III. SUBMARINE TOPOGRAPHY BY 12 kHz PDR IN THE GH78-1 AREA

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Introduction

The GH78-1 cruise area occupies deep sea area surrounded by the Marshall Islands to the west, the Magellan Rise to the east and Mid-Pacific Mountains to the north. The previous bathimetric map of this area was presented as a part of the wider regional map of the Pacific Ocean by WINTERER, EWING *et al.* (1973) (See Fig. I-1 in chapt. I). Using this as a base map, we did some modification on it from our own bathymetric survey data with a NEC 12 kHz Deep Sea Precision Depth Recorder (PDR). The modified bathymetric map (Fig. III-1), bathymetric division map (Fig. III-2) and topographic profiles along the track lines (Fig. III-3) were made to show the general topographic features of the whole survey area. In addition, a detailed bathymetric map was drawn to show the feature of the southwestern part with high manganese nodule distribution (Fig. III-4).

General topographic features

Generally speaking, the survey area shows relatively uniform topographic pattern of repeated troughs and hills, trending in WNW (partly to NW), whereas in the surrounding areas there are marked different features such as high plateau of Magellan Rise to the east (in GH77-1 area), ENE topographic direction parallel to that of Nova-Canton Trough to the southeast, and NWN topographic direction parallel to that of Marshall Islands to the southwest as shown in wider regional map (See Fig. I-1 in chapt. I). However, the GH78-1 area is still divisible roughly into four topographic areas, namely, two topographic highs of northeastern seamounts and southwestern mountainous area at a water depth of about 4,000 m at their highest peaks, northwestern abyssal plain at a depth of 5,500–6,000 m, and the remaining central to southeast deep sea basin area at a water depth of 5,000–6,300 m between the above two topographic high areas, characterized by the development of repeated linear troughs and deep sea hills trending generally in WNW direction.

As a whole, the topography of the GH78-1 area probably is a reflection of both the original relief of oceanic crust and the result of the later sedimentation. The tectonic evolution of oceanic crust of the wider region including GH78-1, GH77-1 and GH76-1 areas was discussed in TAMAKI (1977), TAMAKI *et al.* (1979) particularly with regard to that of Magellan Trough, a remanent Early Cretaceous spreading center, which extends from the GH76-1 area westward to GH77-1 area neighboring to the present GH78-1 area (ONODERA *et al.*, 1979). The prevailing topographic trend of WNW direction on hills and troughs presumably reflecting the basement relief of original volcanic crust, is roughly con-

