XV. RELATION BETWEEN MANGANESE NODULE ABUNDANCE AND ACOUSTIC STRATIGRAPHY IN THE GH77-1 AREA

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The problem of the relation between the manganese nodule abundance and the thickness of acoustic transparent layer both on seismic and 3.5 kHz PDR or SBP (sub-bottom profiling) records has been received attention especially in connection with the possibility of establishing a rapid prospecting method as well as obtaining the data for the feature of sedimentation and its bearing on the nodule growth.

In neighboring GH76–1 and GH74–5 areas, such correlation was pointed out to exist between the thickness of transparent layer of Unit I on the seismic record or of 3.5 kHz record, as represented by the tendency that nodule abundance was almost zero in case of their thickness more than 100 m and higher abundance more than 10 kg/m^2 was confined to the part of transparent layer thinner than 50 m, and that higher abundance more than 20 kg/m^2 related only to Type A of Unit I layer (Tamaki *et al.*, 1977).

As described in Chap. V (Murakami and Moritani, in this report) following the classification by Tamaki *et al.* (1977), the acoustical stratigraphic sequence on seismic record of the present GH77–1 area consists of Unit I (Type A and Type C), Unit II, and acoustic basement in descending order, and this is roughly correlative to that on the 3.5 kHz record.

Unit I ranges in thickness from within 10 m to 200 m, and is probably of Neogene to Quaternary age. Type A is acoustically transparent and likely to be oozy and clayey sediment, while Type C is an acoustically highly stratified layer overlain by thinner transparent layer, which appears as an opaque layer on 3.5 kHz record, and supposedly consists of turbidites beds. Type C seems to develop along the depressions lying outside the rise or seamounts areas. Unit II is an acoustically semi-opaque layer with reflector probably of Middle Eocene to Oligocene chert bed at its uppermost part, and with minor intra-folding structure, ranging in thickness from 40 m to 250 m. Acoustic basement is thought as the Cretaceous basalt.

The results of our investigation on the relationship between the manganese nodule abundance and the thickness of transparent layer both on 3.5 kHz and seismic records and that of the Unit I layer as a whole based on the data obtained at each station are shown in Table XV–1 and Fig. XV–1 respectively.

These results are agreeable as a whole with the tendency recognized in GH76–1 and GH74–5 areas. Fig. XV–1 indicates that the nodule abundance higher than 10 kg/m^2 is confined to either transparent layer or Type A of Unit I layer with a thickness less than 40 m or 50 m, while the thicker layer more than 100 m relates to scarce nodule abundance, and that Type C layer represents scarce nodule abundance.

These facts may suggest that thinner transparent layer or, in other words, low sedimentation rate since Middle Eocence to Oligocene time had relation to the higher manganese nodule growth, and that the mode of sedimentation represented by the

