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III. PRELIMINARY RESULTS ON SEISMIC REFLECTION SURVEYS OF THE OFFSHORE TOKAI DISTRICT

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Introduction

Single-channel seismic reflection surveys for the offshore Tokai district were carried out during cruises GH97 and GA97 (Fig. III-1). The interval of the tracks trending northwest to southeast were 2 miles, and for these northeast to southwest were approximately 4 miles. Ship speed during the seismic surveys were approximately 10 knots on the GH97 cruise and 8.5 knots on the GA97 cruise. The shot interval of GI gun (SEISMIC SYSTEMS GI-355: 250-cubic inch as generator and 105-cubic inch as injector) was 8 second. The received seismic signals by streamer were adequately amplified and filtered on board. and then recorded as profiles by LSR in 4 second ranges. The digital data were also recorded by Delph24X (Elics) and were saved as SEG-Y format.

The study area can be divided into four areas based on physiographic features (Fig. III-2); continental shelf, Enshu Trough, Outer Ridge and landward slope of the Nankai Trough from north to south. Only preliminary observations of each area are given here and more detailed interpretation of the data will be published as marine geological maps.

Continental shelf

Maximum width of the continental shelf is 30 km south of the Ise Bay, and it decreases to 5 km at offshore Hamamatsu City. The water depth of shelf edge is approximately 150-160 m. The acoustic basement slopes gently toward the south. and progradational sequences overlie the basement under the shelf (Fig. III-3). The thickness of the progradational sequence increases to the south reaching about 1 second in two-way travel time at the shelf edge.

Eight faults are observed in a direction parallel to the coastline between longitude 137° 10′ E and 137° 50′ E on the shelf (Arai *et al.*, 1998). Eight sub-parallel faults with east-northeast to west-southwest directions extend over several tens of kms. Some faults are considered to be active since the last glacial periods. because, they cut across the erosional surface of the shelf top. All faults show north side downthrown offset up to 0.2 seconds in two-way travel time at the basement (Fig. III-3) between Matsuzaka and Takamatsu Submarine Canyons.

Enshu Trough

Enshu Trough is landward of Outer Ridge, and it is about 100 km in length in the

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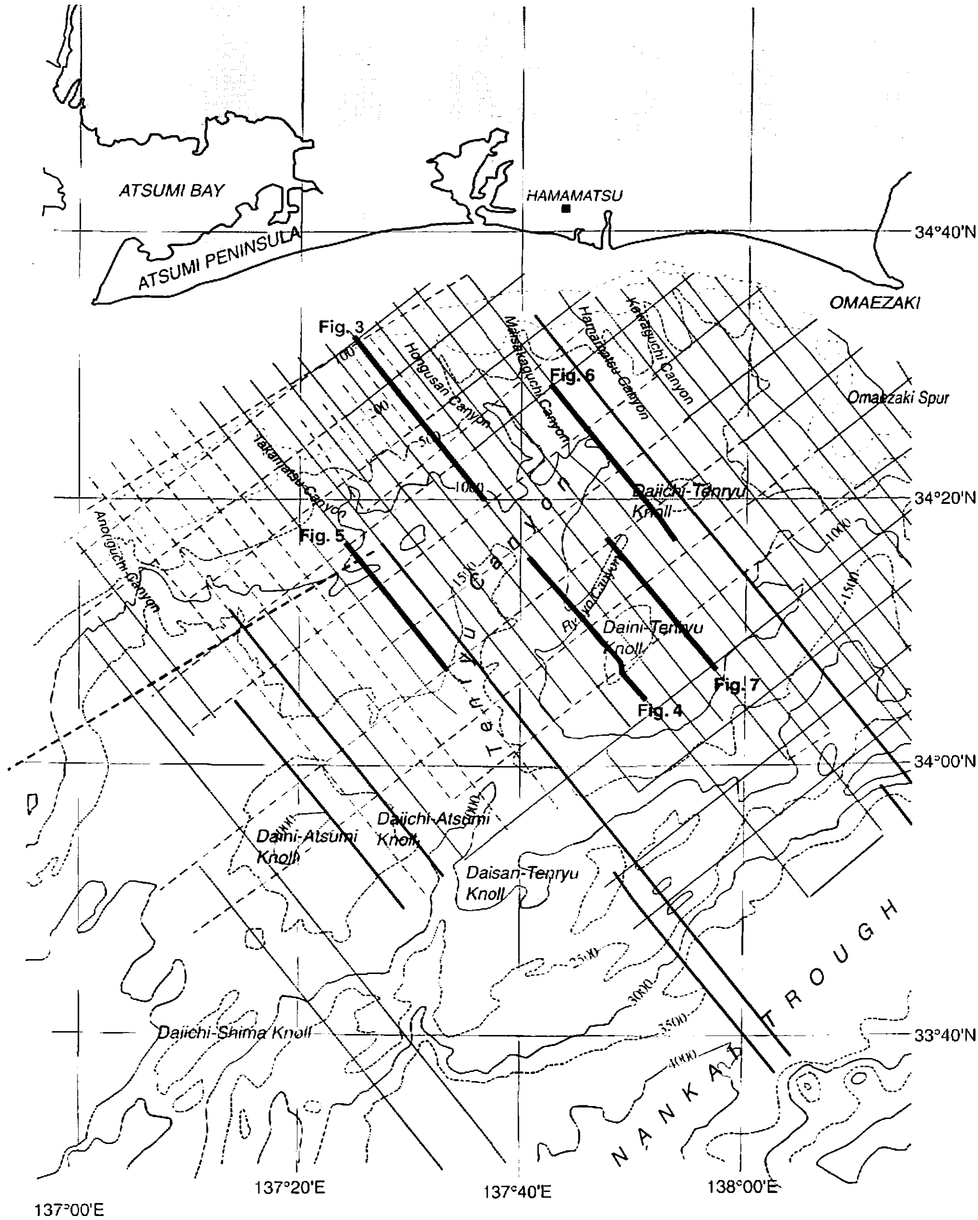

