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V. CONTINUOUS SEISMIC REFLECTION PROFILING SURVEY ON THE SOUTHEASTERN OFFSHORE OF THE BOSO PENINSULA

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Introduction

A continuous seismic reflection profiling survey was carried out along the survey tracks shown in Fig. I–1. Survey equipment and operating conditions are listed in Table V–1. Three profiles of NE-SW tracks (Lines 9, 16, and 25) and four of NW-SE tracks (Lines F, N, P, and S) are shown in Fig. V–2a to 2g with interpretative line drawings, and their lacations are shown in Fig. V–1. We use two-way travel time in order to describe the thickness of sediments and depths of reflectors in this report.

The survey area is divided topographically into two areas: the continental shelf area mainly in the northwestern part, and the continental slope area. Several submarine canyons make topography complicated on the continental slope. Young sedimentary basins filled by acoustically transparent formations are scarcely seen on the continental slope, except a basin observed in the southwestern margin, which continues to the northern margin of a basin developed along the Sagami Trough to the south of the survey area. The offshore sedimentary sequence is suggested to be well correlated with that on land.

Results

Continental shelf area

The continental shelf in the northern part of the survey area has more than 40 km

Table V–1. Survey equipment and operating conditions

1)	Equipment	
	Air Gun	Bolt PAR Air Gun 600 B × 2 or × 1
	Compressor	Norwalk APS-120 or Rix
	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 Guns	40 or 80 in^3 (656 or 1311 cm^3)
	Pressure	1500 psi (105 kg/cm^2)
	Shot interval	10 sec
	Filter range	50 to 160 Hz band pass
	Record range	4 sec
	Ship speed	8 knots against water (varied 5 to 10 knots against sea bottom)
	Hydrostreamer	towed 150 m behind the ship

