

VII. SONOBUOY REFRACTION SURVEY

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Two sonobuoy refraction surveys were carried out during the cruises. SB 11 and SB 12 were carried out in the central part of the Bonin Trough and on the upper continental slope east of Aogashima on the Shichito Ridge respectively (Fig. I-1). Positions and operating conditions at SB 11 and SB 12 are listed in Table VII-1. The refracted waves and reflected waves with variable incident angles and the direct wave which propagates in the upper part of the sea water, were detected and telemetered with OKI OC-01 type expendable sonobuoys and received by a JRC NRE-8E type receiving system. Only one-way measurements were carried out. The records with the reflection profiles detected by a hydrostreamer towed behind the ship are shown in Fig. VII-1a and 1b.

Table VII-1

| |
|---|
| Position: SB 11: 28°14.8'N, 141°25.5'E— 28°01.7'N, 141°27.4'E |
| SB 12: 32°20.5'N, 140°45.2'E— 32°08.0'N, 140°45.2'E |
| Pressure of air gun: 1800 psi |
| Volume of air gun: 150 × 3 in ³ |
| Shot interval: 20 sec |
| Ship speed: 6 knot |

Only one refracted wave was received at SB 11, although there are thick horizontal layers on the reflection profile. This may be due to the roughness of deeper layers or the existence of a layer with anomalous velocity. Highly contorted layers, which may show the existence of slump deposits with anomalous low sonic velocities, can be observed on the reflection profile. The results calculated for SB 11 on the basis of a horizontally layered model, without correction for dip, are shown in Table VII-2a.

A record with high resolution was obtained at SB 12. The calculated results are shown in Table VII-2b. We found a four-layered crustal structure at SB 12, including the sea water layer and excluding the thickness of the lowest layer. Our layer 2 is thought to be a sedimentary layer showing folding and including some unconformities. Our layer 3 is thought to be a sedimentary and volcanic layer, the lower boundary of this layer being the so-called acoustic basement on the reflection profiler records. Layer 4 is the basement of this area.

SB 12 is almost at the same latitude, as the refraction and reflection surveys by Hotta (1970). A comparison of results between SB 12 and the nearest line of the previous survey shows a slight difference as an eight-layered crustal structure was distinguished in the previous survey. The correlation between both crustal

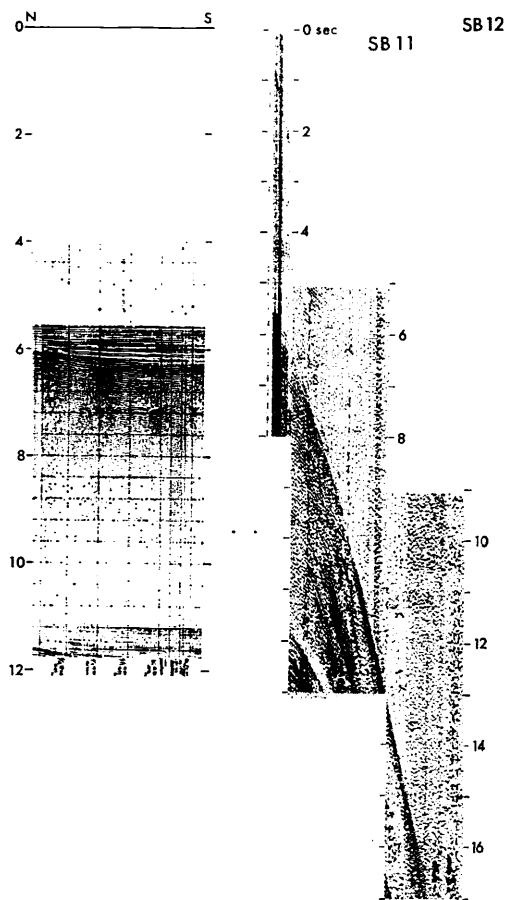


Fig. VII-1a: Sonobuoy record with reflection profile at SB 11.

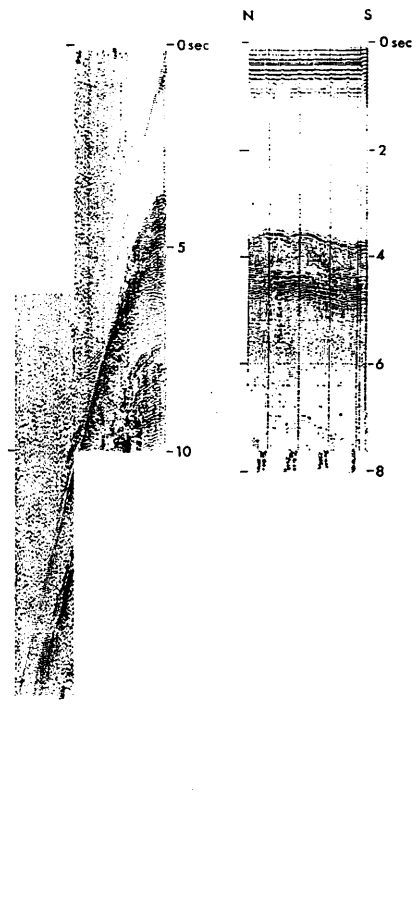


Fig. VII-1b: Sonobuoy record with reflection profile at SB 12.

Table VII-2a

| Layer | Velocity | Thickness |
|---------|------------|-----------|
| layer 1 | 1.50 km/s | 4.15 km |
| layer 2 | 2.00 km/s* | 1.77 km |
| layer 3 | 3.59 km/s | — |

Table VII-2b

| Layer | Velocity | Thickness |
|---------|------------|-----------|
| layer 1 | 1.50 km/s | 2.66 km |
| layer 2 | 2.00 km/s* | 1.76 km |
| layer 3 | 4.57 km/s | 1.69 km |
| layer 4 | 5.58 km/s | — |

*means estimated value.

structure is shown in Fig. VII-2. Layer 4 in our profile is thought to coincide with the upper part of the 6th layer by Hotta (1970) which is exclusively found between the volcanic ridge and the trench.

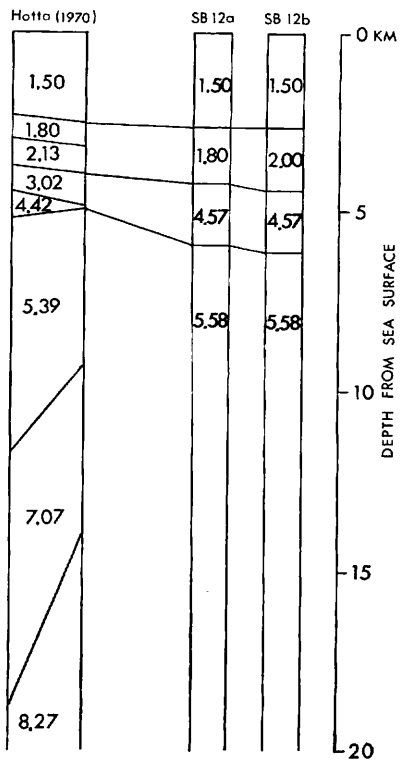


Fig. VII-2 Comparison of the crustal structure detected by sonobuoy at SB 12 with the results of Hotta (1970). The figures in the columns are the velocities of the layers in km/sec. Two examples are shown for different larger 1 velocity estimation.

Reference Cited

HOTTA, H. (1970) A crustal section across the Izu-Ogasawara arc and trench; *Jour. Phys. Earth*, vol. 18, p. 125-141.