Fig. III-1 Track chart of the seismic reflection surveys for cruises GH97 and GA97. Solid lines are for cruise GH97, broken lines are for cruise GA97, and bold lines are for multi-channel seismic reflection surveys.

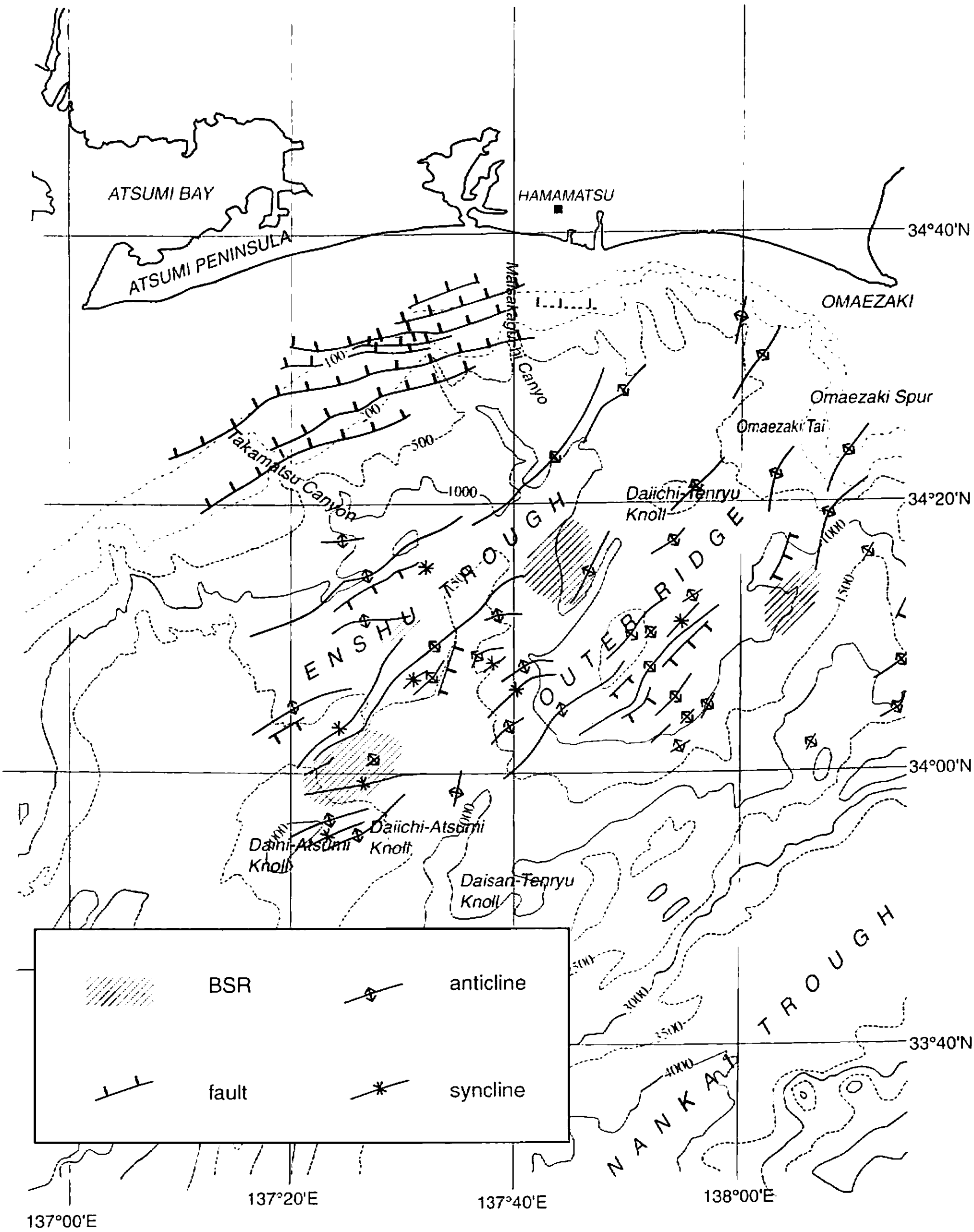

Fig. III-2 Preliminary geological structure map of the offshore Tokai district.

northeast to southwest direction, and the maximum width is about 40 km (Sakurai and Sato, 1983). Enshu Trough develops along Tenryu Submarine Canyon at east of longitude 137° 36′ E. However, Tenryu Submarine Canyon changes direction to the south at the longitude 137° 36′ E, Enshu Trough follows to the southwest direction. Small submarine canyons cut continental shelf in the northwest to southeast direction into Enshu Trough.

In the northeast of Enshu Trough, anticlinal axes run in the northeast to southwest direction along the Tenryu Submarine Canyon (Fig. III-2). The eastern anticlinal axis 13 km long occurs from ridge between Kawaguchi and Hamamatsu Submarine Canyons to Hamamatsu Submarine Canyon. The anticlinal axis of about 28 km long extends from Hamamatsu Submarine Canyon to an area between Takamatsu and Tenryu Submarine Canyons. An anticlinal axis over 30 km long is extended from an area between Takamatsu and Tenryu Submarine Canyons to the southwest. An anticlinal axis 40 km long of similar direction is observed at a site 13 km southeast of the axis of over 30 km long. This axis is cut by Tenryu Submarine Canyon at latitude 34° 12′ N.

The sediments in an area within Tenryu and Ryuyo Submarine Canyons at northwest side of Daini-Tenryu Knoll is characterized by a tilt to the northwest which seemed to accumulate related with the uplift of Daini-Tenryu Knoll. The thickness of the sediment attains over 1 second in two-way travel time. Bottom Simulating Reflector (BSR) is remarkably observed in this area (Fig. III-4).

Sediment over 1.5 seconds thickness in two-way travel time accumulated within the syncline of several tens of km wide between the anticline axes over 30 km. Several unconformable surfaces are identified within the sediment in this area (Fig. III-5). The seismic profiles shows the sediment 1.2 seconds thickness in two-way travel time with BSR at north-side slope in the Daini-Atsumi Knoll.

Outer Ridge

Along the landward side of Nankai Trough, knolls and spur develop in the northeast-southwest direction: Omaezaki Spur, Daiichi-Tenryu Knoll, Daini-Tenryu Knoll and Daisan-Tenryu Knoll. Though knolls are cut by Tenryu Submarine Canyon at longitude 137° 36′ E, knolls follow to southwest direction: Daiichi-Atsumi Knoll, Daini-Atsumi Knoll and Daiichi-Shima Knoll. These high topographical structure is defined as Outer Ridge.

