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Three Dimensional Structure of the S-wave Reflectors in and around the Source Region of the 2000 Western Tottori Earthquake

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We mapped three-dimensionally S wave reflectors to investigate the detailed heterogeneous structure in and around the source region of the 2000 Western Tottori Earthquake, using the waveform data of the joint-university dense observation of the aftershocks. We will refer to possible relationships between the distribution of the S wave reflectors and the structure of the fault.

We made NMO correction for the 8770 waveform data with good S/N ratio using the four-layer velocity model used at Tottori Observatory, DPRI. We made 5-25 Hz bandpass-filtering, two seconds muting, the geometrical and inelastic attenuation correction (Q=780), coda-normalization at the 21-23 seconds after the origin time. Then we divided the analysis region into 32025 blocks: 35 blocks along the fault (1 km interval), 15 blocks transverse the fault (1-6 km interval) and 61 blocks in the depth direction (1km interval). Square amplitudes obtained in the NMO correction are accumulated for each block and mapped three-dimensionally in and around the source region. (We define this value as 'reflective strength.')

We found reflective layers at four depth ranges; 10-13km (layer A), 16-23km (layer B), 28-37km (layer C), and 50-60km (layer D). Features of these four layers are as follows:

(1) Layer A corresponds to the bottom of the aftershock distribution and is found over the analysis region.

(2) Layer B is thought to be near the upper boundaries of the lower crust in this region. This layer has high reflective strength through high frequencies (17-25Hz). This layer changes its depth with the northwest side 5 km shallower than the southeast.

(3) Layer C is thought to correspond to the Moho. This layer has high reflective strength beneath the source region and for 5-25 Hz filter zone. This layer also changes its depth: it is deep (at depths of 32-37 km) at the northwest side, shallowest (at depths of 28-33 km) beneath the mainshock source and again deeper (at depths of 32-37 km) at the southeast side.

(4) Layer B and Layer C are not incompatible to Yoshii et al. (1974) and Tada et al. (2001).

(5) Layer D has high reflective strength through low frequencies (2-5 Hz), which implies that there is a structure with large scale (more than 1 km) reflectors. This layer becomes deeper at the northwest side (60km) than the southeast side (50km).

(6) In the crosssection transverse to the aftershock zone, the northeast of the aftershock zone has high reflective strength from 10-25 km depths, while the southwest part has low. There is some vertical structure extending from the aftershock area (1-15km depths) to the lower crust.

We have imaged the reflectors at the bottom of the aftershock distribution, and to clarify the detailed relationship between the aftershock distribution and reflective layers, we will have more detailed look (reflection wave, converted wave and so on) at the waveform data just after the direct S wave. We will also research the relationship between the Layer D and the Philippines Sea Plate, using the Hi-net data and so on.