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X. 3.5 kHz SUBBOTTOM PROFILING SURVEY IN KASHIMA-NADA AREA IN CRUISE GH80–3

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Introduction

A subbottom profiling survey was carried out with a 3.5 kHz PDR (subbottom profiler) along all the survey tracks of the cruise in order to clarify the surficial structure and distribution of sediments. The survey system comprises nine transducers (TR 75A), a tranceiver (PTR 105A), a correlation processor (CESP II), and a praphic recorder (UGR 196C), which are manufactured by Raytheon Co. The acoustic pulse length is 50 msec, and the recording range is 2 seconds.

Survey results

There are generally small variations of the acoustic character which can be detected by the 3.5 kHz subbottom profiling survey in the survey area. The penetration is generally shallow, and the contrast of the reflectivity between layers is not so high compared with that in the southeastern offshore of the Boso Peninsula which lies south of the GH80–3 area (Chapter III in this report). This fact probably shows relatively low sedimentation activity in Holocene age in the area. Three typical profiles of E-W lines are shown in Fig. X–1a, 1b and 1c from north to south.

On the continental shelf in the middle and north of the area, the topographic contrast between shallow and deep parts is observed. The sea bottom surface is very rough at the shallower than 50 m in water depth, and it is very smooth and flat at deeper than 50 m. A very thin (about 0.01 sec two-way time) horizontal trasparent layer is generally observed under the flat part of the shelf. Inclined opaque formations can be seen under the transparent layer in the northern part of the shelf (Fig. X–1a). These formations correspond to Unit A on the continuous seismic profiles (Chapter XII in this report). The top surface of Unit A sometimes shows the differential erosional feature (Fig. X–2). The epoch of the erosion is probably correlated to the time of sea-level fall caused by maximum Würm glaciation. Therefore the thin transparent layer underlain by Unit A is probably correlated with Holocene formations.

In the southern part of the shelf, the transparent layer shows fairly well development (Fig. X–1c). The maximum thickness of the layer amounts to 25 m east of the Tone River. The thickness distribution of the layer is shown in Fig. X–3. The thick part is distributed as a band with 10 km width from the southeast of the Choshi Peninsula to the northeast. Although the Tone River, one of the biggest rivers in Japan, opens to the area now, the main upstream had been flowed into Tokyo Bay in historic age before it was artificially changed to the present system. The sediments of the layer have probably been supplied by rivers resemblant to the present Tone River, or supplied by the present Tone River during relatively short period. The thickness distribution probably shows the superiority north