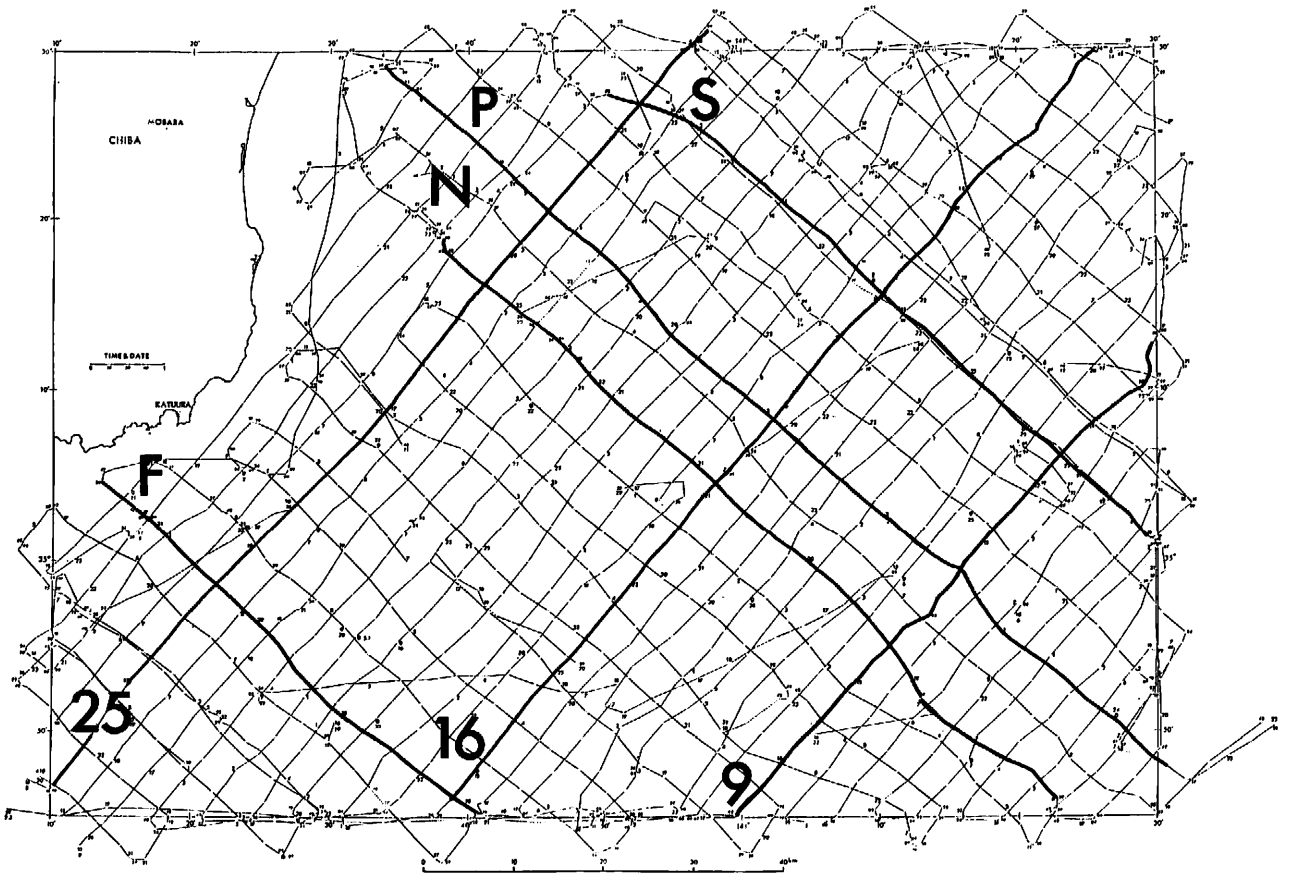


Fig. V-1 Locations of seismic profiles shown in Fig. V–2 to 8.

width. The width comes to narrow to the south, and it is less than 15 km in the south of 35°05'N where the shelf is cut by Kamogawa Canyon accompanied by faults in a WNW-ESE direction. Although Katakai Canyon cut the shelf in the northern part, major part of the shelf has very flat sea floor surface (Fig. V–2c). Some shallows are distributed as far as 10 to 15 km off Onjuku and Ohara.

Thin transparent layer (about 0.01 sec) is well recognized by a 3.5 kHz subbottom profiler under the sea floor around the Katakai Canyon. This subbottom unit (Unit A) is also often observed on seismic profiles (Fig. V–2a). Unit A is probably correlated with the Shimosa Group overlying the Kazusa Group with the late Pleistocene Naganuma unconformity which is widely recognized on land.

