

Seismic array observation on land in the vicinity of the 2007 Chuetsu-Oki earthquake

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The Chuetsu-Oki earthquake occurred on 16 July, 2007. The source area is one part of 'Niigata-Kobe tectonic zone (NKTZ)', which shows high strain rates geodetically and geologically. In 2004, a similar size earthquake occurred 30 km southeast away from this source area. The both earthquakes are parallel to axis of the folds. The active fold area between both earthquakes is therefore important to understand process of strain accumulation, propagation and release. We deployed some seismic arrays in the vicinity of the source area in order to reveal not only shallow active fold structure but also deep crustal structure.

The seismic arrays include Small Array (SA), and Large Arrays (LAs). The SA with a survey line length of 3 km consists 116 seismometers at 30 m spacing. The LAs with survey line length of 7 km -22 km consist of 103 seismometers at 500 m -700 m spacing. The SA recorded air-gun fires in the vicinity of the source area and many aftershocks. A reflection survey, moreover, was conducted with a source of mini-vibrator along the SA. The LAs were deployed only during air-gun fires.

The SA data analysis was proceeded as follows. The mini-vibrator data was analyzed with a conventional reflection method. The air gun and earthquake data were analyzed with a seismic interferometry (Claerbout, 1968, Wapenaar, 2003), which could produce pseudo-reflection records with a waveform cross correlation analysis. After we obtained pseudo-reflection, we could treat as conventional reflection data. These operations result in three reflection sections.

In mini-vibrator section, we can recognize an east dipping reflector at 500 m depth but poor reflectors in the deeper part. In air-gun and earthquake sections analyzed with seismic interferometry method, we could not recognize clear reflectors. To treat air gun data as ground motion noise, and analyze with seismic interferometry method as S-wave seismic sources, however, we could obtain a similar section to mini-vibrator. This indicates a possibility to obtain S-wave section using ground motion noise.

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