

Shallow crustal structures in the north Izu-Ogasawara region observed by seismic reflection data

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1. Introduction

An oceanic island arc is one of the best fields to study a process of the crustal growth, because its tectonics is simpler than a continental island arc. The crustal growth had been started by a subduction of an oceanic crust beneath another oceanic crust, which had been separated from the continental margin with complex structure. The Izu-Ogasawara region is a typical intra-oceanic island arc system involving trench, arc, and backarc-basin: the Izu-Ogasawara trench where the Pacific plate is subducting beneath the Philippine Sea plate, the Izu-Ogasawara arc, and the backarc Shikoku basin which lies to the west of the Izu-Ogasawara arc. The shallow structures are expected to exhibit deformations originated from the crustal growth that occurs in the deep earth interior.

In order to figure out the process of the crust growth of this typical island arc system, we carried out a multi-channel seismic (MCS) reflection survey using R/V KAIREI of Japan Agency for Marine-Earth Science and Technology (JAMSTEC) around the north Izu-Ogasawara region in August and December, 2004. The data acquired in these surveys contribute to the continental shelf investigation.

2. Data Acquisition

The survey line IBr2 has the length of about 500km, crossing the Izu-Ogasawara trench, the Izu-Ogasawara arc, and backarc basin. The western end reaches the southernmost part of the Zenisu ridge.

The airgun array has total capacity of 12,000 cubic inches, and the length of a hydrophone streamer cable is about 5400m. The basic specifications of the data acquisition are as follows; 50m shot-spacing, 2000psi airgun-pressure, 25m group-spacing, 204 channels, 4ms sampling- interval and 15s record-length.

The reflection data have good enough quality to interpret the shallow structures, although the noise by typhoons and large cable feathering are partly included.

3. Results

We report here our preliminary interpretations from the MCS profile.

1) We can identify a clear seismic reflector of the subducting Pacific plate with horst-and-graben structures, which can be observed beneath the arc more than 60km landward from the trench axis. A fault activity seemed to be a reverse fault is visible within the trench-fill-sediments.

2) The back arc basin, which lies to the west of the Izu-Ogasawara arc, is covered with sediments having ~2km thickness (~2s in two way traveltimes). A number of normal faults develop in this sedimentary layer. The backarc basin is bordered with the island arc by a normal fault with large throw and low angle at the eastern edge.

3) In the westernmost part of the survey line, a pronounced reverse fault, which forms the south edge of the Zenisu ridge, is visible.