

Repeating earthquake activity along the Izu-Bonin and Ryukyu trenches

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There are several subduction systems near the Japanese islands. The 2011 Mw9.0 Tohoku-oki megathrust earthquake occurred at the northeastern Japan subduction zone and revealed a complementary relation between the slip areas for huge earthquakes and small repeating earthquakes (REs). Investigations of REs in other subduction zones and their comparison with Tohoku area are important for revealing generation mechanism of megathrust earthquakes.

We use seismograms from the High Sensitivity Seismograph Network (Hi-net) and Japan Meteorological Agency (JMA)'s permanent seismograph stations from 8 May 2003 to 31 December 2012. We detect RE along the Izu-Bonin and Ryukyu trenches, using similarity of seismogram pairs.

Although, Igarashi (2010) and Yamashita et al. (2012) have already examined RE activity in this region, we mainly follow the method of Uchida et al. (2010) to compare with the REs at Tohoku area. In the method, pair with coherence larger than 0.95 at multiple stations is considered to belong to a repeating earthquake group. We apply this method to the earthquakes along the Ryukyu trench. Along the Izu-Bonin trench, however, the signal-to-noise (S/N) ratios of the waveforms are not so good because of the limited seismic stations at sparsely distributed islands. Therefore, we adopt a coherence threshold of 0.8 and even if S/N ratios of the waveform are good at only one station, earthquake pairs that satisfy the threshold in multiple components are considered as candidates of REs along the Izu-Bonin trench.

Along the Ryukyu trench, we find RE distribution shows two dense bands parallel to the trench axis. This feature is similar to the northeastern Japan subduction zone. We consider the regions between the two bands of REs may have strong interplate locking as suggested at Tohoku.

Along the Izu-Bonin trench, in spite of the non-strict coherence threshold, we find much fewer REs than that in northeastern Japan. Our result suggests that REs are relatively rare along the Izu-Bonin trench and they mainly occur at the shallow part where the Pacific plate contacts with the crust of the Philippine Sea plate.

These varieties in the RE occurrences suggest different interplate locking patterns along these subduction systems.

Keywords: subduction zone, repeating earthquake, Izu-Bonin, Ryukyu, interplate locking