

## Relationship between very low frequency earthquakes and repeating slow slip events in the south Ryukyu Trench

NAKAMURA, Mamoru<sup>1\*</sup> ; SUNAGAWA, Naoya<sup>1</sup>

<sup>1</sup>Faculty of Science, Univ. Ryukyus

The repeating slow slip events (SSEs) occur on the upper interface of subducted Philippine Sea plate at the depth from 30 to 50 km in the south Ryukyu Trench region (Heki & Kataoka, 2008). The afterslip of the March 2002 earthquake ( $M_w=7.2$ ) is distributed at the west of the fault of the repeating SSEs. This afterslip continued from March 2002 to 2005 (Nakamura, 2009).

Recently, very low frequency earthquakes, which occurred continuously along the Ryukyu Trench, were detected (Ando et al., 2012). The occurrences of SSEs, afterslip, and very low frequency earthquakes reflect the state of slip in the plate interface.

Then we investigated the relation between the SSEs with very low frequency earthquakes.

We employed the broad-band seismometer network of NIED (F-NET) and IRIS. We used the station of Ryukyu Islands, Kyusyu, SSE (Shanghai), and TATO (Taipei). We used the waveforms of vertical component for the analysis. The period we used are from January 1, 2002 to September 30, 2013. We filtered the band-pass range of 0.02-0.05 Hz to the waveforms, and detected the low-frequency events and picked the arrival times of surface waves manually. The local and teleseismic earthquakes were eliminated using the earthquake catalogue. The local events were also eliminated with checking the high-pass filtered record. Then we determined the location of low frequency events assuming that the observed waves were Raleigh waves.

We determined the 6299 low frequency events for 12 years. Almost events are distributed along the Ryukyu Trench axis. The low frequency events are clustering at the south Iriomote Island, south of Okinawa Island, and near Amami Island. The events are also distributed near the Okinawa Trough. However, the events in the Okinawa Trough would be the apparent distribution by miss-location of hypocenter determination which is caused by the linear distribution of seismic stations along the Ryukyu Arc.

Next we investigated the cumulative number of low frequency earthquakes in the clusters. The activity of the low frequency events at the cluster of the south of Iriomote Island decreased from 2005 to 2010, and increased since late of 2011. The activation of very low frequency events occurred after the occurrence of repeating SSEs. The 24 SSEs had occurred since 2002, and the 14 activation of the low frequency events occurred after the SSEs. The occurrence rates of the VLFs during the SSEs increased about 2-3 times than the averaged ones. However, the activation of usual earthquakes during the SSEs occurred only two times. These suggest that the SSEs would trigger the VLFs.

Keywords: very low frequency earthquake, slow slip event, Ryukyu Trench