Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SCG64-05 Room:501 Time:April 30 12:00-12:15

A shallow slow-slip-event in northern Hokkaido in 2012-2013: An event triggered by seismic waves.

IKEDA, Shohei[1*] ; HEKI, Kosuke[2]

[1]Graduate School of Science, Hokkaido University, [2]Department of Natural History Sciences, Faculty of Science, Hokkaido University

GNSS (Global Navigation Satellite System), as represented by GPS (Global Positioning System), enabled us to study SSE (Slow Slip Event), slow displacement of fault without exciting seismic waves. In this study, we report that baseline length between the Horonobe and the Nakatombetsu GNSS stations (part of the GEONET, GNSS Earth Observation Network) in Northern Hokkaido, shortened by ˜2 cm over 4-5 months period from 2012 summer to the early 2013. We assumed that an SSE is responsible for this change, and inferred fault parameters of this unique SSE. There have been lots of reports on repeating SSE at plate boundaries, e.g. off the Boso Peninsula, the Nankai Trough, and the Ryukyu Trench. In the Northern Hokkaido, a block boundary is considered to run north-south (Loveless and Meade, 2010) with the convergence rate of about 1 cm/year. This shallow SSE we report here is considered to have occurred at this boundary.

At first, we analyzed time series of the distance change between Horonobe and Nakatombetsu, together with a few additional GNSS stations nearby and estimated the fault parameters of this SSE by grid searches. The estimated slip was about 10 cm (Mw was ˜5.9), which suggests that a similar SSE recurs every decade. However, these GNSS stations started in 2002, and we do not have information on the previous SSE. We modeled the time series using lines with two breaks, and we constrained the onset time and the ending time of the SSE by minimizing the root-mean-square of the post-fit residuals. The optimal onset and termination was 2012.64 and 2013.08, respectively. Around the onset time, there was a deep earthquake beneath Sakhalin (M7.7) on August 14, 2012, and there were four M4 class earthquakes close to the Horonobe station in July, 2012. Seismic waves generated by these earthquakes may have triggered this SSE. At the termination time, there was an M4.8 earthquake on 3 Jan. 2013 at the depth of 24 km on the westward extension of the SSE fault. From mechanical point of view, it is difficult to consider that this earthquake encouraged the termination of SSE.

Keywords: GPS, Slow Slip Event, Northern Hokkaido, seismic waves