes smaller. Off Tokai and Tonankai (JMA), the amplitudes were about 10 cm, and they were about 6 cm off Muroto (JAMSTEC).



These tsunami sensors are located on seafloor at depth > 1,000 m, hence the tsunami amplitudes were smaller, but recorded earlier than coastal points. Because they are free from coastal complication of tsunami waveforms, they are more appropriate for comparison with tsunami simulation results than coastal tide gauge records. We computed tsunami waveforms from several fault models and compared the waveforms at the tsunameter locations. The computed results well reproduced the arrival times and amplitudes in Eastern and Southwestern Pacific stations. However, at the Northwestern Pacific stations, while the amplitudes and waveforms are similar, the actual tsunami arrival times are later by a few tens of minutes. The results are the same for different bathymetry data, grid size and the governing equations (linear long wave, nonlinear long wave, linear Boussinesq equation with dispersion effects). Except for these stations, the observed and simulated waveforms from an offshore fault model (L 400 km, W 150km, slip 10m, Mw 8.8) are very similar.

Fig. Tsunami height distribution in the Pacific computed from a fault model, and the observed tsunami amplitudes at DART stations. The observed tsunami waveforms at station with codes (5 digit numerals) are well reproduced and can be used for the earthquake source study. The observed tsunami amplitude distribution on the cabled tsunami sensors around Japan is shown in Japanese page.

Keywords: tsunami, Chilean earthquake, Bottom pressure gauges