

Wide angle seismic experiments in the Western Pacific in 2007 (1)

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The full-dress seismic investigation of crust and upper mantle velocity structure for the delineation of the Japanese Continental Shelf had begun in 2004 and will be carried out until June 2008. In 2007, we conducted 17 seismic refraction profiles in total, including 6 lines at 23-26.5 N in the mid Kyushu-Palau Ridge (KPR), 5 lines at 15-18.5 N in the southern KPR, 5 lines in the southeastern region of the Ogasawara Plateau on the Pacific plate, and one profile across the northern end of the Mariana arc. The total length of the profiles was over 5,000 km. The specifications of a series of surveys are the same as previous ones. We shot a tuned airgun array of 36 airguns with a total volume of 8,040 inch³ as a controlled seismic source at an interval of 200 m (90 s) for each line. Ocean bottom seismographs (OBS) deployed at every 5 km interval were used as receivers. In this paper, we will describe preliminary velocity models deduced from these seismic refraction experiments.

The velocity models were derived from appropriate combination of a travel time inversion (tomo2D, Korenaga et al., 2000) and an interactive ray tracing (Kubota et al., 2005). We also examined consistency with the multi-channel seismic profiles obtained on the same survey lines. Finally, the 2-D synthetic seismograms are calculated by a finite difference method, E3D (Larsen and Schultz, 1995) and compared with the observed amplitude data.

Six profiles in the mid KPR cross the Shikoku Basin on the eastern side and Minami Daito Basin on the western side. P-wave velocity models beneath the northern three lines show a thick crust of the KPR corresponding to a wide bathymetric high. On the other hand, the southern three models have thinner crust compared with the northern ones. Crustal models of the Minami Daito Basin are similar to standard oceanic crusts but the thicknesses are rather thicker than those of the Shikoku Basin.

Five profiles in the southern KPR traverse the Parece Vela Basin on the eastern side and West Philippine Basin on the western side. The KPR crusts are always thicker than the oceanic crusts of the basins on both sides. However, the crustal models of the transition between the KPR and ambilateral backarc basins vary depending of the profiles.

Particular crust and upper mantle velocity models were obtained in the oceanic basin to the southeast of the Ogasawara Plateau. The velocity models are different from normal oceanic models as expected and a low velocity layer exists in the lower crust and a crust/mantle boundary is not explained by a simple velocity gap.

One profile was conducted at the northern end of the Mariana arc to obtain a velocity model illustrating the initial rifting of the arc and the oceanic basin of the Parece Vela Basin.