[JJ] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS14]Strong Ground Motion and Earthquake Disaster

convener:Masayuki Kuriyama(Central Research Institute of Electric Power Industry)
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
Strong ground motion has social impacts as it induces earthquake disasters. We solicit contribution on any seismological topics related to strong ground motion that includes, but are not limited to, source processes, wave propagation, and site effects. We also welcome contribution on earthquake related disaster mitigation.

[SSS14-P27]Rupture process of the 2016 Fukushima-ken oki earthquake and stress change on the fault

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The 2016 Mj7.4 off Fukushima earthquake was occurred at 05:59, November 22, 2016. I have investigated the source processes of three earthquakes in the 2016 earthquake by the multi-time-window linear waveform inversion method using the strong-ground motion data. I used the strong-motion data obtained from K-NET and KiK-net. The data were windowed for 40 s, starting at P-wave arrival time, and band-pass-filtered between 0.05 to 0.3 Hz (period of 3-20 s) for waveform inversion. The accelerograms were integrated into ground velocities. Theoretical Green's functions are calculated using the discrete wavenumber method (Bouchon, 1981) and the Reflection/Transmission coefficient matrix method (Kennett and Kerry, 1979) using a stratified medium.
I assumed individual one-dimensional velocity structure model for each station by using waveform modelling with small earthquake records (Yoshida et al., 2017, EPS). I used multi-time-window linear waveform inversion procedure (e.g., Hartzell and Heaton, 1983) in which the moment-release distribution was discretized in both space and time. The relative strength of the smoothing constraint was determined to minimize Akaike’s Baysian Information Criteria. The length and width of the fault plane was assumed to be 44 km and 24 km, respectively. The fault plane was divided into subfaults of 4 km × 4 km. The moment function of each subfault was represented by a series of five smoothed ramp functions. The first time-window front triggering velocity (V_{FT}) was determined between 1.8 and 2.6 km/s based on residual of the waveform fits.
The estimated source model has one asperity located on approximately 20 km southwest to the rupture starting point. Its largest slip is 2.1 m. The total seismic moment is 2.4×10^{19} Nm (Mw 6.9). The average slip is 0.8 m. The rake angle is 270 degree. A characterized source model was made based on the inverted source model. One rectangular asperity patch was set. Slip time functions on the asperity and background areas were set based on the moment rate functions on the inverted source model (Yoshida, 2017, SSJ). Synthetic waveforms agree with the observed records.
The spatial and temporal stress distribution on the fault planes of this event was calculated by using 3D FDM. Average of dynamic stress drop on the asperity is about 4 MPa. Rupture time on each subfault was determined based on peak stress time. The identified rupture propagation was nearly circular and small deviation of the velocity in the background, but the rupture velocity in the asperity varied in a short distance.
Acknowledgments: I use the hypocentral information catalog of JMA, the moment tensor catalog by F-net, and the strong motion data from K-NET and KiK-net provided by NIED. This study was based on the 2017 research project ‘Examination for uncertainty of strong ground motion prediction for the

inland crustal earthquakes’ by the Nuclear Regulation Authority (NRA), Japan.