Three anticlinal axes of 15 km or less long in the north-northeast to south-southwest direction occur on Omaezaki Tai (Kotai Ba) in Omaezaki Spur. In the western slope of Omaezaki Tai, the thickness of the sediment that fills the submarine canyon attains 0.6 seconds in two-way travel time. In the east of Omaezaki Tai, seismic reflections are not clear. The folded structures approximately north-south direction in the east side of the Daiichi-Tenryu Knoll change to the northeast-southwest direction in the west (Fig. III-2). It has already been reported that banded pattern of topographical and geological structure and the extending direction are changed at the offshore Omaezaki (e.g. Mogi, 1975). The result of present survey supports the existing data.

Over 1 second thickness in two-way travel time of the sediment observed at top of

Daiichi-Tenryu Knoll. and the acoustic basement can not confirm in this area. The sediment gradually thins to the southwest, and becomes 0.3 seconds thick in two-way travel time in the southwest edge of Daiichi-Tenryu Knoll. Two anticlinal axes of northeast to southwest direction with 10 km or less long range parallel each other. The topographical high of the present knoll is not located at the anticlinal axis, because the south side of anticlinal axis is eroded (Fig. III-6).

At the Daini-Tenryu Knoll, anticlinorium structures of 10 km length or less with the small faults develop at the top of knoll and southeast slope. The seismic reflection is not clear at the acoustic basement of the anticline. At the Daiichi-Atsumi Knoll of the southwest, the anticlinal axis 5 km long of the north to northeast to south-southwest direction is developed. Two anticlinal axes about 10 km long in the southwest-northeast direction run on Daini-Atsumi Knoll (Fig. III-2).

Landward slope of the Nankai Trough

Offshore side of Daiichi-Tenryu Knoll and Daini-Tenryu Knoll are investigated as landward slope of the Nankai Trough. Omaezaki Trough (Iwabuchi et al., 1991) occurs in southeast of Daiichi-Tenryu Knoll. The trough has concave topography of 10 km in length, 5 km in width, relative elevation 200-300 m and north-northeast to south-southwest direction. Reverse fault of 8 km long are observed by seismic reflection surveys in this area. BSR is observed in the southeast area of Omaezaki Trough (Fig. III-2).

In the southeast slope of Daini-Tenryu Knoll, some faults with south downthrown 10 km in length or less exist. They are parallel to the anticlinorium structure (Fig. III-7). These faults are almost identical with the Kodaiba fault that was described by Tokuyama *et al.* (1998).

