

APPENDIX II. CONTINUOUS SEISMIC REFLECTION PROFILING SURVEY IN THE BONIN (IZU-OGASAWARA) ISLAND ARC

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Introduction

The Bonin Island arc was investigated by the echo-sounder method (12 kHz and 3.5 kHz), continuous seismic reflection profiling method, magnetic measurement and gravity measurement as a supplement to the earlier investigation by the GH74-1 cruise (INOUE, *ed.*, 1976). In this chapter, the results of continuous seismic reflection profiling are presented.

The methods and instruments in the present investigation are same as those in the survey area (Central Pacific Basin) of this cruise (see Chap. VI). The ship's tracks are shown in Fig. AII-1 together with bathymetric contours. The summarized profiles across the Bonin island arc are shown in Fig. AII-2, and all the continuous seismic profiles obtained in the present cruise are shown in Fig. AII-3.

The Bonin Island arc system is composed of the Shikoku Basin, the Iwo Jima Ridge, the Bonin (Ogasawara) Trough, the Bonin (Ogasawara) ridge, and the Bonin (Izu-Ogasawara) Trench, according to KARIG and MOORE (1975). The Iwo Jima Ridge is divided into smaller en-échelon ridges and troughs which trend north-easterly, oblique to the general direction of the Ridge. The Bonin Ridge and the Bonin Trough are developed only in the southern area.

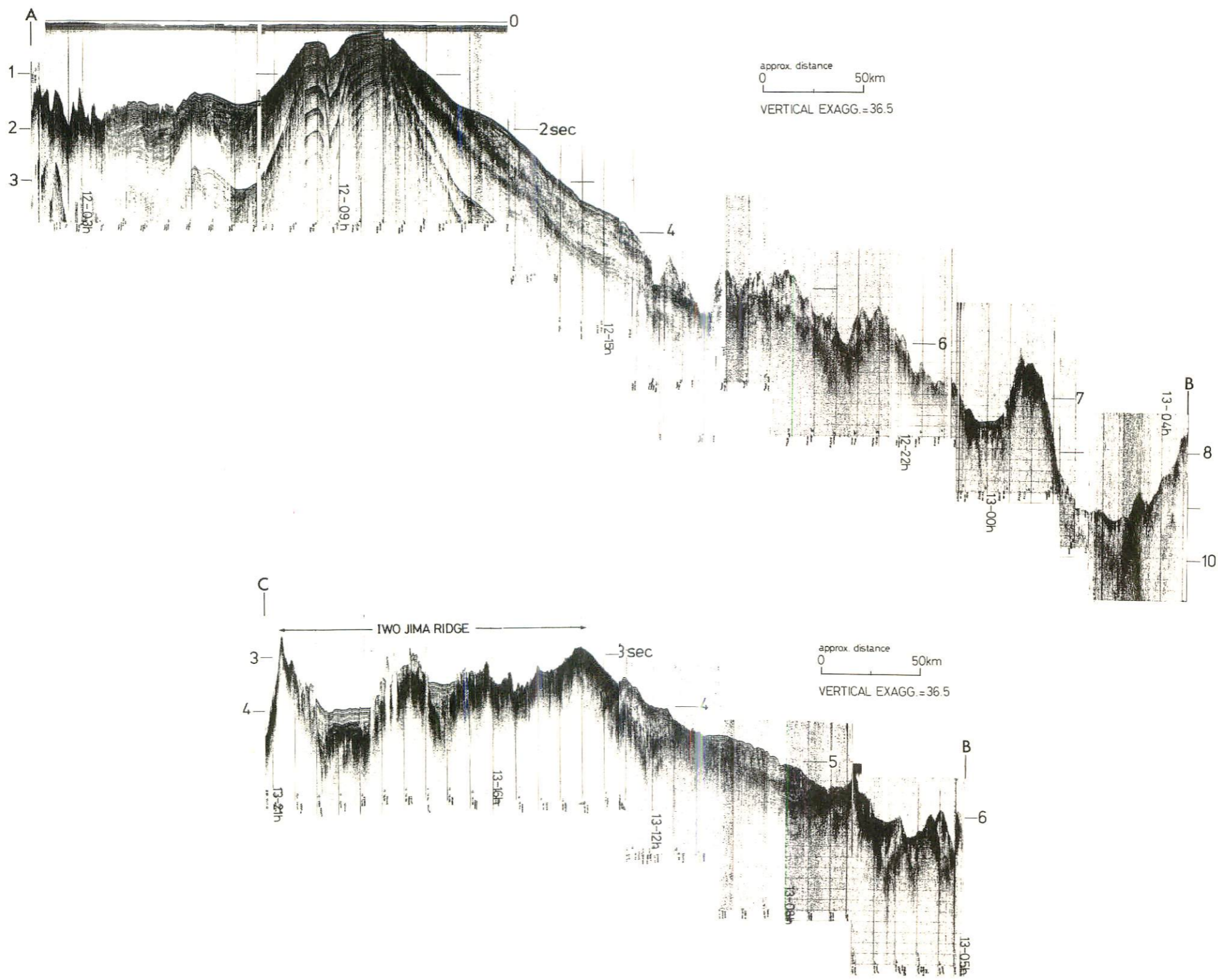
In interpreting the profiles, the thickness of sedimentary units are described in two-way travel time.

