VI. 3.5 KHz PDR PROFILING SURVEY

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The 3.5 KHz PDR (subbottom profiler) profiling survey was almost continuously carried out through the present cruise including the surveyed area of the Eastern Central Pacific Basin, and the geophysical traverses off the surveyed area. Particularly, in the surveyed area the distribution of the transparent layer by 3.5 KHz PDR and its relation to manganese nodule distribution were clarified.

Eastern Central Pacific Basin

Although several layers are acoustically discriminated in detail, generally two layers are easily recognizable and traceable throughout almost all of the surveyed area. They are the transparent and opaque layers, occupying the upper and lower portions in the profile respectively. These acoustic layers obtained by 3.5 KHz PDR have different characteristics as compared with those obtained by seismic profiling shown in the preceding chapter.

The upper, transparent layer is distributed over almost all the surveyed area, though there are some areas where the layer is poorly developed, and it varies from 0 m to 200 m in thickness. The lower opaque layer has many acoustic characters. It may reflect various kinds of materials and physical conditions, and in some places it exhibits acoustic stratification.

In the eastern half area, the thin cover of the transparent layer is developed in the western part with the thickness of about 60 m, covering the turbidite layers. A few deep-sea channels cut the transparent layer, where no levees are developed. They are found on two tracks of St. 114–115 and St. 115–132, but their detailed features including direction are not clear as yet, as we have only very poor tracks. A part of acoustic profile of the track St. 114–115 is shown in Fig. VI-1-A.

In the hilly western half area, the thickness of the transparent layer varies even over short distance. The thickness seems to depend upon the topography. It tends as a whole, however, to more thicker southwesterly, measuring about 100–200 m in southwestern corner of the surveyed area (Fig. VI-1-B), where the layer roughly corresponds to that given by the air-gun. At the eastern part of the hilly area, the layer is 50–100 m in thickness, though it tends to decrease eastwards (Fig. VI-1-C).

On the other hand, in the northern area, just south of the northern seamounts chain in the surveyed area, the thinner transparent layer extensively covers the rather flat deep sea basin (Fig. VI-1-D).

The distribution pattern mentioned above is summarized as shown in Fig. VI-2.

Geological features of the acoustic layers by 3.5 KHz PDR are not ascertained as yet, as well as those by air-gun, though some information is available from the DSDP's data (The Shipboard Scientific Party, 1973).

Japan—Hawaii

The Shatsky Rise has a smooth top with a little elevation in the central area. Bottom topography at the marginal area of the top of the Rise is rough and consists of a few ridges. The smooth surface of the top consists of stratified sediments which have an acoustically semi-transparent pattern. The foot of the Rise is very smooth and gently sloped, where

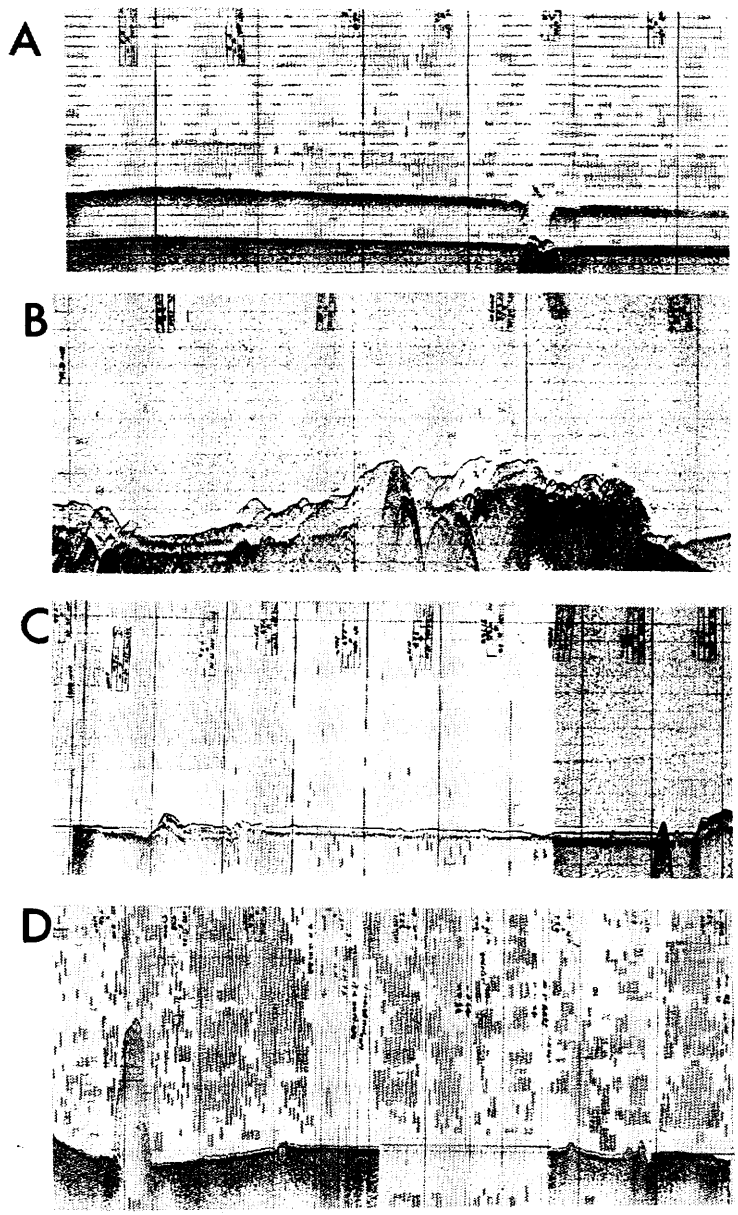
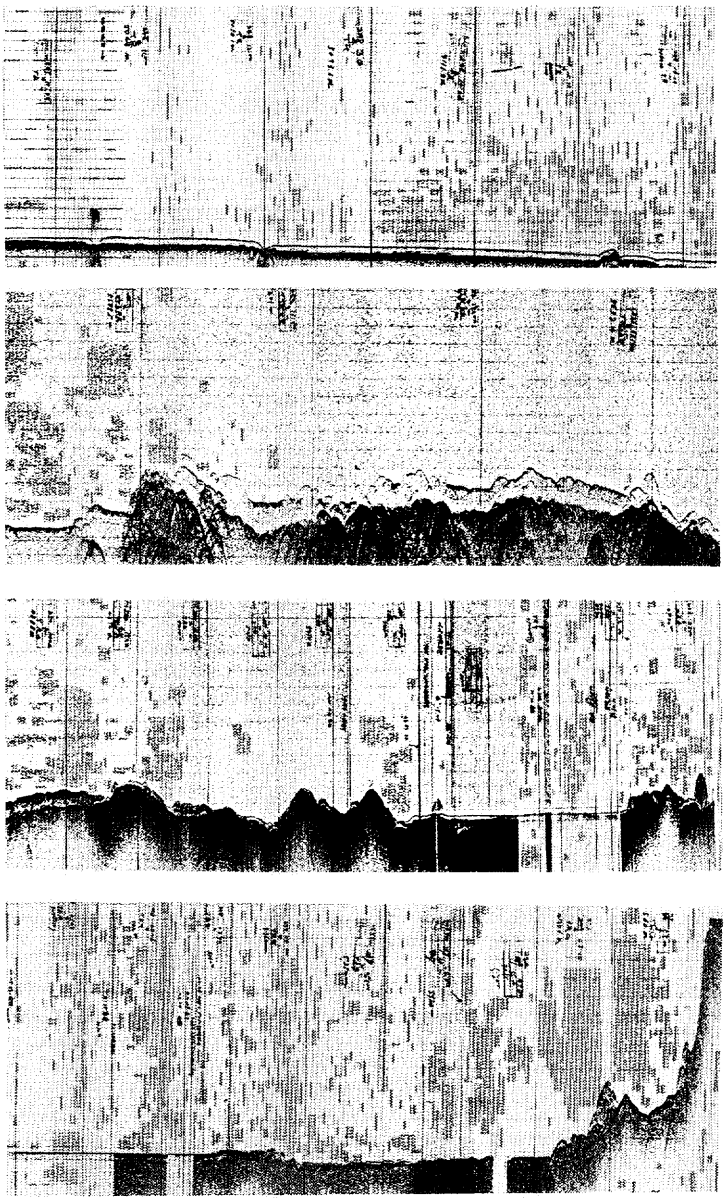