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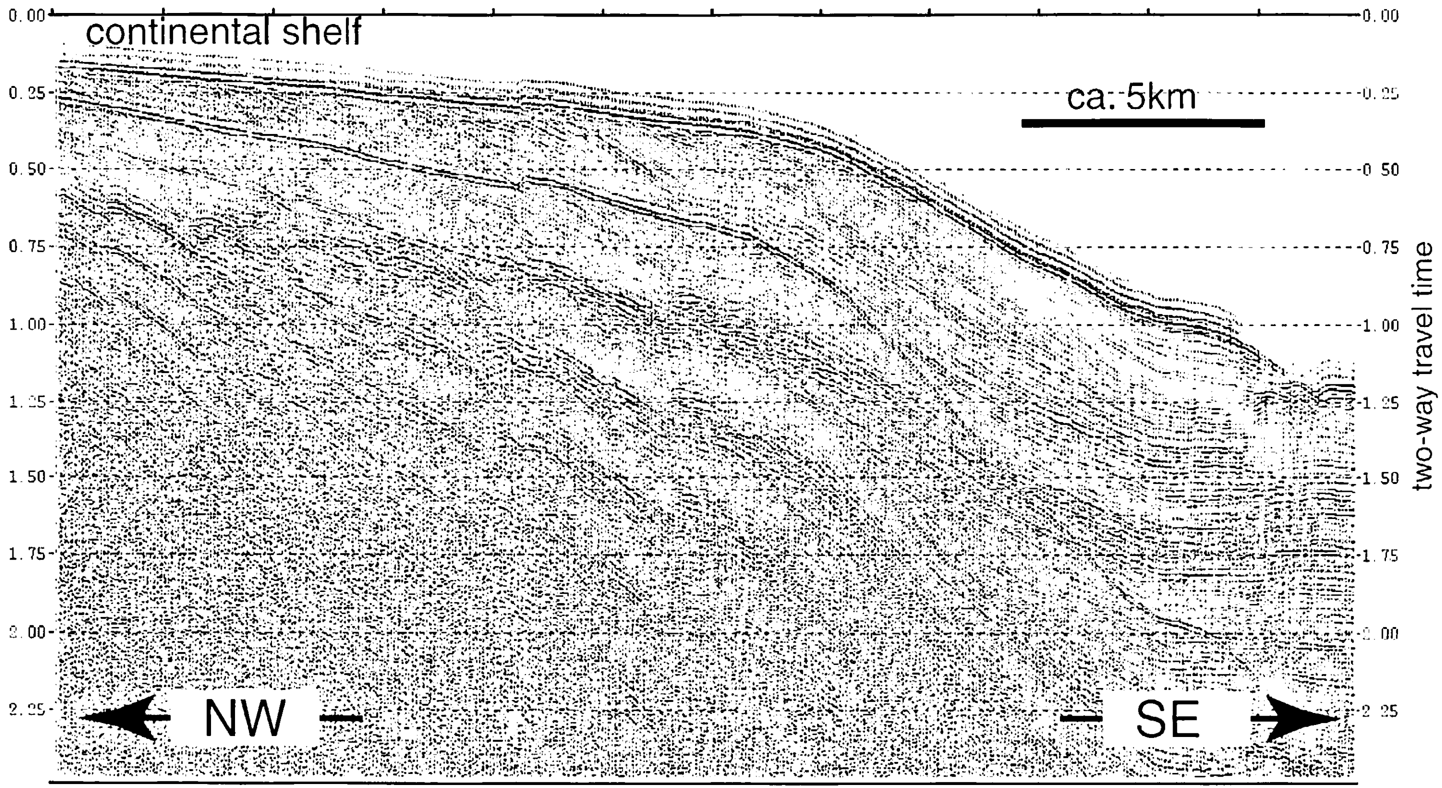

Fig. III-3 Seismic reflection profile of continental shelf to shelf slope. Vertical scale is presented in seconds of two-way travel time.

