

Short-Period Seismic Wave Radiation from Asperities of Megathrust Earthquakes with Multiple-Segment Rupture along the Trench

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Short-period seismic wave radiation zones (SPRZ) have been evaluated for the historical sequence of the Tokai-Nankai earthquakes at 1707 Hiei, 1854 Ansei, and 1944 and 1946 Showa, and the sequence of the Miyagi-oki earthquakes at 1793, 1835, 1861, 1897, 1936, 1978, and 2005 from the inversion analysis of seismic intensity data (Kanda et al., 2004; Takemura and Kanda, 2006). It was concluded by Kanda and Takemura (2006) that the centroid of SPRZ was located at the terminal of rupture propagation in every asperity, in comparison with the results from the wave form inversion analysis for the recent earthquakes. These sequences included both single-segment rupture events and the multiple-segment rupture events. We discuss an influence of multiple-segment rupture for the scaling of the asperities by using the results of SPRZ's from each event.

The results of the seismic intensity inversion analysis estimated that the same asperities usually became active in each cycle of the earthquake sequence and produced SPRZ's at their terminals of rupture propagation. Magnitude MI was newly defined and calculated for each SPRZ of the analyzed earthquake to measure the strength of short-period seismic wave radiation energy. It was found that the sum of MI values of the SPRZ's for the multiple-segment rupture event is larger than that for some single segment rupture events whose focal regions occupy the same region of the multiple-segment rupture event. This suggests that the activity of each asperity depends on the rupture style of single-segment or multiple-segment and that the strength of SPRZ is larger in multiple-segment rupture event than that in single-segment rupture event for the same asperity.

However, there was an exceptional case, such as the Nankai area in the Hiei event. The different asperity, which was not active in other cycles, radiated large short-period seismic wave energy, while activity levels of usual asperities were almost the same as those in other cycles.

References

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