

## Repeating earthquake activity at the Kanto and Tokai regions

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### 1. Introduction

At the Kanto and Tokai regions, great earthquakes such as the 1923 Kanto earthquake(M7.9) and the 1944 Tonankai earthquake(M7.9) have occurred on the subducting Philippine Sea plate (PHS) and next great earthquake is anticipated at the Suruga trough (ERC, 1999). Understanding of seismotectonics at these regions is important.

Repeating earthquake sequence is a series of events which repeatedly occur on the identical fault patch surrounded by area of stable sliding on the plate boundary (Nadeau and McEvilly, 1999; Igarashi et al., 2003; Kimura et al., 2006). Repeating earthquakes are utilized to reveal geometry of plate (Kimura et al., 2006) and to estimate quasi-static plate slips (Igarashi et al., 2003; Uchida et al., 2003; Matsubara et al., 2005a). To reveal seismotectonics at the Kanto and Tokai regions, we studied repeating earthquakes at these regions.

### 2. Repeating earthquake activity at the Kanto region

Waveform similarity analysis was conducted by using digital waveform data obtained by the Kanto-Tokai seismic network (KT-net) of the National Research Institute for Earth Science and Disaster Prevention (NIED). Earthquakes associated with the subduction motion of the PHS from 1979 to 2003 were analyzed and 140 repeating earthquake groups constituting 428 events were found (Kimura et al., 2006). They have low-angle thrust type focal mechanisms and are distributed near the upper boundary of the PHS. Estimated space time history of the plate boundary slip revealed swarm activity of repeating earthquakes synchronized with the Boso slow slip event and acceleration of slip preceding M5 class event (Kimura et al., 2005). In this study, we investigated space time slip history in more detail.

An earthquake which occurred on the PHS at the southwestern Ibaraki prefecture on Dec. 11, 1996, 10:28(JST)(Mj5.6) is one of the largest interplate earthquake near repeating earthquakes during analyzing period (hereafter, referred to as 'main-event'). This event is thrust type and located near the upper boundary of the PHS. Few repeating earthquakes are observed within 2 km from this event. Within 3 km, numerous repeating earthquakes occurred after the main-event. Averaged slip history was estimated from repeating earthquakes within 3 km from the main-event based on Nadeau and Johnson (1998). Obtained result shows averaged slip rate of 0.98 cm/y for 17.5 year before the main-event. On the other hand, slip rate increases rapidly after the main-event (36.4 cm/y on average for 1year after this event) and decreases gradually with time. Considering hypocenter and focal mechanism of the main-event, we expect these slip histories correspond to afterslip of the main-event. At the southwestern Ibaraki prefecture, repeating earthquakes are distributed within thick seismic cluster, and are thought to be affected by seismicity in the nearby area.

### 3. Repeating earthquake activity at the Tokai region

Matsubara et al. (2005b) analyzed 27,594 earthquakes with magnitude of 0.9 or greater at the Tokai region by using waveform data obtained by KT-net and Hi-net (NIED) from 1979 to 2004 and found 883 repeating earthquake groups constituting 3,184 events.

Repeating earthquakes at the plate boundary 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, numerous repeating earthquakes are distributed and the average slip rates are estimated as 3-4 cm/year for 26 years. Repeating earthquakes at the plate boundary and inside the PHS are distributed to the northwest direction from the lake and they may form the fracture zone.

### 4. Development of this study

Repeating earthquake analysis can leads to the estimation of deformation near the plate boundary and inside the plate. Further investigation is necessary.