Line A-B (Fig. AII-2a)

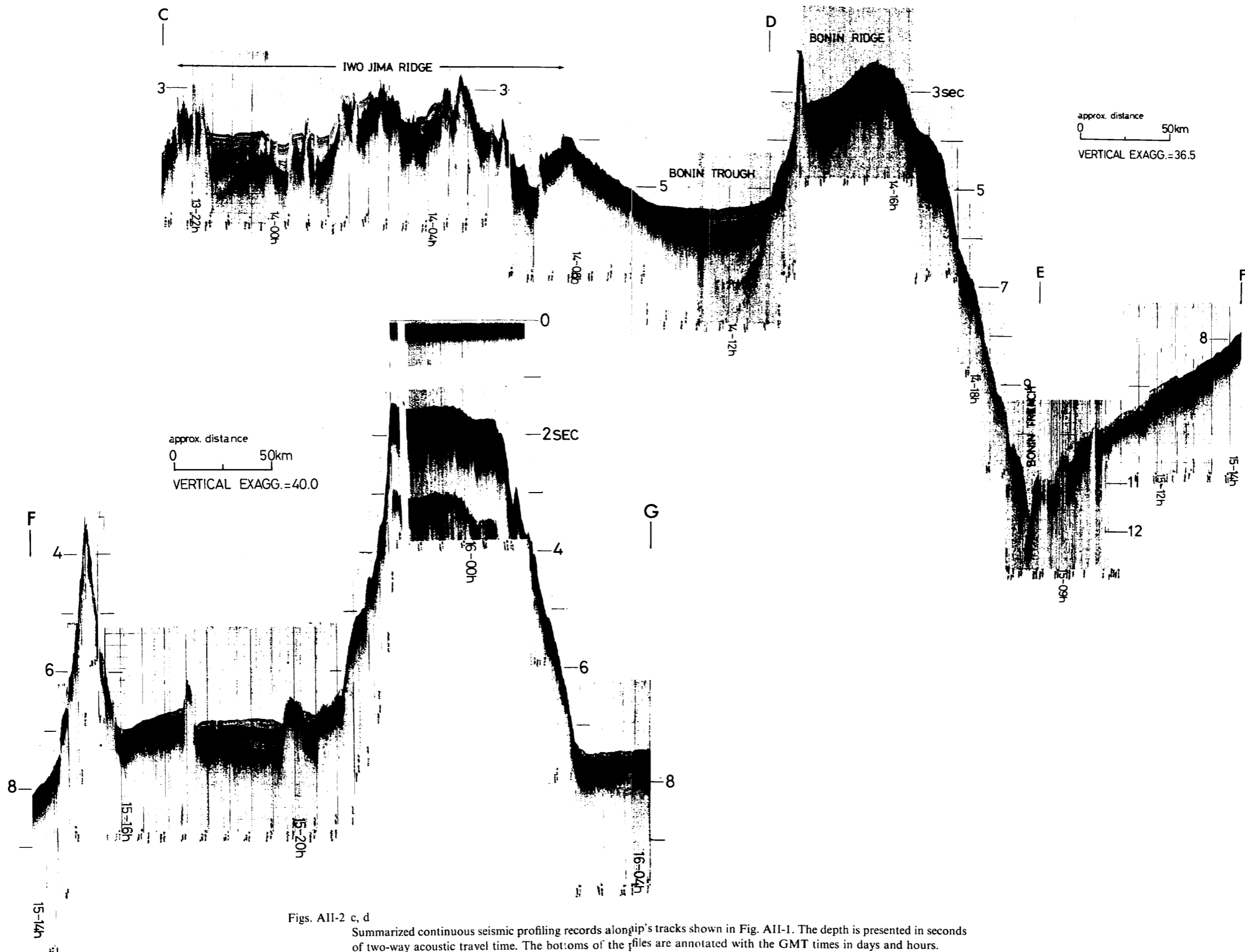
A thick sedimentary apron of over 1.4 seconds in thickness is observed on the trenchward slope of the Iwo Jima Ridge (on the profile between 12-10:00 and 12-16:00). The sediments in this apron are less reflective and gently deformed, and divided into three sedimentary units—the upper unit, the middle unit and the lower unit. Each sedimentary unit overlaps disconformably the underlying unit in the landward direction. The lower unit crops out on the uppermost part of the slope (on the profile around 12-10:30), the middle unit crops out on the upper part of the slope (on the profile between 12-10:40 and 12-11:30), and the upper unit crops out on the middle part of the slope. The feature of the lower part of the trench slope is quite different from that of the upper sedimentary apron. The lower part of the trench slope is characterized by complicated topography. There are many peaks observed and these peaks may be composed of sedimentary layers. One large peak is present on the profile around 13-01:00.

