

Short-period radiation properties of intra-slab earthquakes in the subducting Pacific plate from seismic intensity data

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Intra-slab earthquakes occurring in the subducting oceanic plate radiate more short-period seismic energy than shallow inland and interplate earthquakes and often cause a wide area of strong ground motion. Three damage intra-slab earthquakes in Miyagiken-oki and Kishiro-oki in the Pacific plate are analyzed. Their properties of short-period energy radiation are revealed from JMA seismic intensity data. Seismic intensity inversion analysis is carried out to obtain high-frequency radiation area on their fault planes.

Recently, two damage intra-slab earthquakes occurred in Miyagiken-oki, the 2003/5/26(MJ7.1, D=72km) and 2011/4/7(MJ7.2, D=66km). 6 minus of JMA intensity was observed in Miyagi and the south of Iwate with 174 of the injured and 2 collapsed houses during the 2003 event. Meanwhile, 6 plus of JMA intensity was observed in Miyagi with 4 casualties and 296 of the injured during the 2011 event. The attenuation relationship and site correction factors of seismic intensity are estimated based on recent seismic intensity data. The relationship between focal depth and residual term of attenuation equation for each earthquake shows depth-dependency of short-period radiation. We also find the discrepancy of short-period radiation between the 2003 and 2011 events. It may be due to the Q-value structure in the mantle wedge above a subducting ocean plate. The short-period radiation area of fault plane almost corresponds to a large slip area from waveform inversion analysis.

The 1993/1/15 Kushiro-oki earthquake (M7.5, D=101km) occurred with 6 of JMA intensity at Kushiro-city and caused 966 of the injured and 53 collapsed houses. The Seismic intensity data of intra-slab earthquakes in the vicinity of Kushiro-city are analyzed in the same way as the Miyagiken-oki events. The short-period radiation properties is similar to those of the Miyagiken-oki events and depend on focal depth. The short-period radiation area of the 1993 Kushiro-oki earthquake spread in the rupture direction from the hypocenter.

Keywords: seismic intensity inversion, short-period energy radiation, the 1993 Kushiro-oki Earthquake, off Miyagi Prefecture, intra-slab earthquake, focal depth