SCG63-02 Room:303 Time:May 20 09:15-09:30

Depth-dependency on direction and velocity of tremor migration in Kii peninsula

OBARA, Kazushige[1*], MATSUZAWA, Takanori[2], TANAKA, Sachiko[2], MAEDA, Takuto[1]

[1]Earthquake Research Institute, The University of Tokyo, [2]National Research Institute for Earth Science and Disaster Prevention

Coupling phenomenon of non-volcanic tremor and slow slip event in southwest Japan [Obara, 2002; Obara et al., 2004] and Cascadia [Dragert et al., 2001; Rogers and Dragert, 2003] called Episodic tremor and slip (ETS) is an evidence for weak coupling of the plate interface at the downdip side of the seismogenic zone. One of the most significant features of tremor is migration. So far there exist three types of tremor migration; along-strike long-term migration at a speed of about 10 km/day [Obara, 2010], rapid tremor reversal (RTR) which is along-strike migration at a speed of order of 100 km/day propagating in the opposite direction from the long-term migration [Houston et al., 2011], and much faster slip-parallel migration at a speed of order of 1000 km/day detected in southwest Japan [Shelly et al., 2007] and Cascadia [Ghosh et al., 2010]. These three migration modes might reflect the main and sub rupture processes during the slow slip episode. Whether the tremor migration is composed of only above three modes or more is very important to construct the appropriate physical model for slow slip phenomena. In this paper, we investigate tremor migration by detecting automatically linear distribution of tremor sequence in Kii peninsula, southwest Japan.

We mainly analyzed a tremor catalog derived from the modified envelope correlation method [Maeda and Obara, 2009] considering with amplitude information applied to borehole data of the High Sensitivity Seismograph Network (Hi-net) administrated by the National Research Institute for Earth Science and Disaster Prevention (NIED) of Japan [Obara et al., 2005] from 2001 to 2010. In order to extract various migrating tremor sequences, we set four different time scales; 0.5, 1, 2 and 4 hours. For the given time window, at first, we choose a linear trend from the space-time plot. In this process, outliers with their distances from the regression line greater than two times of the standard deviation are removed. Then, the linearity of the tremor distribution in the map view and the space-time plot is checked by the principal component analysis. Total numbers of extracted migrating tremor sequences are 167, 213, 169 and 203 for time scales of 0.5, 1, 2 and 4 hours, respectively. The direction of migration is clearly different depending on the time scale. As a result, the tremor migration is characterized by prefixed direction at widely ranging speeds from a few to several 10 km/hr depending on the location. Decrease in the migration speed with increasing measurement time scale suggests that a diffusion process controls migration. The along-strike migration at the slower speed is concentrated in the updip edge of the tremor zone, on the other hand, the slip-parallel faster migration is detected in the downdip side. The long-term migration seems to be composed of and excited by the updipmost along-strike creep propagation. The updip along-strike migration might reflect existence of abundant fluid accumulated at the corner of the mantle wedge. Both of the faster slip-parallel migration and RTR might represent a projection of the along-strike fluctuation of slip pulse propagation at the slip-parallel striation.

Keywords: non-volcanic tremor, slow earthquakes, subduction zone, source migration