Fig. VI-1 3.5 KHz records in the eastern Central Pacific Basin. A: a part of St. 114–115 (248, 03: 00–16: 30), B: a part of St. 119–120 and 144 (277, 15: 00–278, 09: 00)

The characteristic features of the profile are shown here. The position of



(252, 05: 30–13: 00) C: St. 131–132 (270, 04: 00–23: 00), D: Adjacent area of St. 143 each figure is referable to Fig. I-5 in detail and roughly in Fig. VI-2.

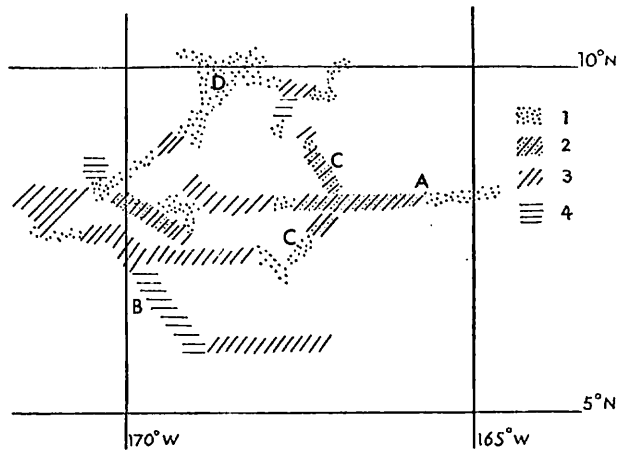


Fig. VI-2 Thickness distribution of transparent layer by 3.5 KHz PDR.
1: less than 30 m, 2: 30–60 m, 3: 60–100 m, 4: 100–200 m. A, B, C and D showing the tracks of Fig. VI-1 roughly.

the same acoustic pattern as at the top is observed. The uppermost layer of the oceanic floor is acoustically transparent and is approximately uniform in thickness in the restricted area. However, the layer varies in thickness gradually over a wide region.

Several stratified layers of approximately 10 m thick in each unit are observed along the east side basin of the Emperor Seamounts Chain. The basin has a horizontally smooth surface, and may form an abyssal plain. (GMT 235,23 : 00–236,10 : 00)

Hawaii—the surveyed area

Step structure with a landward tilted top is observed at the southern foot of Oahu Island, which suggests tilted block movement by horizontal compressional stress.

The depth of the oceanic basin at the foot of the island is deeper as compared with that at the surrounding oceanic floor, and gradually decreases in depth away from the island.

The bottom topography southwest off the Hawaii Island is very rough and is characterized by many small hills.

Almost all of the oceanic floor are composed of acoustically opaque or stratified layers in the surveyed region. Tens of meters of the transparent layer overlies the opaque layer in the southern part of the surveyed tracks.

Reference

The Shipboard Scientific Party (1973): Site 165. *In* Winterer, E. L., Ewing, J. I., et al. *Initial Reports of the Deep Sea Drilling Project*, vol. 17, Washington (U.S. Government Printing Office), xx+930p.