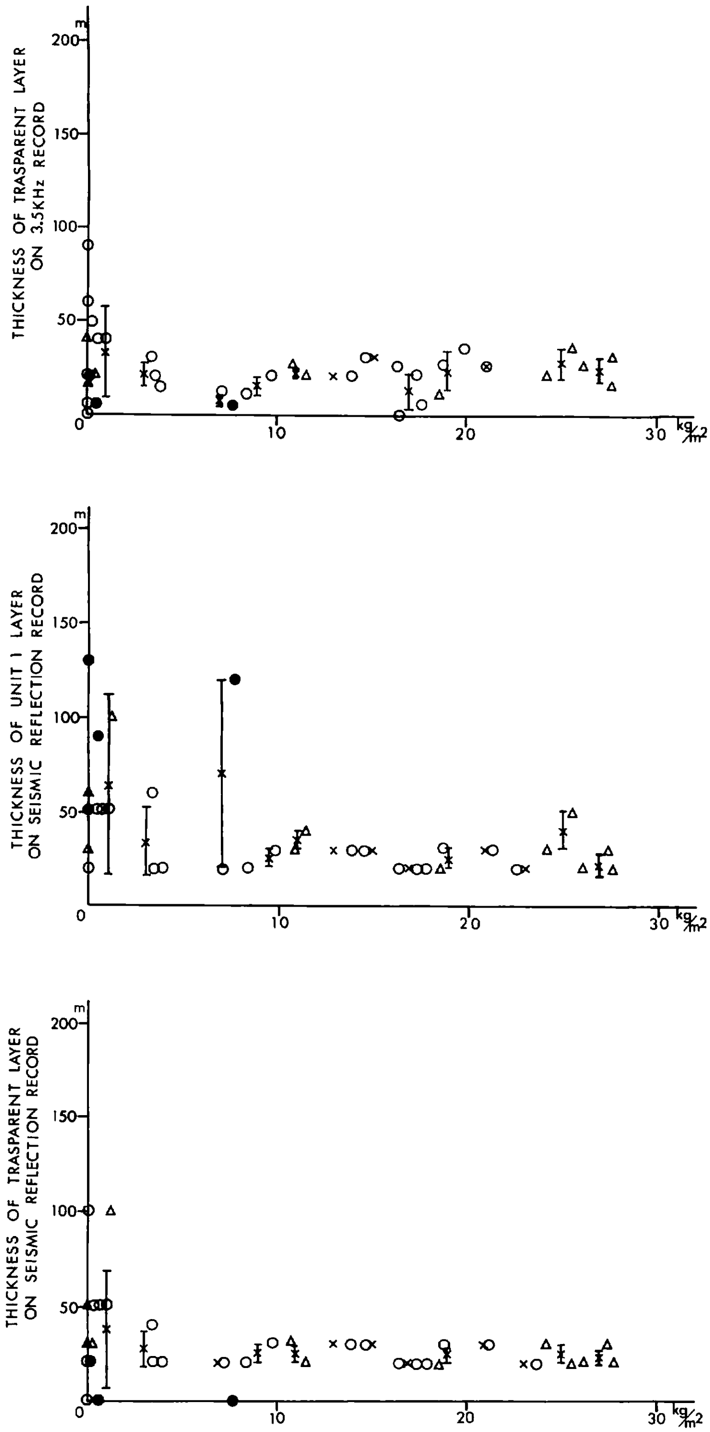

Fig. XV-1 Relation between manganese nodule abundance and thickness of acoustic layers at each sampling station. The data of manganese nodule abundance were obtained mainly from Okean grab (circle), but, in case of the absence of its data, partly from freefall grab (triangle). Open circle and triangle show Type A and solid circle and triangle show Type C of Unit I layer. Vertical bar and × mark indicate standard deviation and mean value of transparent layer and Unit I layer at each 2 kg/m² interval of manganese nodule abundance.

Table XV-1 Manganese nodule abundance and thickness of acoustic transparent layer and Unit I layer on 3.5 kHz SBP and seismic records at each sampling station. Gothic St no. indicates lack of Okean grab data.

Station no.	Thickness of transparent layer 3.5 kHz SBP (m)	Thickness of transparent layer seismic (m)	Thickness of Unit I layer on seismic record (m)	Type of Unit I layer	Abundance of manganese nodule (kg/m²) Okean grab data/ freefall grab data (max.)
701	5	20	20	A	17.7/(3.8)
702	20	30	30	A	9.8/12.0
703	15	30	60	C	—/0
704	20	20	130	C	0/0
705	50	50	50	A	0.2/0.3
706	60	—	—	(A)	0/0
707	15	20	20	A	3.9/10.9
708	10	20	20	A	8.4/2.9
709	0	20	20	A	16.5/2.8
710	20	20	20	A	17.4/11.4
711	20	20	20	A	0/15.4
712	25	30	30	A	21.1/11.3
713	30	40	60	A	3.4/2.9
714	30	30	30	A	14.8/9.7
715	5	0	20	A	0/0
716	0	0	0	A	0/0
717	60	—	—	(A)	0/0
718	25	30	30	A	18.9/20.5
719	10	20	20	A	23.7/26.6
720	20	20	20	A	3.6/6.5
721	25	—	—	(A)	16.4/(7.4)
722	35	—	—	(A)	19.9/28.1
723	40	50	50	A	1.0/2.5
724	5	0	90	C	0.5/0.6
725	5	0	120	C	7.7/0.1
726	90	100?	180	A	0/0
727	40	50	50	A	0.6/0
728	50	100	100	A	—/1.2
729	35	20	50	A	—/25.5
730	20	20	40	A	—/11.5
731	40	50	50	A	—/0
732	20	30	30	A	—/0.1
733	20	30	30	A	—/24.2
734	25	30	30	A	—/10.9
735	15	20	20	A	—/27.7
736	30	30	30	A	—/27.4
737	25	20	20	A	—/26.1
738	20	30	30	A	14.0/26.2
739	10	20	20	A	—/18.6
701A	10	20	20	A	(7.1)/—
703A	20	30	50	C	0/—
722A	40	40	40	A	—/—

Type C or acoustic turbidites affected negatively to the growth of manganese nodules. However, it must be noticed that the thickness less than 40 m or 50 m relates to both higher and less abundances including the case of zero abundance. This means that the thinner transparent layer less than 40 m or 50 m is not necessarily connected with higher nodule abundance, and there must be still some other local factors controlling the distribution of manganese nodules. This problem is to be checked in further surverys.

Reference

TAMAKI, K., HONZA, E. and MIZUNO, A. (1977) Relation between manganese nodule distribution and acoustic stratigraphy in the eastern half of the Central Pacific Basin. *In* A. MIZUNO and T. MORITANI (*eds.*), *Geol. Surv. Japan Cruise Rept.*, no. 8, p. 172–176.