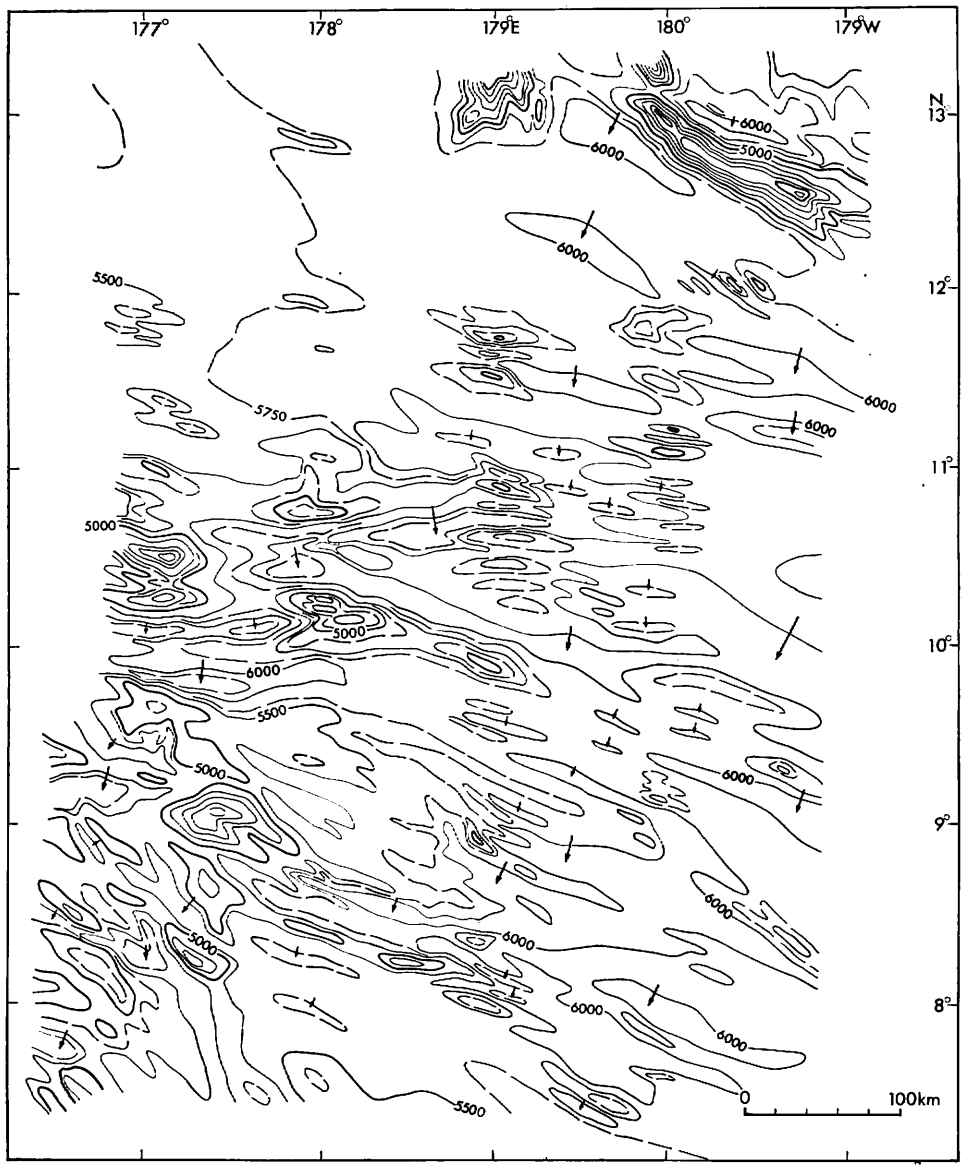

Fig. III-1 Bathymetric map of the GH78-1 area.

