

Observation of the deep low-frequency earthquakes using deep borehole-seismograph network. Activity in Tokai area

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Tokai area is the eastern side of Southwest Japan subduction where great earthquakes and deep low-frequency earthquakes (LFEs) occur along the convergent plate boundary. Researching the LFEs, Tono Research Institute of Earthquake Science (TRIES) installed a seismic array with 10 stations in Toyota city, Tokai area. Geological Survey of Japan (AIST) also installed a seismic array of three borehole-type instruments with high-sensitive seismographs at three depths of 50m, 200m, and 600m in Toyota city. We used seismic data of those two arrays and SMYH station of Hi-net array of National Research Institute of Earth Science and Disaster Prevention (NIED) as 3D array data for investigating LFEs. We successfully detected not only S waves but also very weak P waves of LFEs using the 3D array data and the semblance method. We understood that 3D array observation was effective for researching LFEs. We, therefore, built the second 3D array in Tono region where located 30-40 km north from the source region of LFEs in Tokai area.

We applied the deep borehole-seismograph network and the high density network of seismic stations of TRIES in Tono region to the second 3D array. We called it Tono Juji array. Tono Juji array was constituted by two borehole stations of 1000 m depth, three borehole stations of 500 m depth and twelve shallow stations. Seismic wave data observed by acceleration seismographs were converted velocity data. All of the seismic wave data were unified to sample rate of 100Hz and filtered through a 2 to 10 Hz band pass filter. We selected a LFE with the maximum magnitude ($M=0.6$) among the 209 events from the JMA earthquake catalog and named it LFE108. The origin time of LFE108 was 2014/9/1, 15h26m40.77s. We found a slight signal of P wave of LFE108 in vertical component of each station. And we also found a slightly clear signal of S wave in horizontal component of each station. We could not find large difference in clear or unclear of the signals between borehole stations and shallow stations. It means that the cause of unclear LFE signals mainly depends on not ground noise but overlapping of P, S and Coda waves of many successive LFEs.

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