

Cumulative slip distribution of short-term slow slip events in the western Shikoku area, southwest Japan based on tilt change measurements

*廣瀬 仁^{1,2}、田村 和華子²、木村 武志³

*Hitoshi Hirose^{1,2}, Wakako Tamura², Takeshi Kimura³

1. 神戸大学都市安全研究センター、2. 神戸大学大学院理学研究科惑星学専攻、3. 防災科学技術研究所

1. Research Center for Urban Safety and Security, Kobe University, 2. Graduate School of Science, Kobe University, 3. National Research Institute for Earth Science and Disaster Resilience

In the western Shikoku area, southwest Japan, so-called short-term slow slip events (SSE) accompanying tremor activities repeatedly occur with an average recurrence interval of about six months (e.g., Obara et al., 2004; Sekine et al., 2010). This activity has been detected by high-sensitivity accelerometers (tiltmeters) equipped at NIED Hi-net stations (Obara et al., 2005). Using the observed tilt records, Sekine et al. (2010) estimated a history of released seismic moment by short-term SSEs and reported that about 65% of the accumulated moment by the relative plate convergence is released as short-term SSEs in the western Shikoku area. Because this estimation is based on a fault model such that slip is uniform on a plane rectangular fault and a location of the fault, especially a depth of the fault, is an unknown (nonlinear) parameter in their inversion, it is possible that an estimated seismic moment of an SSE could be biased.

In this study, we apply an inversion method that can express a spatial fault slip distribution assuming the slip is on the plate interface to the same tilt change data set that were detected in Sekine et al. (2010). They measured a tilt change caused by a short-term SSE as a difference between two averages of tilt values in one-day-long time interval (this can vary on a case-by-case basis) just before and after the SSE episode. We estimated each slip distribution of 18 short-term SSEs in western Shikoku between January 2001 and March 2008 although a reliable slip distribution is not estimated in a couple of episodes because of the limited number of available stations.

A cumulative slip distribution of the 18 SSEs shows that (1) slip area is localized within a narrow zone with its width of about 30-40 km in dip direction and about 70 km in strike direction of the subducting plate; (2) accumulated moment by the plate subduction is considered as fully released by SSEs at an area with larger cumulative slip; (3) the width of the slip zone is wider in the western part and narrower in the eastern part. The last characteristics is in agreement with the tremor epicenter distribution in this area (e.g., Obara et al., 2010). This suggests that there is a segment boundary that separates the western and eastern part of the SSE area in the western Shikoku region, and these segments likely have different frictional property and/or different pore fluid distribution.

Acknowledgments: This work was supported by JSPS KAKENHI Grant Number JP16H06474.

キーワード：沈み込み帯、スロー地震、傾斜変化、地震サイクル

Keywords: subduction zone, slow earthquakes, tilt changes, earthquake cycle