

Tsunami source of the Mw7 2016 Fukushima Earthquake inferred from tide gauge and GPS buoy records

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On November 22, 2016, at 05:59 local time (UTC+9), an earthquake occurred off the coast of Fukushima Prefecture, Japan (epicenter 37.392°N, 141.403°E and M_w 7.0 according to the National Research Institute for Earth Science and Disaster Resilience, NIED). The fault mechanism of this event was a normal faulting with shallow focal depth of 11 km [1]. The subsequent tsunami was recorded at several tide gauge station along the east coast of Japan. The maximum tsunami wave amplitude was 1.4 m at Sendai port located more than 100 km from the epicenter [2].

This study aims to investigate the tsunami source of the 2016 Fukushima Earthquake using inversion of recorded tsunami waveform signals. The Japan Meteorological Agency (JMA) provided the tide records from Ofunato, Ayukawa, Sendai port, Soma, and Onahama stations. In addition, we manually digitized the tsunami waveforms recorded at Miyagi Central and Sendai offshore GPS buoys that were published by the Nationwide Ocean Wave information Network for Ports and Harbors (NOPHAS). These waveform records usually include ocean tides, which we removed by applying a high-pass filter.

To estimate the extent of the tsunami source and the slip distribution, we divide the tsunami source into 8 subfaults that covers the aftershock area during one week after the mainshock. The subfault size is 10 km x 10 km with a top depth of 7 km. The focal mechanisms for all the subfaults were taken from the USGS solution of the mainshock.

The preliminary inversion result showed that the largest slip was located around the epicenter with a maximum value of 6.0 m. The estimated moment magnitude was calculated as M_w = 7.1 (5.78E+19 N-m), which is slightly bigger than the estimated by NIED (M_w 7.0, moment 3.47E+19 N-m). The estimated slip distribution suggested that the fault rupture started near the epicenter and propagated from south to north. This evidence is supported by the aftershock distribution.

References:

- [1] National Research Institute for Earth Science and Disaster Resilience (NIED), M_{JMA} 7.4 earthquake on November 22, 2016, [http://www.hinet.bosai.go.jp/topics/off-fukushima161122/?LANG=ja & m=mt](http://www.hinet.bosai.go.jp/topics/off-fukushima161122/?LANG=ja&m=mt), 2016. (accessed 03.02.17).
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