

The Slow Slip Event off the Boso Peninsula on January 2014 and the associated earthquake swarm

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Introduction

Off the Boso Peninsula, at the southeastern Kanto, central Japan, slow slip events (SSE) accompanied with earthquake swarms recurs with time interval of 4-7 years. SSEs have occurred in 1983, 1990, 1996, 2002, 2007, and 2011 and the latest SSE recurred from Dec. 2013 to Jan. 2014 with interval of 2 years and 2 months. In this study, detailed activity of the earthquake swarm and a fault model of the Boso SSE were determined.

Data and Methods

High precision hypocenter distribution was determined for earthquakes shallower than 30 km off the Boso Peninsula, from Jan. 1, 2005 by Double Difference method incorporating waveform correlation analysis. Hypocentral parameters determined by NIED Hi-net (automated hypocenters were partly included) were used as initial hypocenters.

A rectangular fault model with uniform slip was determined using genetic algorithm inversion for fault location and geometry and the weighted least squares method for slip amounts, following a method of Obara *et al.* (2004) based on tilt data recorded by high sensitivity accelerometer co-installed in NIED Hi-net station. In this analysis, slip direction was fixed to the direction of relative plate motion.

Results

Most earthquakes occurred around the northern edge of the seismic region where seismic swarms associated with the previous Boso SSEs occurred. Seismic swarms first occurred at the eastern offshore area and then migrated to the western onshore area. Migration from offshore to onshore regions is common feature among the previous Boso SSEs. Distribution of earthquake swarms is similar to that of the 2007 SSE, although spatial distribution and number of events are slightly smaller than the 2007 SSE.

The maximum crustal tilting of about 0.4μ radian with northwestward direction was observed at KT2H station and the fault model was determined to be located off the Boso Peninsula with size of M_W 6.1. Location of SSE slip overlaps with locations of the 2007 (Sekine *et al.*, 2007) and initial stage of the 2011 (Hirose *et al.*, 2012) SSEs. Tilting direction is similar to tilting direction of the 2007 SSE, however, its amount is about a half of the 2007 SSE (M_W 6.4) and the SSE size is also smaller. Smaller number of earthquakes is likely to reflect smaller size of the SSE. In the 2011 SSE, west-northwestward tilting of about 0.3μ radian was observed for the first two and a half days and size for this period was estimated as M_W 6.2. Its direction and amount are similar to those of the 2014 SSE and the SSE size is also close.

Discussion

Recurrence interval of the 2014 SSE was shortest for the last about 30 years. The size of the 2011 SSE was estimated to be comparable to previous SSEs and a possibility that the 2011 SSE was hastened by the stress increase caused by the 2011 Off Tohoku Earthquake and its afterslip has been proposed (Hirose *et al.*, 2012). On the contrary, size of the 2014 SSE is likely to be smaller than previous SSEs. This result infers that the SSE slip is smaller supposing the same source area and the SSE recurred with shorter interval with smaller stress accumulation. Further analysis is necessary to reveal the detailed source process of the Boso SSE for monitoring of the stress accumulation.

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