

Spatio-temporal evolution of recurrent slow slip events from 2010 to 2013 along the Ryukyu Trench, southwestern Japan

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Various types of slow earthquakes, including slow slip events (SSEs, Heki and Kataoka, 2008, Nishimura, 2014), very low frequency earthquakes (VLFs, Ando et al. 2012, Nakamura and Sunagawa, 2015), and low frequency earthquakes (LFEs, Nakamura, submitted), are detected along the southern part of the Ryukyu Trench, Japan. In this area, Global Navigation Satellite System (GNSS) stations have been newly installed since 2010 by Kyoto University in addition to the stations operated by Geospatial Information Authority of Japan. This study applies a modified Network Inversion Filter to these GNSS time series from March 2010 to February 2013, to estimate the spatio-temporal evolution of slow slip on the plate interface in detail. Five SSEs with Mw 6.6–6.8 and durations of 30–100 days are found during this period. The main slip region of the five SSEs are similar, located beneath the northwestern side of the Iriomote island. In contrast to the similarity in the spatial location, our detailed analysis newly clarifies the difference in the temporal evolution among the events; three SSEs suddenly accelerated to the maximum slip rate, and the other two SSEs showed a slow acceleration for 20–50 days. The spatial relationship among the SSEs, LFEs, VLFs, and tsunamigenic earthquake, is complementary along the trench, depending on the depth; tsunamigenic region in the shallowest part, weakly coupled region of VLFs and LFEs with depths shallower than 30 km, and SSEs deeper than 30 km, reflecting the depth variation of physical properties. VLFs are sometimes activated 10–20 days after the onset of SSEs that initiate with slow acceleration phase, although the number of SSEs is too small to assert this correlation. Since new GNSS stations are planning to be established, additional data and further analyses will possibly make the correlation clear in the future.

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