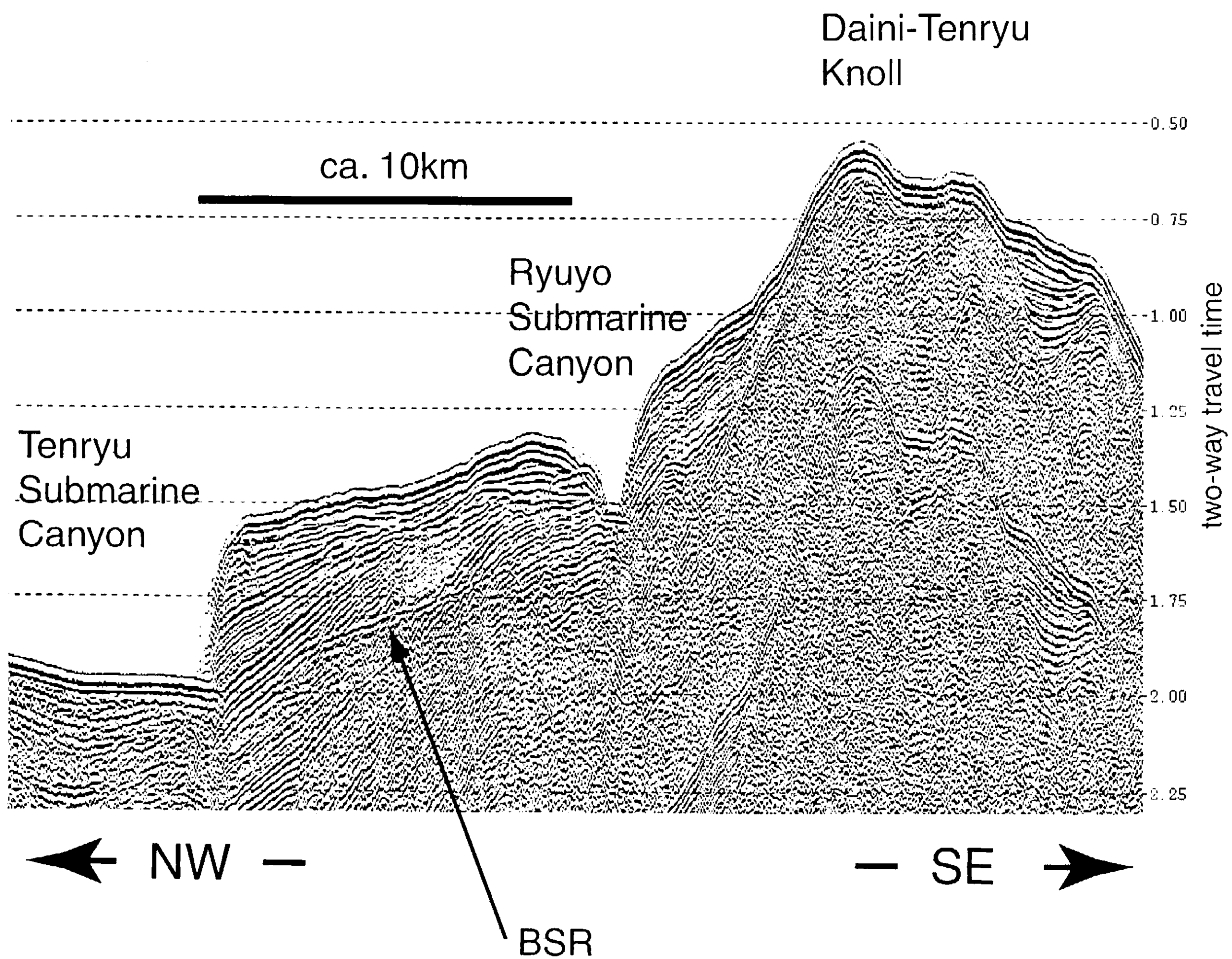

Fig. III-4 Seismic reflection profile of north west of Daini-Tenryu Knoll. Vertical scale is presented in seconds of two-way travel time.