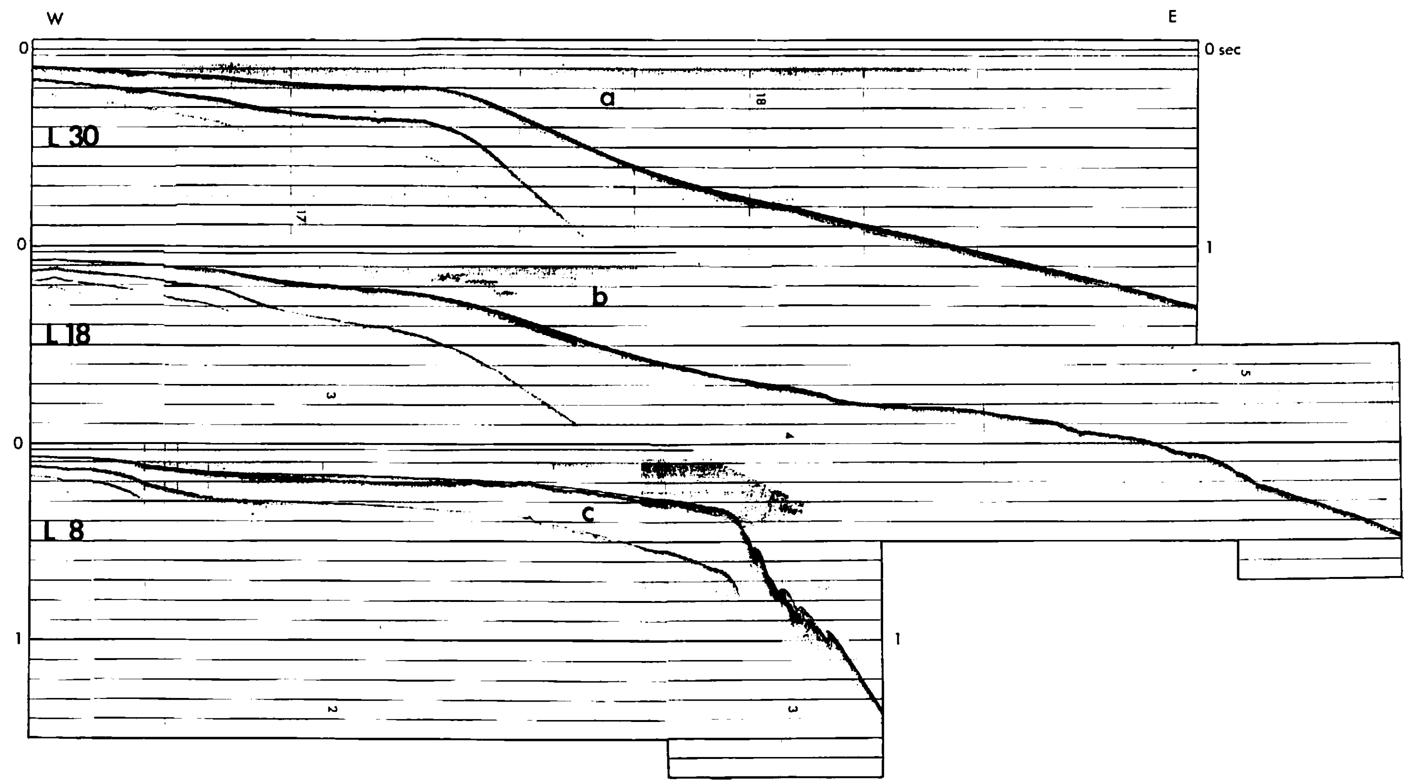

Fig. X–1 Subbottom profiles by 3.5 kHz profiler in Kashima-Nada: a) L8, off Choshi; b) L18, off Hokota; c) L30, off Hitachi. Locations of profiles in Figure I–2.

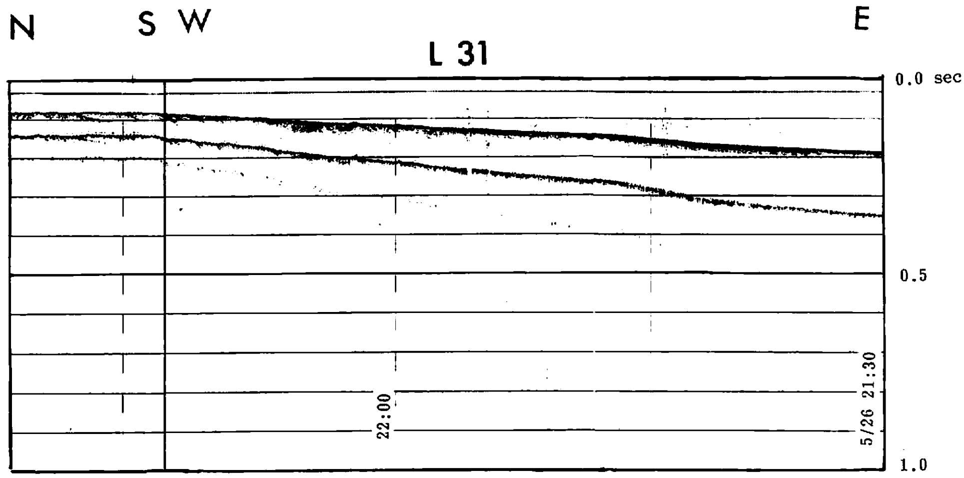

Fig. X-2 Subbottom profile L31. Note the rugged top surface of the seaward inclined opaque layers. The transparent layer is very thin here.

