

Seismic reflection images of the southern Izu-Bonin arc/back-arc system - implications for the Izu-Bonin back-arc evolution

Ryo Miura[1]; Yasuyuki Nakamura[2]; Kyoko Okino[3]; Kensaku Tamaki[4]; Hidekazu Tokuyama[5]; Keita Koda[6]; Millard F. Coffin[7]

[1] ORI, Univ. of Tokyo; [2] Ocean Res. Inst., Univ. Tokyo; [3] ORI; [4] ORI, Univ of Tokyo; [5] ORI, Univ. Tokyo; [6] JNOC; [7] ORI, Univ. Tokyo

The Izu-Bonin arc is a well-known oceanic island arc with back-arc basin (Shikoku Basin) located in the eastern edge of the Philippine Sea plate. The Shikoku Basin was formed between 27-15 Ma, and is located between the Izu-Bonin arc and the Kyushu-Palau Ridge. Previous marine geophysical and geological studies have revealed its crustal structure and its geological interpretation, mainly in the northern Izu-Bonin arc. Although several marine geological and geophysical surveys were also designed in the southern Izu-Bonin arc and in the southern Shikoku Basin areas, the characteristics of the southern Izu-Bonin arc/back-arc system had not been revealed well.

In 2000 and 2001, Metal Mining Agency of Japan and Japan National Oil Corporation collected multichannel seismic (MCS) reflection data in the southern Izu-Bonin arc, the Shikoku Basin, and the Kyushu-Palau Ridge using M/V Geco Emerald and M/V Veritas Searcher, as a part of 'Basic Research for Resources Exploration Technology in the Deep Sea Region'. The MCS data were acquired using a 240-channel streamer of 6000 m length and 134.4 l air gun seismic source in 2000, and using a 564-channel streamer of 7050 m length and 71.1 l air gun seismic source in 2001. The survey consists of nine E-W oriented lines and seven N-S oriented lines.

The MCS data provide us a complete image of transect across the southern Izu-Bonin arc/back-arc system, from the Ogasawara Ridge to the Kyushu-Palau Ridge, including the southern Shikoku Basin and the Ogasawara Trough. Several east-dipping normal faults are developed in the eastern slope of the Kyushu-Palau Ridge, and these normal faults were probably formed during early stage of the back-arc opening, transition from rifting phase to spreading phase. On the other hand, in the Shikoku Basin, crustal structure beneath the seafloor was not imaged, except for several normal faults, which were developed on that surface layer. The west-dipping normal faults were found in the basement of the Ogasawara Trough, which is continuous with the Ogasawara Ridge basement. The west-dip normal faults were also found in the basement of the western slope of the Shichito-Iwojima Ridge, the Quaternary volcanic front of the Izu-Bonin arc. These normal faults, in the Ogasawara Trough and the western slope of the Shichito-Iwojima Ridge, are covered with thick sediment layer. The sediment layer in the Ogasawara Trough is partly deformed by normal faults initiated from the trough basement. These normal faults which were found in the trough basement probably formed during the rifting phase, from the Paleo-Izu-Bonin arc breakup to continuous extension of the arc crust, early stage of the back-arc opening. We will present post-stack time migrated MCS sections in the southern Shikoku Basin and the adjacent region, and discuss the geological structures and their implications for rifting tectonics of the Paleo-Izu-Bonin arc breakup, the initial stage of the Shikoku Basin opening.