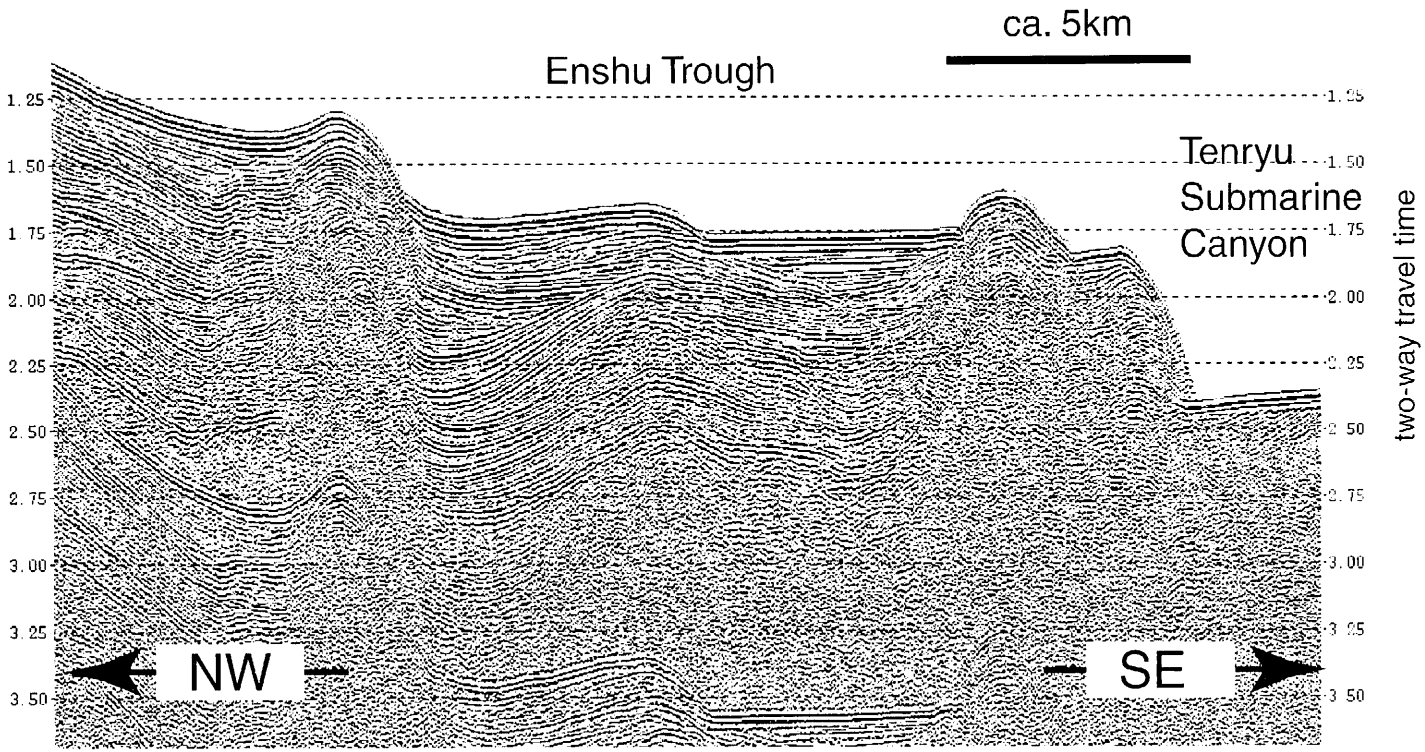

Fig. III-5 Seismic reflection profile through Enshu Trough. Vertical scale is presented in seconds of two-way travel time.

