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XIV. CONTINUOUS SEISMIC PROFILING SURVEY AT THE JUNCTION OF THE TOHOKU AND THE OGASAWARA ARCS IN GH80–3 CRUISE

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Introduction

A continuous seismic reflection profiling survey was carried out along the survey tracks shown in Fig. I–4. Survey equipment and operating conditions are listed in Table XIV–1. The conditions were held same as those operated in the cruises of GH79–2, 3, and 4 which covered the main part of the Ogasawara (Bonin) Arc and the northern part of the Mariana Arc by using the R/V HAKUREI-MARU.

Two profiles of E-W tracks (L49 and 52) are shown in Fig. XIV–1. We use two way travel time in order to describe the thickness of sediments and the depth of reflectors.

Survey Results

The survey area is the junctional part of the Ogasawara Arc and the Tohoku Arc. Two trenches and a trough consist of a so-called trench-trench-transform fault type triple junction. The volcanic arc of the northernmost Ogasawara Arc is composed of several NE-SW trend volcanic chains with en echelon arrangement. They show NWN-SES trend as a whole.

The stratified sedimentary layer fills the depressions among the highs in the volcanic

Table XIV–1

1) Equipment	
Air gun	Bolt PAR Air Gun 1900C × 2
Compressor	Norwalk APS-120
Receiver	Hydrostreamer with 98 elements of Teledyne T-1
Amplifier	Ithaco 3171 and 451
Recorder	Raytheon LSR 1811
2) Operating Conditions	
Total volume of Air gun	300 in^3 (4920 cm^3)
Pressure	1500 psi (105 kg/cm^2)
Shot interval	10 sec (varied from 9 to 11 sec in a trench area)
Filter range	50 to 160 Hz band pass
Record range	8 sec
Ship speed	10 knots
Hydrostremer	towed 150 m behind the ship

arc. The thickness amounts to about 1.0 sec and stratifications in the layer are nearly horizontal in the shallower part and slightly deformed in the deeper part. One of these depressions, in which the thickness of the sediment is more than 1 sec, is observed at the western end of L49 (Fig. XIV-1).

Upper continental slope on L49 shows the terrace topography. The crest of the anticlinal fold is developed on the lower end. The depth of the terrace is about 1,000 m.

The sediments with about 1 to 2 sec in thickness can be seen in the main part of the continental slope which shows gentle inclination to east or northeast. They show semi-transparent and clearly stratified characters on seismic profiles. Erosional features and slumping morphology presumably caused by submarine canyons are observed in the uppermost layer. Some older slumped deposits are covered by the younger sediments.

The trench-slope break is observed at 4,000 m deep on L47 and 48, and 4500 m on L49, and becomes obscure on L50. It is underlain by the probable Holocene sediments which have been deposited in the Sagami Trough.

The benches can be observed on the inner trench slope, where the sediments fill the depressions between rugged morphological highs. The thickness of those sediments amounts to 1.0–1.5 sec. The sediments with high transparency and stratification fill the trench bottom. They are nearly flat and show little disturbance. The thickness is about 1.0–1.5 sec in the Izu-Ogasawara Trench, and 0.3–1.0 sec in the Japan Trench.

Very thick (up to 2 sec) sediments with clear stratifications and high acoustic transparency are observed in the Sagami Trough untill 3,500 m in water depth. Thin (about 1 sec) sediments with less transparency are observed in the trough untill 6,000 m.

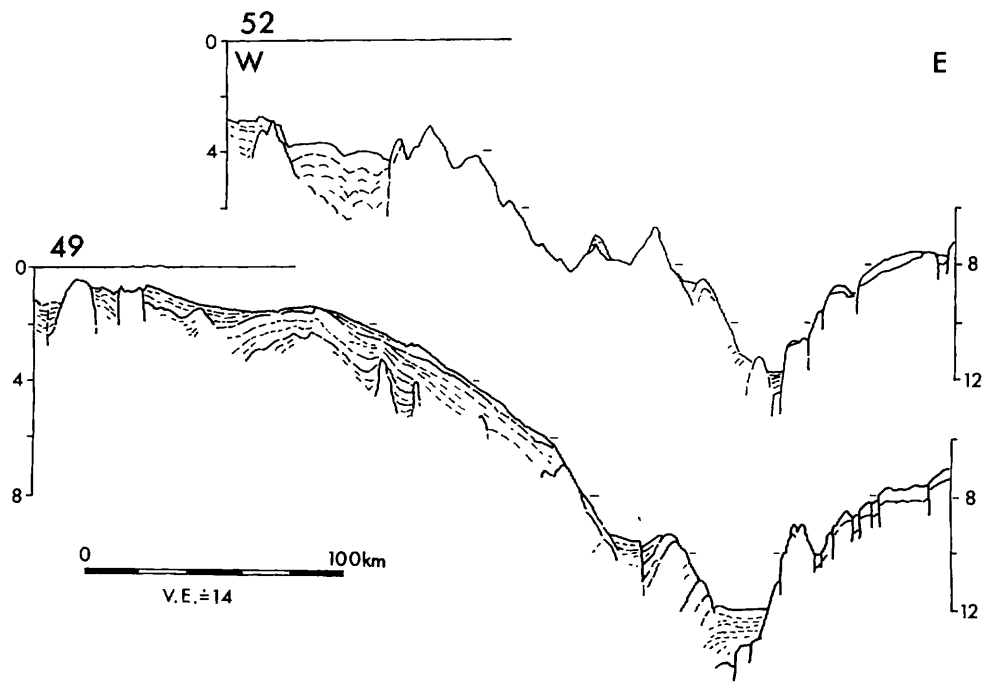

Fig. XIV-1 Seismic profiles along Lines L49 and L52. Locations are shown in Figure I-4.

They are quite resemblant to the sediments on the continental slope and the slope break. The northern margin of the Sagami Trough is bounded by large structural cliffs. It is probably correlated to the Sagami Tectonic Line in the Sagami Bay. The depositional axis of the Sagami Trough is situated 10–20 km south of the cliffs. The deep sea terrace is developed at 7000 m in water depth. Thick sediments which amount to 2 sec is observed in this area. A topographic high can be seen in the junctional area between the Sagami Trough and the Izu-Ogasawara Trench.