O-08

Modeling Slow Slip Events and Low-Frequency Tremors in the Kii Peninsula and Tokai Regions

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Recent high-resolution observations of crustal movements have revealed the occurrence of slow slip events (SSEs) in various subduction zones. Because SSEs occur in areas surrounding the source regions of large earthquakes, SSE activity may change during a cycle of large earthquakes (Matsuzawa et al., 2010). The detection of SSEs will also be useful for finding the coupled regions where stress is accumulated. We attempt to model SSE cycles and multi-segment events. We also investigate the interaction between SSEs and large earthquakes (Matsuzawa et al., 2010). In this presentation, we introduce the model of deep short-term SSEs in the Kii Peninsula and Tokai regions. Recently, Obara et al. (2010) located deep low-frequency tremors (LFTs) with a high resolution. Because LFTs occur with SSEs, we can model precisely the generation zones of SSEs from the distribution of LFTs.

We simulate the activity of SSEs on a 3D plate interface beneath the Kii Peninsula and Tokai regions by considering a rate- and state-dependent friction law with a small cut-off velocity on an evolution effect that was used by Shibazaki and Shimamoto (2007). The generation zones of SSEs are set from the hypocenters of LFTs (Obara et al., 2010). The results of the numerical simulation show that SSEs beneath the Kii Peninsula are separated into three segments. The recurrence intervals of SSEs in the northern Kii are approximately 5 months, but those in the middle and southern Kii are approximately 3 months. The recurrence intervals of SSEs in the Tokai region are approximately 6 months. Our numerical results reproduce well the characteristics of the observed SSE activity (Obara, 2010). The recurrence intervals are determined on the basis of the width of the segments and the plate convergent rate. Our simulation also reproduces a multi-segment event that propagates from the Kii segment to the Tokai segment. Multi-segment events over the Kii and Tokai segments occur when sufficient preparation for the SSEs is completed at the both segments.

We also attempt to model LFTs accompanied by short-term SSEs. We consider the local circular patches of LFTs in which the critical displacement is small, in the SSE region. The distributions of the LFT patches are derived on the basis of the observed LFT locations. Our simulation reproduces fast LFT events during slow SSEs. LFTs can be regarded as numerous small fast-slip events at the patches with a relatively small critical displacement during the macroscopic SSE propagation.