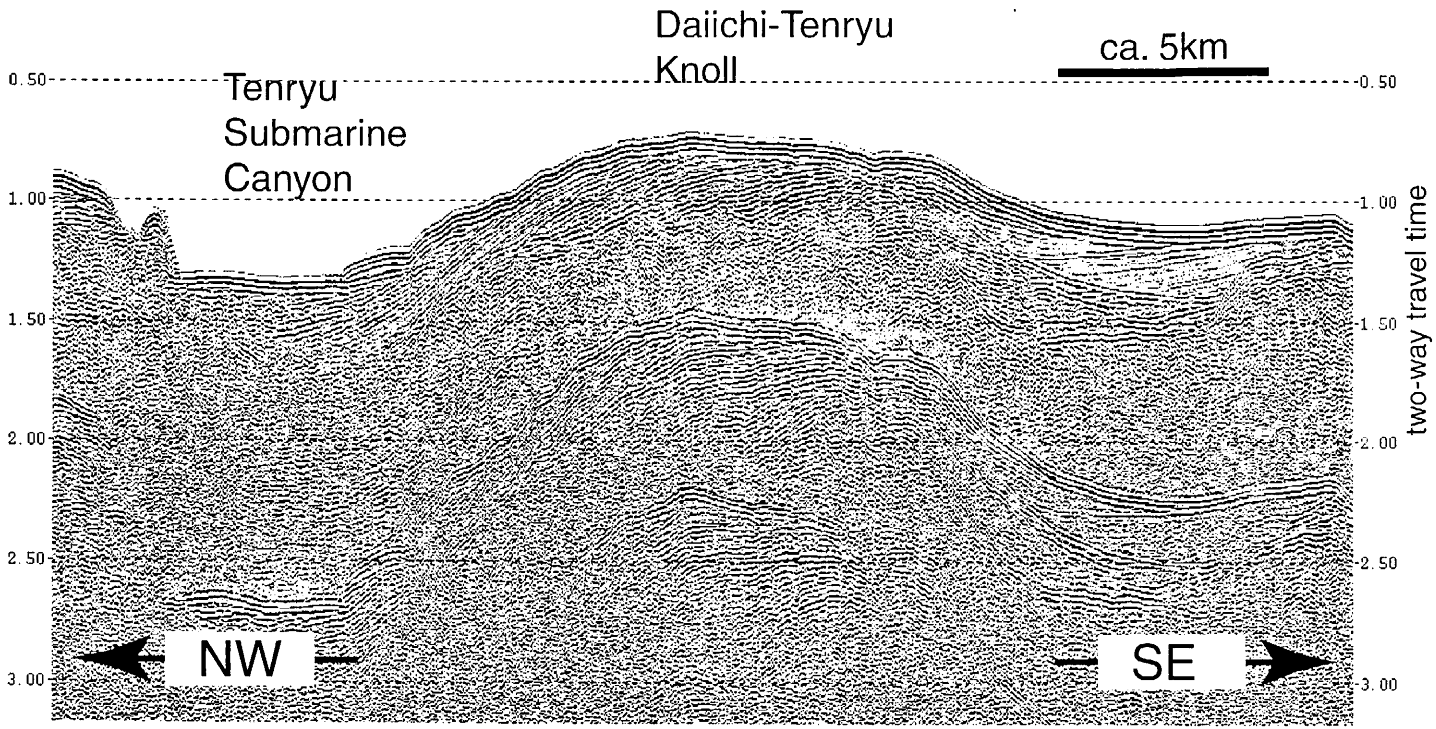

Fig. III-6 Seismic reflection profile of Daiichi-Tenryu Knoll. Vertical scale is presented in seconds of two-way travel time.