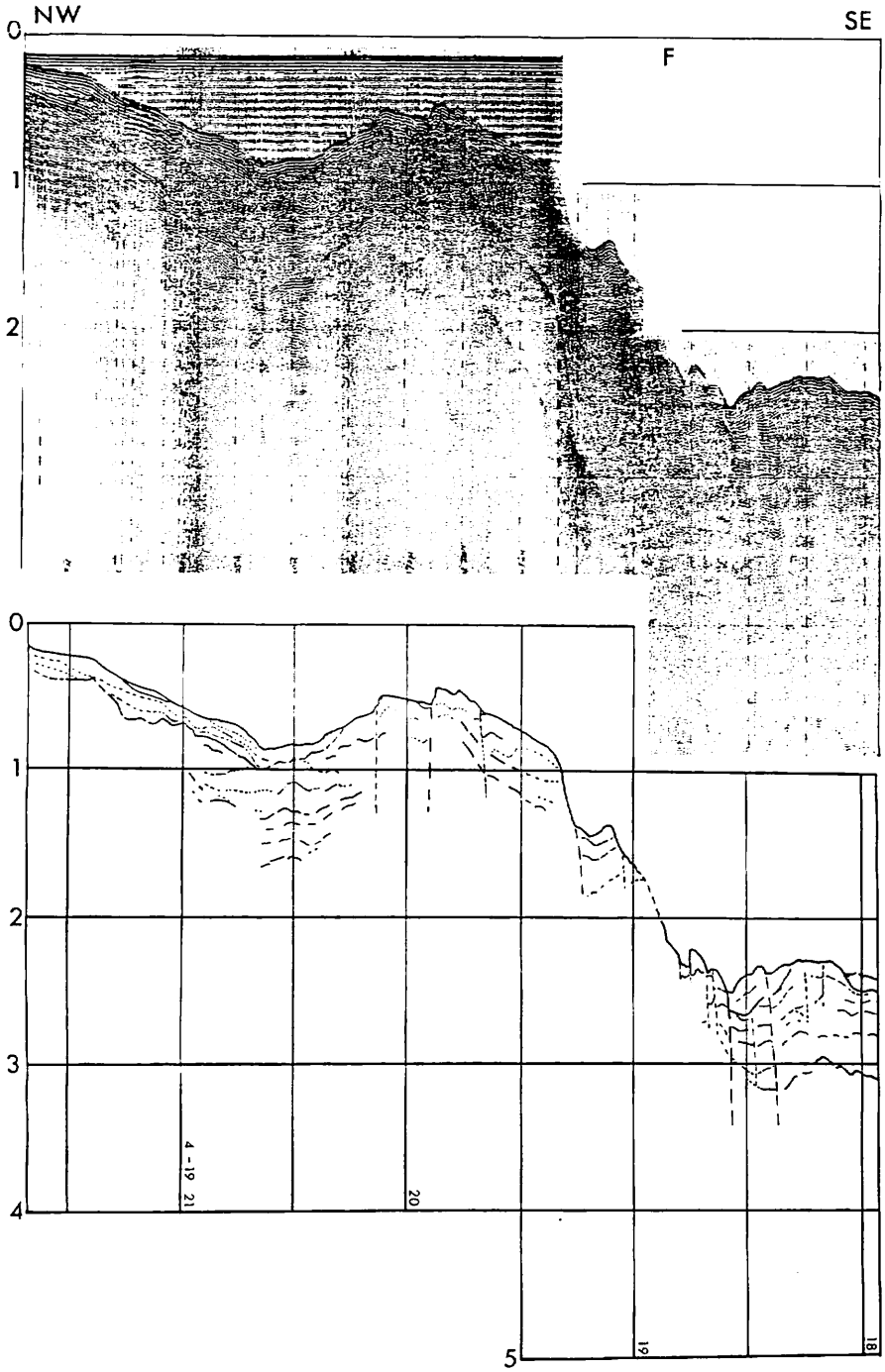
There is a distinct unconformity in the Boso Peninsula, which is named Kurotaki unconformity between Miocene to early Pliocene Miura Group on the south and late Pliocene to early Pleistocene Kazusa Group on the north. The sedimentary basin, in which the Kazusa Group is deposited to the north side of the Kurotaki unconformity, extends to the east (KANTO NEOTECTONICS RESEARCH GROUP, 1977). The Kazusa Group has its maximum thickness at the coast area near the outcrop of the Kurotaki unconformity, and thins to the north and west. Its maximum thickness is estimated about 1500–2000 m. There are no other distinct unconformities between the Kurotaki and the Naganuma unconformities.

A considerably strong and nearly flat reflector is observed at about 1.5 sec deep on Line P (Fig. V–2f). The reflector shows the distinct discordance of the strikes and dip angles with overlying formations. It is a clear unconformity beneath the Katakai Canyon (Fig. V–2c). We correlate this unconformity with the Kurotaki unconformity, and the unit between the Naganuma unconformity and the Kurotaki unconformity is called here as Unit B, which may be correlated with the Kazusa Group. Unit B is characterized by very fine stratification on seismic profiles.

Formations under the Kurotaki unconformity are exposed on the crest of the anticline along the southern margin of the shelf area (Fig. V–2b). We call those formations Unit C. This unit is correlated with the Miura Group based on the continuation from land. It shows the fine stronger reflectors than Unit B.

The Kurotaki unconformity comes to shallow and turn to unclear in the northern margin of the continental shelf (Fig. V–2b). Formations under the Kurotaki horizon can be divided into upper and lower sequences by an angular unconformity in the northern area. The upper sequence shows thinning to northeast. This sequence overlain conformably by Unit B can be correlated with the Naarai Formation which is the lowermost formation of the Kazusa Group in the Choshi Peninsula. It fills depressions of the surface of the lower sequence and has a smooth upper surface. The lower sequence (Unit D) shows a dip to northeast under Unit B which shows a dip to southwest. Unit D has been intensely faulted and shows a rugged surface. It may be correlated with the Cretaceous system which has small distribution in the Choshi Peninsula north of the survey area or older formations.

The depth of the basement of Neogene formations at the eastern shore province of the Boso Peninsula is estimated at about −2,500 m and shows the tendency of northeastward shallowing (KAKIMI *et al.*, 1973). According to the summary of the bore hole data at the shore province, the Miocene Miura Group is pinched out at about 35°40'N (ASAHI GLASS



(d)

Co., 1980). Basement of the northern part of the shore province is the Cretaceous or the Upper Paleozoic sedimentary rocks which are probably correlated with the Chichibu terrain typically distributed in the southwest Japan.

