

Seismic structure along the Okinawa Trough axis, East China Sea.

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The Okinawa Trough is known as one of the active areas in the early stage of back-arc rifting system. Although some seismic surveys were conducted in the Okinawa Trough, there have not yet been continuous velocity models entirely along the Okinawa Trough axis from south to north. Japan Coast Guard (JCG) conducted seismic refraction and reflection surveys in order to construct velocity models continuously along the Okinawa Trough axis.

We carried out three seismic lines designed to obtain the velocity structure along the curved Okinawa Trough axis. The total length of the lines was 1,233 km. We shot a non-tuned airgun array with a total volume of 98.4 L (6,000 inch³) as a controlled seismic source at an interval of 200 m (90 s) for refraction experiments. 243 ocean bottom seismographs (OBS) deployed at every 5 km interval were used as receivers. We also obtained the multi-channel seismic data by using a 240-channel streamer cable of 3,000 m in length, shooting a 3-gun cluster airgun, 17.1 L (1,050 inch³) in a total volume, at an interval of 50 m.

The record sections obtained by OBSs show three distinctive reflection phases from velocity discontinuities in crusts and from the Moho. Pn phases are observed in the south area of the Okinawa Trough, but hardly observed in the north area.

Our experiments present the detailed P-wave velocity models along the Okinawa Trough. The crustal structure beneath the Okinawa Trough is divided into three layers, upper, middle, and lower, on the basis of their layer velocities and the depths of reflectors/layer boundaries. The V_p of the middle crust is 5.8-6.5 km/s and seems to correspond to the island arc middle crust which is observed at the Izu-Ogasawara Arc. The uppermost mantle velocities with 7.5-7.8 km/s are slower than typical oceanic mantle velocities.

The thickness of the igneous crust in the Okinawa Trough changes locally, approximately 10 km just below the Yaeyama and Miyako Submarine Grabens, 20-25 km in the area between the grabens and in the northern part of the Okinawa Trough. This variation in the crustal thickness may be due to the thinning of lower crusts. The thickness range of the lower crusts is 3-15 km, although the thicknesses of the upper and middle crust do not change largely.

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