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Along the Ryukyu Trench, the most southwestern part of Japan, no historical records of large thrust type earthquakes (Mw > 8.0) exist for the last 300 years (Ando et al. 2009) and therefore it is assumed that subduction zone in this region are aseismic. However, a tsunamigenic normal fault type earthquake occurred in 1771 around the Yaeyama Islands and its source region was estimated in the shallower part of the Ryukyu Trench from the tsunami heights (Nakamura 2009a). Recently, very low frequency earthquakes (VLFEs) were detected from a broadband seismic network along the trench (Ando et al. 2012). On the other hand, Heki and Kataoka (2008) reported that slow slip events (SSEs) had repeatedly occurred with a recurrence interval of about six months along the southwestern Ryukyu Trench. They estimated simple time-independent fault model for the SSEs assuming a planar rectangular fault with spatially uniform slip around the Iriomote Island by analyzing GNSS data at eight GEONET stations. However, the spatio-temporal evolution of SSEs has not been investigated. We have developed four GNSS stations in the Yaeyama Islands in 2010 in addition to eight GEONET stations to clarify the characteristics of the subduction zone along the southern part of the Ryukyu Trench. Because no large earthquakes recently occurred in this region, it is expected that the GNSS observations contain signals of SSEs that are not contaminated by earthquakes although some meteorological phenomena such as typhoon may affect the observations. In this study, we apply a geodetic time-dependent inversion scheme to these GNSS data to clarify the spatio-temporal evolution of the SSEs and its relation to VLFEs.

Data period used in this study is between March 2010 and July 2013. GNSS data from the 12 stations are processed with the GIPSY-OASIS II software. As a result, 5 SSEs were detected during the period. First of all, we remove the trend from each time-series. Then we conduct a geodetic time-dependent inversion using the detrended time-series to infer the spatio-temporal evolution of slip during each event. For this purpose, we employ a modified Network Inversion Filter (NIF) which is based on the Monte Carlo mixture Kalman Filter (MCMKF, Fukuda et al. 2004, 2008). This method is an improved version of the standard NIF (Segall & Matthews, 1998) and is able to extract slow slip signals without oversmoothing or undersmoothing of estimated slip.

The estimated temporal evolution of moment rate suggests that the first event initiated around 10 August 2010 and lasted for about 40 days and the moment magnitude is estimated as about 6.75. The main slip region locates at the northwestern part of the Iriomote Island and the maximum magnitude of slip is about 10 cm, which is consistent with Heki & Kataoka (2008). The resolution of slip below the Iriomote Island is improved by adding the four new observations, and hence no slip is inferred at the southeastern part of the Iriomote Island at depths of about 30 km where some amount slip is inferred without the four new stations. We find that the passage of a typhoon in the summer of 2010 affected the GNSS position estimates. We thus removed the data during that period to avoid the estimated slip to be affected by the typhoon. In the presentation, we will also show the results for the four other SSEs between 2010 and 2013 and compare the spatio-temporal evolution among the five SSEs.

キーワード：slow slip event、Ryukyu Trench、time-dependent inversion、GNSS
Keywords: slow slip event, Ryukyu Trench, time-dependent inversion, GNSS

