

Smaill repeating earthquakes beneath the Tokai region detected by NIED Hi-net

*Makoto MATSUBARA¹

1. National Research Institute for Earth Science and Disaster Resilience

1. Introduction

Small repeating earthquakes (SRQs) occur around the quasi-static slip region at the plate boundary (Igarashi et al., 2001; Uchida et al., 2003). Matsubara and Obara (2006) found the SRQ at the upper boundary of the Philippine Sea (PHS) plate with the data of Kanto-Tokai seismic network operated by National Research Institute for Earth Science and Disaster Resilience (NIED). In this study, I analyze data in Tokai region of the high-sensitivity seismograph network (Hi-net) operated by NIED.

2. Data and Method

Target region is 136.4-139E, 34-36N, and 0-500 km depth. The number of earthquakes with magnitude equal or larger than 1.5 satisfying the Gutenberg-Richter magnitude-frequency relation is 20331. I compare waveforms of an event to those of events within the 0.1 degree from the event since I focus on the events beneath the land area. I compare the band-pass filtered waveforms with 1-4 Hz on vertical component from P onset to five seconds after the S-wave arrival time. I defined the SRQ whose waveforms with at least three seismic stations within the 100 km from the event.

3. Result

The number of group of the SRQs is 1194 with 4697 events. I defined the burst-type SRQ with the total period from the first event to the last event within a group. The number of the group of the SRQs is 341. SRQs with low-angle lower thrust occur at depths of 18-27 km beneath the Fujieda region with 11 groups and at depths around 23 km beneath the Mori Town with 3 events. I estimated the plate slip rate using the relationship estimated by Nadeau and Johnson (1998). The slip rate at the upper boundary of the PHS plate is 1.5 cm/year.

SRQs within the PHS plate occur on the north of the Lake Hamana. There are three clusters of SRQs. The slip rate is approximately 0.8-1.2 cm/year.

There are many SRQs deeper than 35 km, however the focal mechanism of those events are strike-slip or normal fault. These events are located within the PHS plate.

SRQs accompanied with the subducting Pacific plate occur at depths deeper than 100 km. The focal mechanisms of those events are mainly reverse fault with strike-slip component or strike-slip type. There is no SRQ at the upper boundary of the Pacific plate beneath the Tokai region.

4. Discussion

SRQs at the upper boundary of the PHS plate beneath Fujieda region are also found by Kanto-Tokai seismic network by Matsubara and Obara (2006). The average slip rate from 1980 to 2004 was 0.9 cm/year and it is 1.4 cm/year in this study. Both slip rates are smaller than the slip rate 4.0 cm/year estimated by geodetic data (Seno et al., 1993).

5. Conclusion

I analyzed the NIED Hi-net data beneath the Tokai region from 2000 to 2015. The SRQs at the upper boundary of the PHS plate occur beneath Fujieda city and Mori Town. Many SRQs are selected within the inland crust, PHS plate, Pacific plate with focal mechanism of strike-slip or normal fault.

Keywords: repeating earthquake, Tokai, Philippine Sea plate