

P- and S-wave detection of the low frequency earthquakes (LFE) using 3D array (3)

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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 relationship between the great interplate earthquakes and activity of LFEs, Tono Research Institute of Earthquake Science (TRIES) installed two seismic arrays at Shimoyama in Tokai area. The first was a small-aperture array (six stations in the area of 120m diameter) with short-period velocity type seismographs. The second was a middle-aperture array (four stations in the area of 4 km diameter) with high-sensitive acceleration type seismographs. 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 at Shimoyama. We used seismic data of those three 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. Using the 3D array (total 14 stations), we observed a remarkable activity of LFEs occurring in Tokai area in November 10-30, 2010. We analyzed the 3D array data to pick out direct P and S-waves propagating from LFE origins by using the semblance method. Assuming a homogeneous half space model with $V_p=4.5$ km/s and $V_s=2.2$ km/s, we obtained a semblance distribution for each component depending on the three factors of time, back-azimuth and incident angle of seismic waves. The maximum semblance point in each component shows a direct P-wave in UD, and S-wave in NS and EW, respectively. Incident angles and back-azimuths are compared with theoretical ones calculated by using JMA hypocenter data. Using the estimated S-P time of the LFE, we recalculated the depth of its hypocenter. The LFE locates near the interface of the Philippine Sea Plate subducting under Tokai area.

Keywords: deep low-frequency earthquake, 3D array, P- and S-waves, semblance, plate boundary