

Observation of non-volcanic tremors and very low-frequency earthquakes in eastern Shikoku using Nankaido NECESSArray

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NorthEast China Extended Seismic Array (NECESSArray) is a broadband seismic network aiming to reveal the seismic structure beneath the northeastern China. It was planned that the network deployment started in 2008, but unexpected problems in China prevented it from making progress on schedule. For the purpose of both the field test of broadband observation system and the observation of non-volcanic tremors and very low-frequency earthquakes, about 40 broadband seismometers have been installed in Kii Peninsula and eastern Shikoku where Episodic Tremor and Slip occurs. This temporal seismic array project is named 'Nankaido NECESSArray'. On this project we have installed a total of eight seismic stations in Miyoshi city, the western-most part of Tokushima prefecture, Shikoku. The purpose of this study is to reveal activity of non-volcanic tremors and very-low frequency earthquakes in eastern Shikoku using the data recorded by this array.

In eastern Shikoku, the active swarm of non-volcanic tremor occurs with a relatively short recurrence interval of about 3 months in and around Miyoshi city, so that this area is an ideal field for the short-term campaign. The swarm activity in eastern Shikoku appears to occur independently from that in central and western Shikoku where the linked swarm bridging the two areas is sometimes observed. In eastern Shikoku, it has been observed that the tremor sources migrate with a high velocity of about 40 km/hour, and that the tremor swarms exhibit periodicities of about 12 or 24 hours, which are synchronized with the Earth tides.

We deployed two small arrays in Yamashiro town and Nishi-Iya village in Miyoshi city as the part of Nankaido NECESSArray. The Yamashiro and Nishi-Iya arrays consist of five and three seismometers, respectively. The distances between seismic stations are 2-3km in each array, and that between two arrays is about 10 km. We searched for the installation sites on the condition that the commercial power supply is available, and selected eight public institutions as the sites. The seismometer and data logger are Guralp CMG3-T and Ref Tek 130-01, respectively. Continuous three-component seismic records with a sampling rate of 50 Hz are saved in CF cards, and the data are collected at each site every two to three months.

The Yamashiro and Nishi-Iya arrays started the observation on October 16 and 17, 2008, respectively. Since a relatively weak swarm of non-volcanic tremors occurred in August 9-11, 2008, we expected that the next swarm would occur after mid-October. However, it started on October 12, so that we could not observe the most active stage of swarm; we could observe only the final decaying stage. The second swarm occurred in October 10-16. Since the seismometers have been installed on the ground, they are affected by the ambient temperature variation. This causes the zero-level shift of sensor mass with time, and eventually it prevents regular measurement. Fortunately, we could adjust the sensor zero levels on October 8 and 9. Also, we collected the stored data for the first swarm, and confirmed that the tremors were clearly recorded in the data by visual inspection of waveforms. Although we first planned to withdraw the array until the end of March 2009, now we have a plan to go on the observation up to early in April, 2009 to observe the third swarm. The results of analysis for non-volcanic tremors and very low-frequency earthquakes will be shown in the presentation.

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