Continental slope area

Submarine canyons are well developed on the continental slope, which make topography very rough. Kamogawa Canyon is developed in the western margin. It runs from the northwest to the southeast, and bend to southwest on the upper continental slope. Katsuura Canyon runs west to east in the southern part, Onjuku Canyon dose northwest to southeast in the central part, and Katakai Canyon dose northwest to southeast in the northern part of the survey area. These canyons are considered to be formed by faulting origin. Relatively large anticline exists on the northeastern part of the survey area, and no large canyons are observed around the anticline.

There is a shallow block south of the Katsuura Canyon, which is elongated in a WNW-ESE direction with 20 km length and about 10 km width. It corresponds to the negative magnetic anomaly (OGAWA *et al.*, 1979; Chapter IV in this report), and is considered to the elongation of the Mineoka uplift zone composed of the Tertiary (mainly Paleogene) Mineoka Group and metamorphic and igneous complex. Stratified and relatively transparent layers are observed on the south of the shallow block as shown on Lines 25 and F (Fig. V–2c and 2d). The maximum thickness is 1.5 to 2.0 sec. This basin is margined by the structural high which is elongated in a WNW-ESE direction in the south. Minor folds with NW-SE axes are observed in the basin. Those layers may be correlated with the Shimosa Group by the presumption from its high transparency as compared with other formations.

Sedimentary basins filled by the transparent layers are not so developed in other continental slope areas. Small basins are observed along submarine canyons. One of such examples is observed at southwestern side of the Katakai Canyon, where the thickness of the transparent layers is 0.5 sec at most (Fig. V–2f). These small basins are probably composed of detritus overflowed from the canyons, and the basin fill is probably Quaternary in age, same as the basin sediments south of the shallow block.

Clear subbottom reflectors are scarcely observed on the continental slopes but a few exceptions. A thick stratified layer mainly under the Kurotaki unconformity is widely distributed in those area. The layer shows large scale foldings with NW-SE axes. A part of the layer crops out along the crest of the anticline northeast of the Katakai Canyon (Fig. V–2b). This layer is probably compared to the Miura Group and/or other Tertiary formations such as the lower Miocene Hota Group and Paleogene Mineoka Group. Topography is very rough and subbottom reflectors are not so clear on the southwestern part of the Katakai Canyon. Some folds with NW-SE axes are observed in this area. The strike of the Katakai Canyon roughly coincides with the direction of syncline axes.

The preliminary structural map is shown in Fig. V–3. The Kurotaki unconformity which is clearly recognized in the shelf area is not clear in the slope area. After the paleontological study on sedimentary rocks sampled during the cruise by NISHIDA (Chapter VII in this report), the stratigraphic boundary between the Miura and Kazusa Groups is estimated on the middle of the continental slope. He also shows biostratigraphically the existence of the formations in the time gap in the Kurotaki unconformity