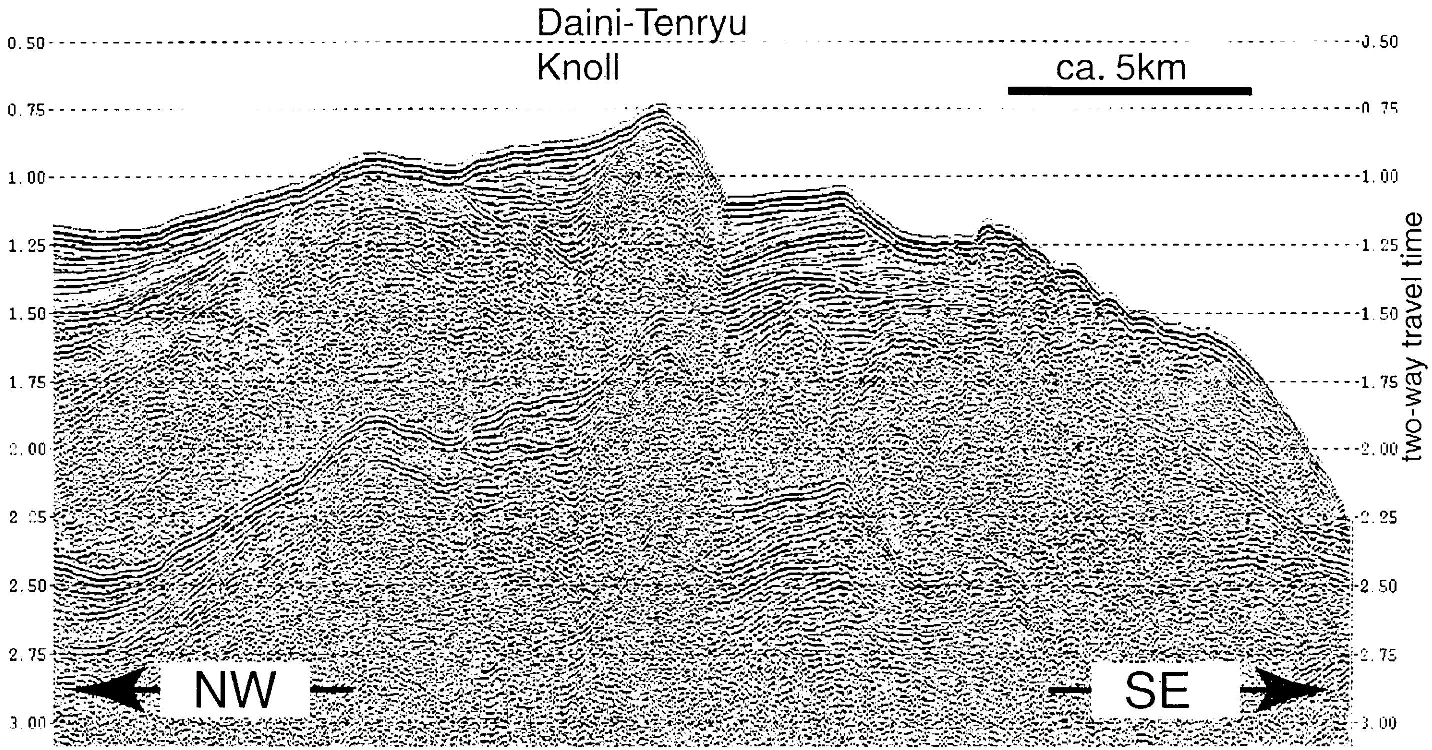

Fig. III-7 Seismic reflection profile of Daini-Tenryu Knoll. Vertical scale is presented in seconds of two-way travel time.