Seismic and tsunami waveform analyses for the 1938 and 2016 Off Fukushima earthquake sequence

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The 1938 Off Fukushima (Shioya-oki) earthquake sequence, which consists of five earthquakes of M_{JMA} ranging from 6.9 to 7.5, occurred in the southern part of the 2011 Tohoku earthquake source area. In this region, a normal fault earthquake occurred on November 22, 2016 (M_w 6.9) . To understand their source processes, we re-examined seismic and tsunami waveform records. Murotani et al. (2004, SSJ Fall Meeting) estimated slip distributions for event 1 on May 23 (M_w 7.6, Fault size 60 km x 70 km), event 2 on November 5 (M_w 7.9, Fault size 80 km x 60 km), and event 3 on November 5 (M_w 7.8, Fault size 90 km x 60 km) from inversion analyses of near field seismic waveforms at Sendai, Niigata, Maebashi, Mito, and Hongo (Tokyo). In this study, we compared the observed teleseismic waveforms at Christchurch (CHR), De Bilt (DBN), Pasadena (PAS), and Pulkovo (PUL) with the calculated waveforms from the above slip distributions. The result showed that the amplitudes of computed waveforms for all events were several to several tens of times larger than the observations. We also calculated the tsunami waveforms using the slip distribution for Event 2, and compared with the observations at Hachinohe, Ayukawa, Miyako, Ojima, and Onahama. The amplitudes of calculated tsunami waveforms were also larger than the observations. These indicate that the slip amount and M_w obtained from the near field seismic waveforms inversion were over-estimated. Then, we compared the normal fault event of 1938 (event 4 on November 6) with the 2016 (M_w 6.9) event. Although there were only a few tsunami records from the same stations, the waveforms are not similar. The teleseismic waveforms of event 4 is similar to those of 2016 event. The re-analyses of near field seismic data using the heterogeneous velocity model will be also presented in the presentation.
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