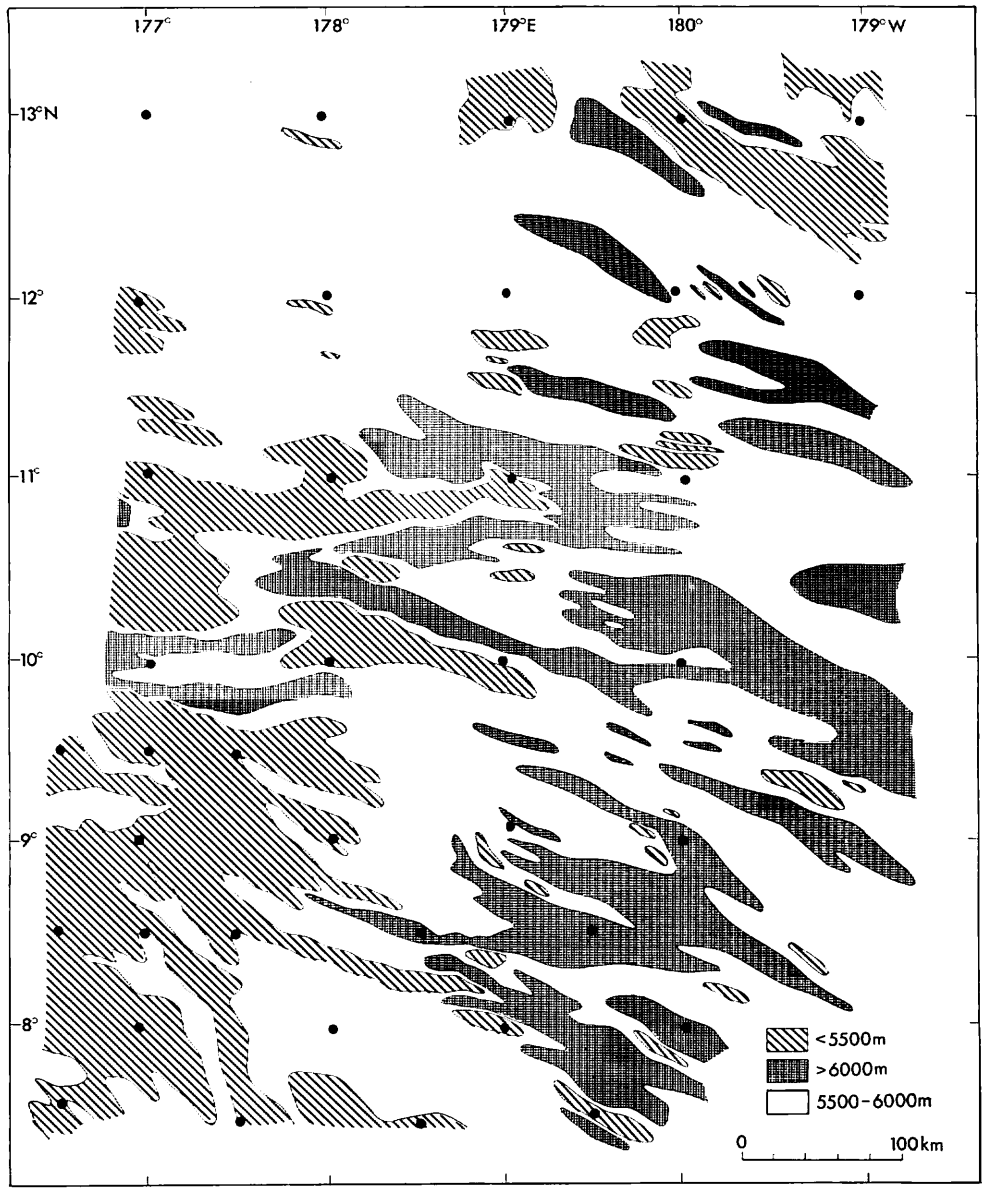

Fig. III-2 Bathymetric division map of the GH78-1 area showing general topographic feature.