Line B-C and Line D-E-F (Figs. AII-2b and c)

Line B-C and Line D-E-F are rather closely situated, but the topographic features on



Figs. AII-2 a, b
 Summarized continuous seismic profiling records along the tracks shown in Fig. AII-1. The depth is presented in seconds of two-way acoustic travel time. The bottoms of the files are annotated with the GMT times in days and hours.



Figs. AII-2 c, d
 Summarized continuous seismic profiling records along ship's tracks shown in Fig. AII-1. The depth is presented in seconds of two-way acoustic travel time. The bottoms of the profiles are annotated with the GMT times in days and hours.

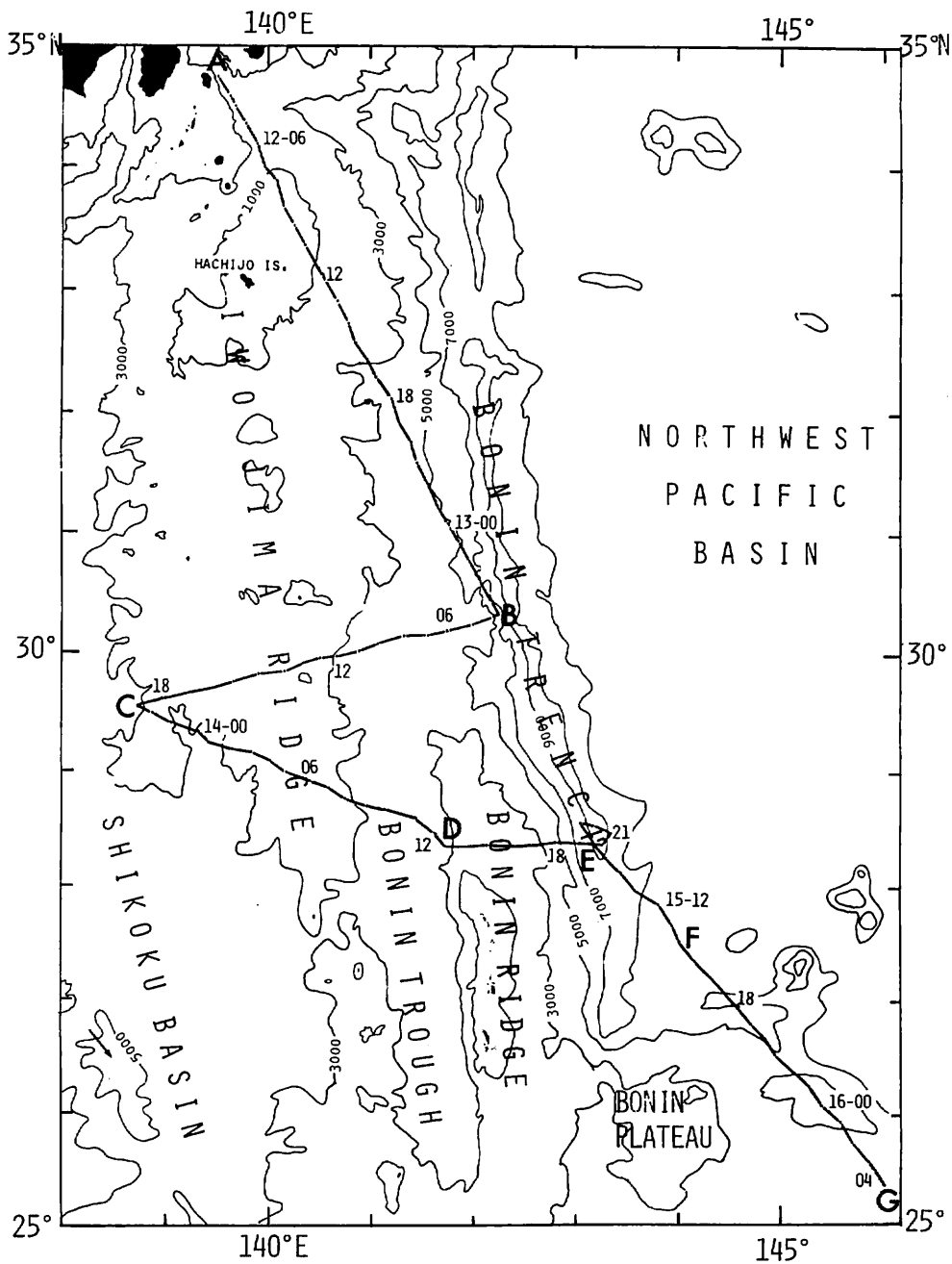


Fig. All-1 Location map of the profiles. Ship's tracks are annotated with the GMT time in days and hours. Bathymetry in meters from Japanese bathymetric chart 6302 of Maritime Safety Agency of Japan (1966).

the trench side of Iwo Jima Ridge do not resemble each other. The conspicuous feature shown by the Bonin Ridge and the Bonin Trough on the profile C-D-E is not recognizable at the Line B-C.

The Iwo Jima Ridge is composed of several ridges and troughs as suggested by KARIG and MOORE (1975) to be en-échelon trending northeast-southwest. Most troughs of the Iwo Jima Ridge are filled with sediments, but a few narrow troughs on the ridge crest are free of sediments. The upper sediments in the troughs are weakly reflective or transparent and the lower sediments in the troughs are rather more reflective. The basement in the troughs is complicated and forms ridges of rugged topography.

