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Seismic survey using artificial sources at Nobi fault system, central Japan

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The structure of active fault in deep region has important information for investigating generation mechanism of inland earthquakes and forecasting strong ground motion by the earthquake. We conducted seismic reflection survey using artificial sources (Vibroseis) at Nobi fault system, central Japan in order to evaluate seismic structure beneath the fault system. The Nobi fault system consist of three major faults, Nukumi, Neodani and Umehara fault, and the three faults activated at the 1891Nobi earthquake. We set two survey lines. The one was an NE-SW line crossing the Neodani fault (northern line), about 30km length, and the other was an E-W line in the south of Umehara fault (southern line), about 22km length. Four large size vibrator trucks vibrate the ground along the survey lines and we tried to image subsurface seismic structures down to the depth of about 20 km.
The sweep signals of 6-40 Hz were recorded by geophones and digital telemetry systems (JGI G-DAPS4) arranged along the survey lines at about 50 m interval. Geophones and off-line recorders (JGI MS2000) were also used in a small part of the northern survey line. Total seismic receiving points were 684 and 453 in the northern and southern survey lines, respectively. We transmitted 3 0 sweep signals with the duration of 20 seconds at totally 105 sites in the northern survey line and 93 sites in the southern survey line. At some sites, we transmitted 60 sweep signals where the base rock was expected to be hard enough to transmit seismic signals effectively. Seismic data were processed using CMP-reflection method and refraction tomography, and we obtained depth converted seismic reflection profiles and seismic velocity structures beneath the survey lines.
In the northern survey line, the seismic profile seems to be divided into three regions; north-east part, fault zone part and south-west part. South-west region represent clear reflection planes at the two-way time of about 1, 3, 3.5 seconds (the depth of about 2, 8.5, 10 km depth), fault zone region represent reflection plane at the two-way time of about 2.5 seconds (the depth of about 7 km depth)., but the north-east region does not represent clear reflection planes. In the southern survey line, clear reflection planes were not detected. The seismic tomography shows velocity change at the eastern part near the geological boundary between chert and conglomerate-sand stone. The causes of the notable features of seismic profiles and their correlations to subsurface geological and geophysical structures are important problems, but are not clear yet. Progress of data analysis is necessary for the problems.

Keywords: Nobi fault system, seismic survey, seismic reflection method, Vibroseis