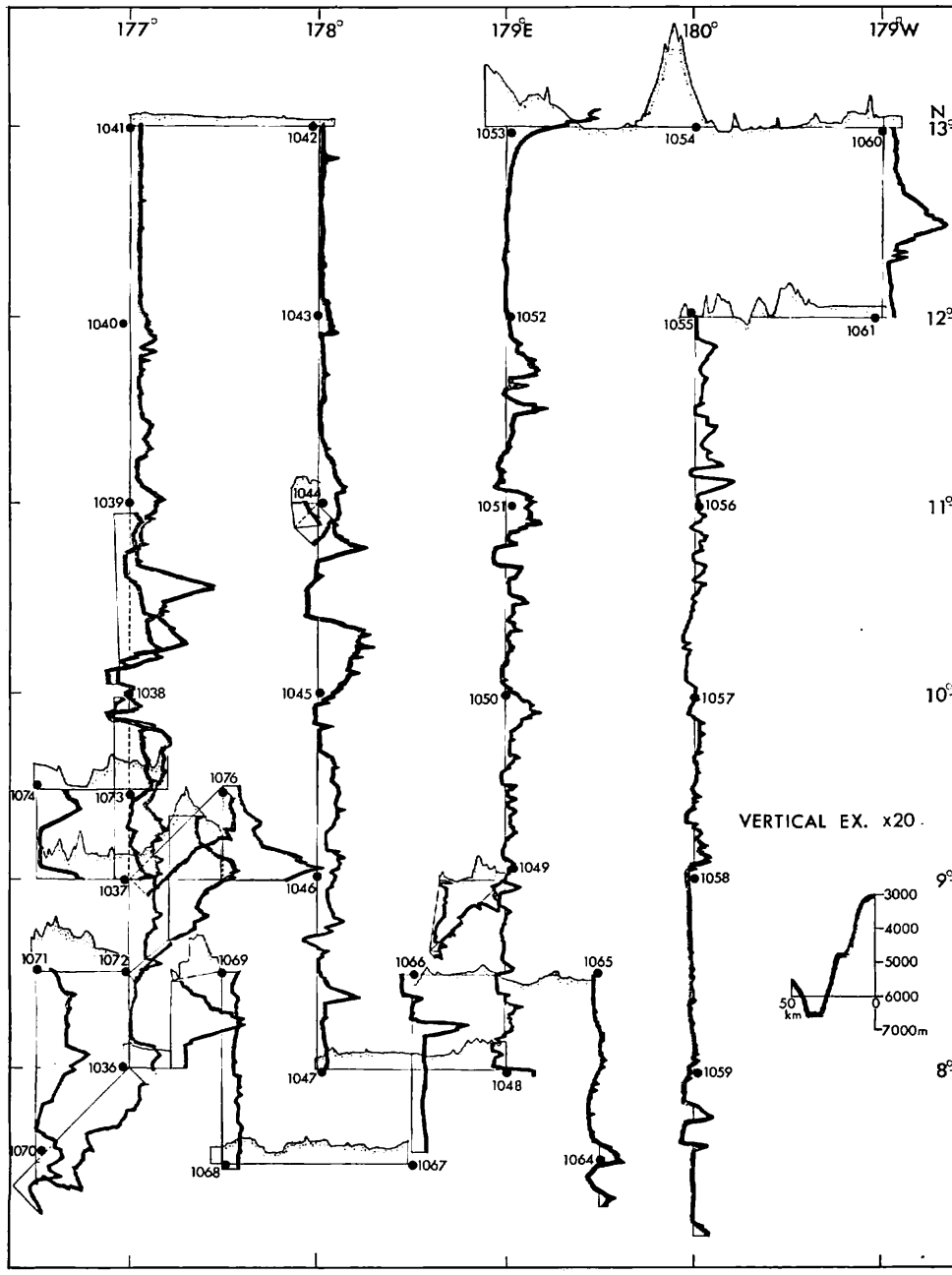

Fig. III-3 Topographic profile along the major survey lines from NEC 12 kHz PDR data.