Sediments of over 1.8 seconds in thickness are markedly developed in the Bonin Trough, and are little deformed. The trough sediments abut eastwards on to the Bonin Ridge, but overlap the Iwo Jima Ridge to the west. The upper part of the sediments in the Bonin Trough is highly reflective and evenly stratified in contrast with the lower part of the sediments which is less reflective and gently deformed.

The inner trench slope off the Bonin Ridge has no prominent ridge and is composed of acoustic basement. The trench bottom is V-shaped and free of sediments. The outer trench slope is characterized by step faults, horst and graben features, and this is similar to the structure found along oceanic slopes of many other trenches.

Line F-G (Fig. A11-2d)

A typical guyot feature is prominent on the F-G profile. Densely stratified sediments of nearly 1.0 sec thickness are observed on the guyot crest. Four acoustic units are identified in the basin, i.e., an upper transparent layer, an upper opaque layer, a lower transparent layer, and acoustic basement. Such a sequence is common in the North-West Pacific Basin.

References

- INOUE, E. (ed.) (1976) Izu-Ogasawara (Bonin) Arc and Trench investigations. *Geol. Surv. Japan Cruise Rept.*, no. 5, 68p.
- KARIG, D. E. and MOORE, G. F. (1975) Tectonic complexities in the Bonin arc system. *Tectonophysics*, vol. 27, p. 97-118.

Fig. A11-3 Original continuous seismic profiling records of the whole tracks. A G. The depth is presented in seconds of two-way acoustic travel time. The profiles are annotated with the GMT times in days and hours.

