

Repeating earthquake beneath Tokai region by comparison with Kanto region

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1. Introduction

Plate boundary slip of strike-slip type was estimated with repeating earthquakes (Nadeau and McEvilly, 1999). Quasi-static plate boundary slip at the subduction zone off the northeastern Japan arc was also estimated (Igarashi et al., 2003; Uchida et al., 2003; Matsubara et al., 2005). Beneath the Kanto region, Kimura et al. (2006) estimated the plate boundary between the Philippine Sea (PHS) plate and Eurasian (EUR) plate with the repeating earthquakes. In this study, we compare the repeating earthquake activity beneath the Kanto (Kimura et al., 2006) and Tokai (Matsubara et al., 2005) region, central Japan.

2. Repeating earthquake activity beneath the Kanto region

Kimura et al. (2006) used the waveform data obtained by the Kanto-Tokai seismic network (KT-net) of National Research Institute for Earth Science and Disaster Prevention (NIED) from 1979 to 2003. Earthquakes accompanying the subduction of the PHS plate with magnitude larger than 2.5 were analyzed. Repeating earthquakes were identified based on event pairs with waveform cross-correlation coefficients of larger than 0.95 at two or more seismic stations.

They found 140 groups of repeating earthquakes constituting 428 events. Repeating earthquakes occurred at the upper boundary of the PHS plate beneath the southeastern Kanto region. Estimated time and space distribution of plate boundary slip revealed that plate slip increased after the large events with magnitude larger than 5.

3. Repeating earthquake activity beneath the Tokai region

Matsubara et al. (2005) used the waveform data with a passband frequency of 1-8 Hz obtained by the KT-net and high-sensitivity seismograph network of Japan (Hi-net) of NIED from 1979 to 2004. Earthquakes in the Tokai region with magnitude larger than 0.9 were analyzed. Repeating earthquakes were identified based on event pairs with waveform cross-correlation coefficients of larger than 0.95 at three or more seismic stations.

In this region, 883 groups of repeating earthquakes constituting 3184 events were found. Repeating earthquakes at the plate boundary (M 1.1-2.8) with thrust type occurred beneath the Fujieda, Shizuoka. Estimated average slip rate is 0.8 cm/year for 26 years and especially 0.36cm/year from 1999 to 2003. At the depths of around 30 km beneath the Lake Hamana, repeating earthquakes with strike-slip type constituting three clusters occurred. Three clusters exist at the east side of the lake, along the east end of the lake, and along the northwestern end of the lake. The average slip rates of these clusters are 3-4 cm/year for 26 years. The activity of the repeating earthquakes at the east side of the lake became active after the long-term slow slip events (Ozawa et al., 2002; Yamamoto et al., 2005) ended. Repeating earthquakes at the plate boundary and in the PHS plate are distributed to the northwest direction from the lake and they may form the fracture zone.

Many repeating earthquakes are found in the crust of the EUR plate. Many of them behave like burst, however, a number of them behave like repeating earthquake at the plate boundary with a stable interval. In the crust, repeating earthquakes occur at the existing fault zone.

4. Development of this study

We found the repeating earthquake activity in the crust as well as the plate boundary. Slip history analyzed with estimation of fault plane of them and consideration of their focal mechanism lead to the estimation of the accumulation and release history of strain and stress field in the crust.