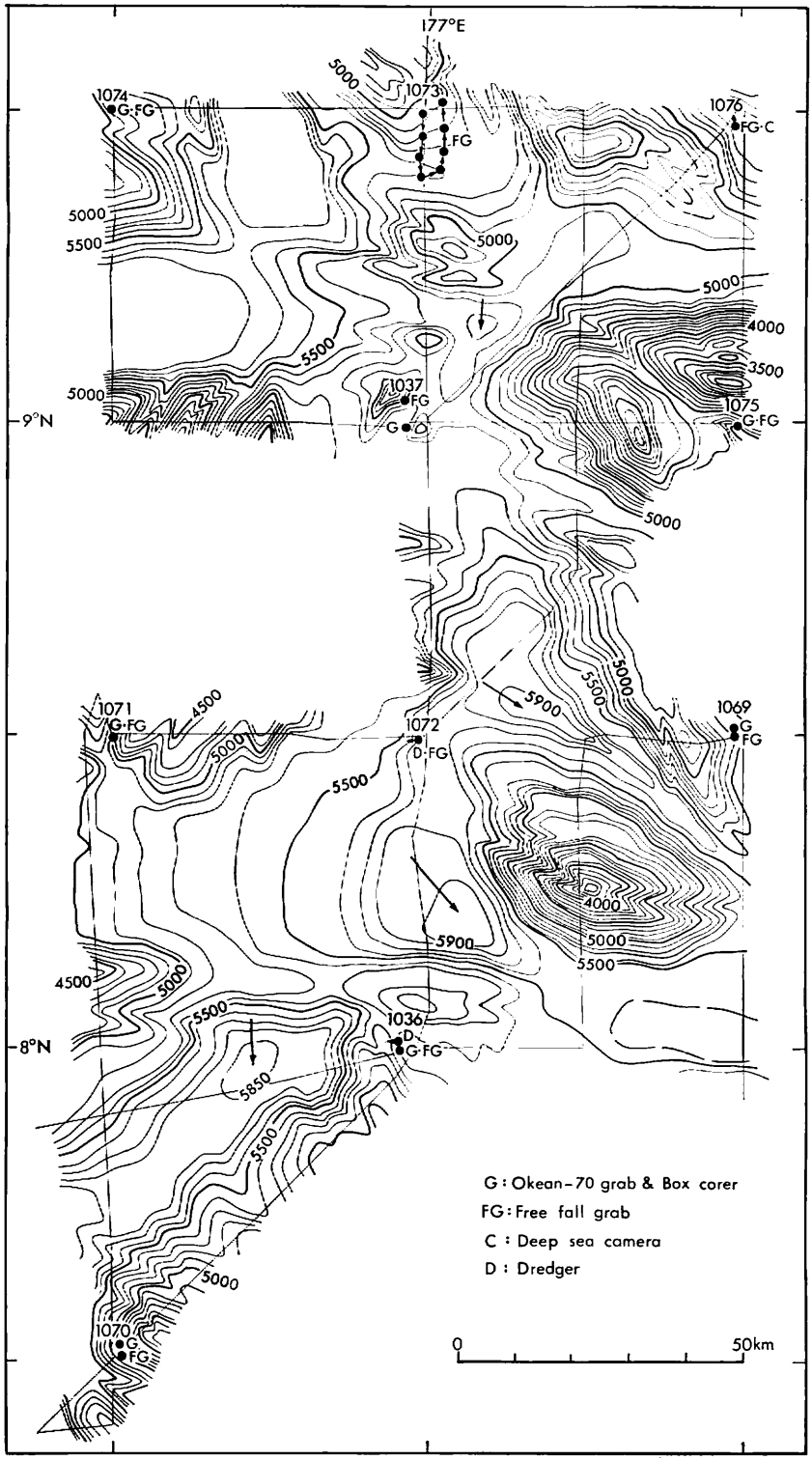

Fig. III-4 Detailed topographic map of the southwestern Mountainous area.

cordant with that of the Magellan Trough, while this WNW direction trends to shift to NW direction towards the southwestern part of the survey area. This tendency may suggest some influence of the fructure zone of NWN direction running along just the westward vicinity of the southwestern corner of GH78-1 area shown in the magnetic pattern map in TAMAKI *et al.* (1979). On the other hand, the parts of abyssal plain and troughs in the survey area show the filling and flattening of the original irregularity of volcanic oceanic crust by the sedimentation mainly of biogenic materials since it's formation.

Northeastern seamounts area

As shown in Figs. III-1 and III-2, there are two or three seamounts lining in WNW general trend at a water depth of 4,000 m at their tops and with relative height of 1,000–2,000 m. Also, along both northern and southern foots of the major seamount lower troughs at a depth of 6,000 m are developed.

Southwestern mountainous area

As shown in Fig. III-1 and especially in Fig. III-2, this area, occupying the southwestern part, is characterized by rugged seamounts with lining trend of WNW to NW direction at a water depth of 3,500–4,000 m at their tops, and by the absence of lower troughs deeper than 6,000 m. This feature as rather raized zone and of rather ambiguous topographic trend from NWN to NW directions may suggest, as previously mentioned, the influence by the tectonic character of original oceanic crust like the existence of fructure zone in westward vicinity as shown in regional magnetic lineation map (TAMAKI *et al.*, 1979).

Fig. III-4 shows some details of a part of this mountainous area in the figure, the topographic trend is rather ambiguous with independent seamounts, and even there are recognized small depressions in 5,900 m depth along NW direction among seamounts for instance, to the southwest and northeast of St. 1036, and to the northeast of St. 1072. We have no definite data to interprete these topographic characters, but it seems worthwhile to mention that this mountainous area show high nodule abundance.

Northwestern abyssal plain area

The northwestern part of the survey area is characterized by the development of wide abyssal plain at a water depth of 5,500–6,000 m. Although this area has flat floor, upper sedimentary layer (Unit I) is generally thinner than 50 m. However the nodule abundance of the area is very low.

Central to southeastern deep sea basin

The area occupies wider part bounded by the northeastern seamounts, southwestern mountainous and northwestern abyssal plain areas. As shown particularly in Fig. III-2, this area is characterized by the repeated hills and troughs trending generally in WNW direction. Especially the troughs or lineated basins in water depth of 6,000–6,300 m are remarkable. These depressions, however, tend to be wider to southward from around the latitude 10°N. The southern part corresponds to the northwest of Magellan Rise, and is likely to have been sub-

jected to sedimentation influenced by the materials derived from the Rise. This seems to reflect of very low nodule abundance in the southern basin part with relatively high sedimentation, as contrasted with relatively high abundance in the central zone of the deep sea basin to northward from around the latitude 10°N.

References

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