**S053-P014** Time: May 26 17:15-18:45

# Heterogeneous Crustal Structure in the Fault Area of the 2000 Tottori-ken Seibu Earthquake


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On October 6, 2000, an earthquake (Mw 6.6) occurred in the western Tottori prefecture of Japan. Although the earthquake is a large intra-island-arc type event, a surface rupture is not clearly observed. The generation mechanism of such intra-island-arc earthquakes is not clarified yet. The heterogeneous crustal structure is one of the key points to understand these earthquakes.

To reveal the heterogeneous crustal structure in the fault area of this earthquake, we conducted earthquake observations in twice.

In October 2000, right after this large earthquake, an urgent joint aftershock observation was carried out (The Joint Group for Dense Aftershock Observation of the 2000 Tottori-ken Seibu Earthquake, 2001). As a part of this, we conducted multi-channel earthquake observation. We deployed a 12-km-long highly dense multi-channel seismic array (MCS array) along and across the main fault area. We operated the array for 85 hours from 17:00 on October 21 (JST) to obtain quasi-continuous records of aftershocks at a sampling rate of 250 Hz. At the same time, about 700 events were located by off-line recorders operated by the joint aftershock observation (Chiba, 2003). About 300 events among them were recorded in our MCS array.

In April 2002, a seismic reflection survey was carried out along the fault (Nishida et al., 2002). At the same time, we conducted a seismic array observation using off-line seismic recorders in the same area to image a crustal structure. The array consisted of 145 seismometers distributed across a southeastern part of the main fault with a spacing of 50 m. Waveforms were continuously recorded at a sampling rate of 250 Hz, 200 Hz, and 100 Hz. The observation started on May 30 and continued for one month and about 200 events were recorded.

Since the seismic sources are not on the surface of the earth, we cannot apply the conventional CMP method to these earthquake data sets. Therefore, we applied the offset VSP (Vertical Seismic Profiling) method. We used one dimensional velocity model that is used in the joint aftershock observation. We assumed the PP and SS reflection. We can recognize strong reflected waves from the mid-crust at depths of 12 km, 20 km, and 30 km. A depth of 12 km corresponds to the bottom of the aftershock distributions. Depths of 20 km and 30 km correspond to the top of lower crust and the Moholovicic discontinuity.

All the enveloped waveforms except noisy data were stacked to improve and to expand the image. But the errors of epicenters or origin times of aftershocks introduced noises in reflection layers. This analysis strongly depends on the velocity structure.