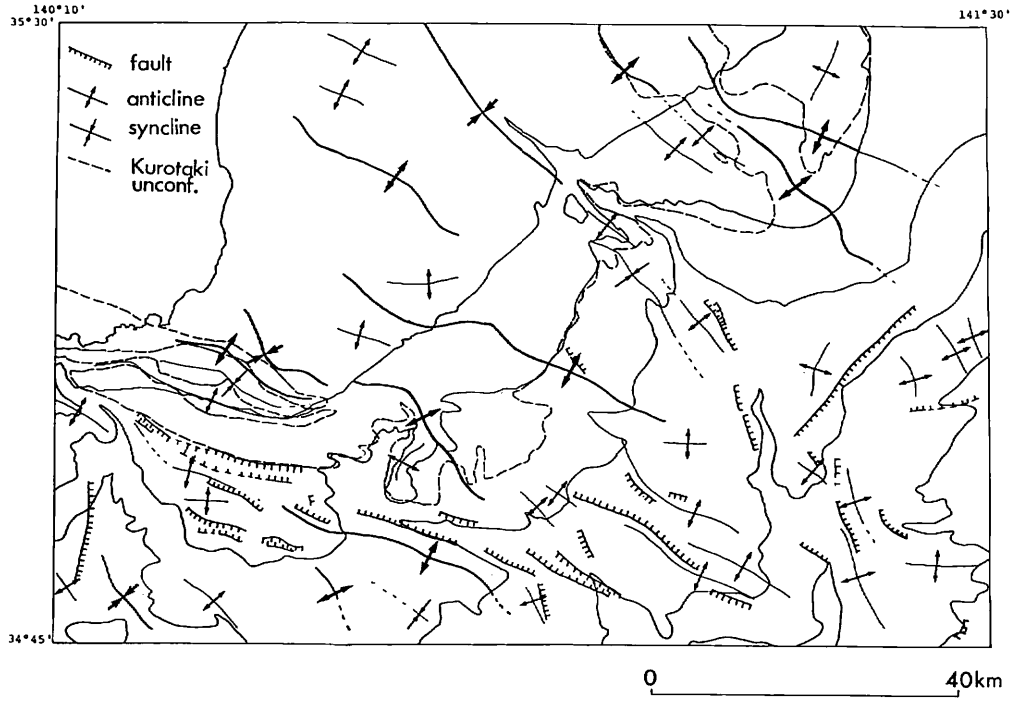


Fig. V-3 Structural map of GH80-2 area.

previously known on land. This fact shows the probability of the conformable or shorter unconformable feature of the boundary between the Miura and Kazusa Groups in the continental slope area. The boundary cannot be recognized clearly on the seismic profiles, but can be roughly traceable. The trace of the Kurotaki unconformity on the sea bottom and the rough contours of calculated thickness of Unit B is shown in Figure V-4.

Summary

GH80-2 survey area is topographically very rough, and three major submarine canyons and many minor ones are developed. Acoustically transparent young sediments are poorly developed and restricted in the southern margin of the area and narrow regions along the canyons on the continental slope. Older formations are folded with NW-SE axes and the magnitudes of the folds tend to decrease to the southwest. The strong reflector which is considered to be an unconformity at about late Pliocene is well observed on the central and northern part of the continental shelf. The continuation of the unconformity into the continental slope area from the land has been estimated and shown.

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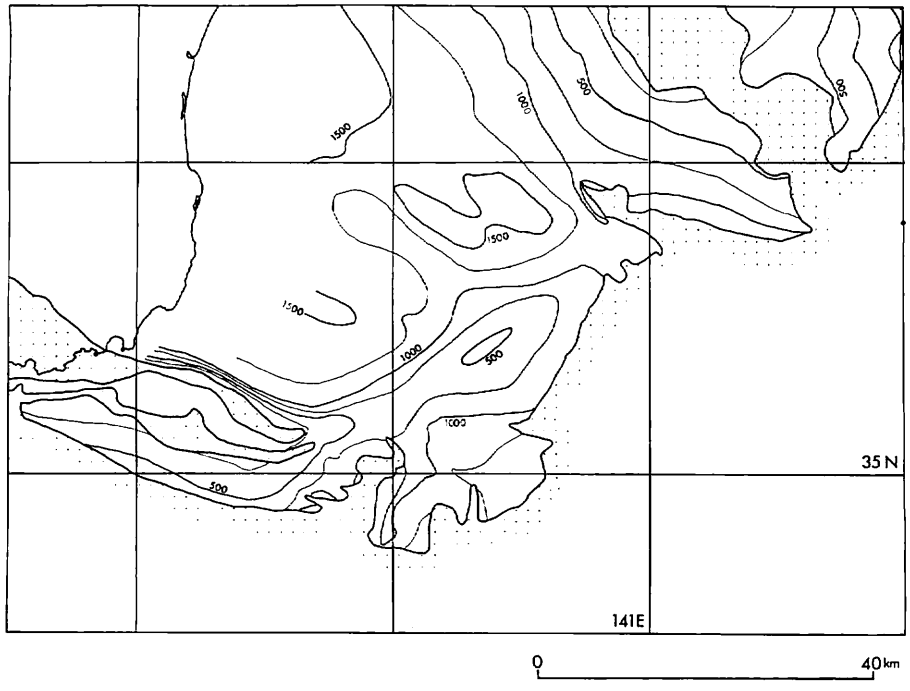

Fig. V-4 The distribution of Unit B (Kazusa Group) on and around the continental shelf in GH80-2 area. Contours show the depth of the basement of Unit B in meters with estimated velocities as 1.5 km/s in sea water and 2.0 km/s in Unit B.

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