

The fluctuation of the slip accumulation rate of long-term SSE and its relation to VLFE beneath the Iriomote Island, southwest Ryukyu Arc

*Yoko Tu¹, Kosuke Heki¹, Hiroyuki Kumagai², Yoshiko Yamanaka²

1.Graduate School of Science, Hokkaido University, 2.Graduate School of Environmental Studies, Nagoya University

37 slow slip events (SSEs) beneath the Iriomote Island, the southwestern Ryukyu Arc, were detected in the GEONET F3 solution GNSS data 1997-2015. Their average moment magnitude (M_w) is 6.6, and the average recurrence interval is ~6 months, which are in accord with Heki and Kataoka (2008).

However, the recurrence interval was found to vary in time during the 18 years time span. During 2005-2009, the interval remained as short as ~4 months, and then returned to ~7 months after that. Moreover, the SSE slip rate (cumulative slip/ lapse time) increased from 9 to 11 cm/y and from 6 to 11 cm/y during two time periods, 2003-2006 and 2013-2015, respectively. Heki and Kataoka (2008) and Nakamura (2009) suggested that the slip rate could increase due to occurrences of large thrust earthquakes near the Ryukyu trench. However, no noticeable events occurred in this region prior to the trend increase around 2013. Conversely, two earthquake swarms occurred in the Okinawa Trough during these periods. In addition, southward motion of the Yonaguni Island, to the west of the Iriomote, has accelerated together with the SSE slip accumulation rate. From these results, we hypothesize that both the spreading at the Okinawa trough and the subduction at the Ryukyu trench could modify the SSE slip accumulation rate beneath the Iriomote Island.

In additions to SSEs, very low frequency earthquake (VLFE) is another kind of slow earthquakes that occur along the Ryukyu subduction zone. To understand the relationship between SSE and VLFE activities, we analyzed the broadband seismic data of the F-net in Japan and the BATS in Taiwan in order to identify VLFEs in southwestern Ryukyu Arc. During 2005-2010, we detected 2575 VLFEs there, and most of them were found to be thrust events in the shallow part of the plate boundary.

According to the distributions of SSEs and VLFEs, we found VLFEs are often activated by SSEs 10-30 days after the SSE onsets. We also found that the VLFE activity becomes higher during the periods of the enhanced SSE slip accumulation rate.

Keywords: slow slip events, very low frequency earthquakes, The Ryukyu subduction zone