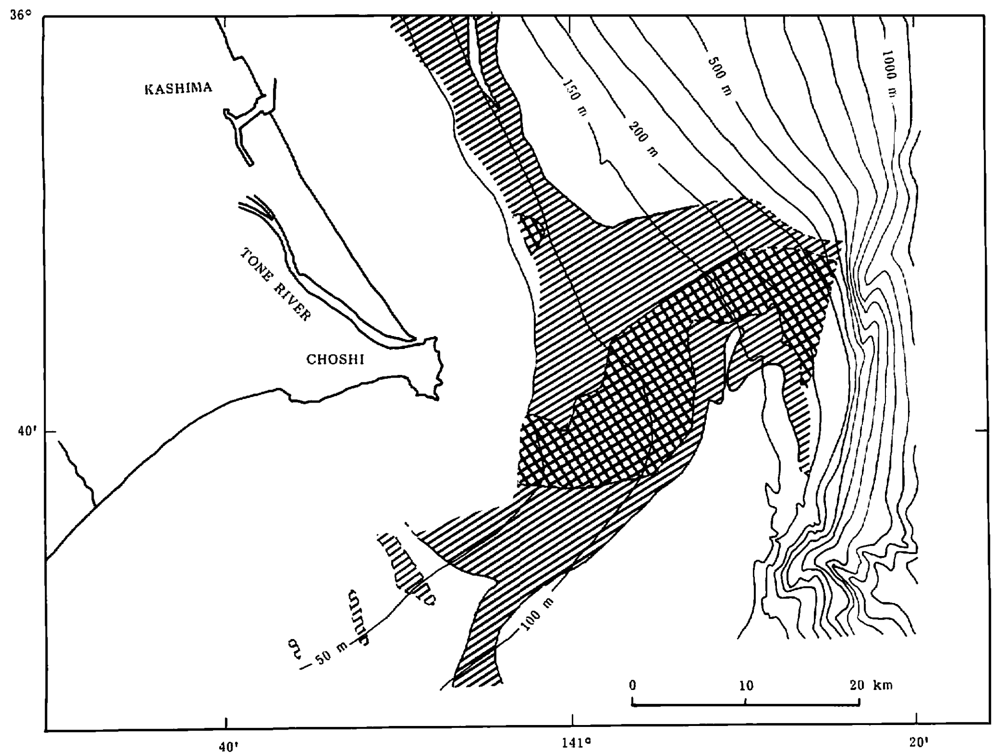

Fig. X-3 Distribution of the transparent layer on the shelf. Cross hatch indicates the thick area over 0.02 sec of two-way time (about 15 m).

to south distributor current near the coast and south to north in offshore.

The lower boundary of the transparent layer shows the erosional rough feature. Judging from the profiles (e.g. L9 in Fig. X–4), the subaerial erosion has occurred till at least –150 m during the sea-level falling period, if the tectonic movement is negligible. The basement on the shelf is probably composed of Paleozoic to Miocene formations which are exposed on the Choshi Peninsula.

A relatively thick (0.02–0.03 sec) stratified layer is widely distributed on the upper continental slope of the survey area (Fig. X–1a and 1b). Althouth the internal reflectors of the layer show the irregular variations, the total acoustic character of the layer is rather monotonous in general. It is probably correlated with the upper part of Unit A on the seismic profiles, but some uppermost part of the layer may be correlated with the Hollocene transparent layer on the shelf.

Many large and small deep sea channels exist on the slope especially in the southern part of the area. Considerably thick transparent or stratified deposits are accumulated on the bottoms and the surroundings of the channels (Fig. X–5). A thin transparent layer on the slope making wedges and pond shapes seems to be channel-overflow deposits. Channel-distributed deposits may construct the main part of the relatively thick monotonous stratified layer on the slope.

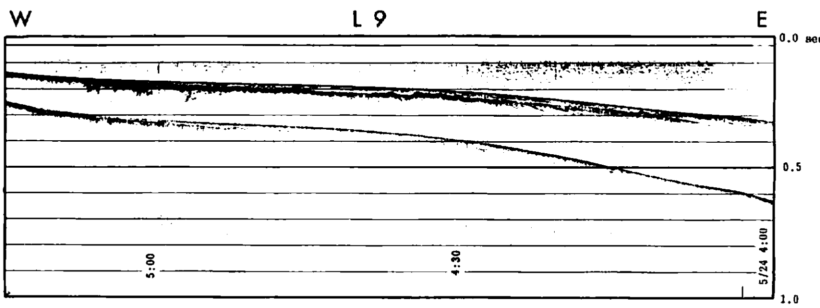

Fig. X–4 Subbottom profile L9. Note the highly discordant feature of the bottom of translparent layer with opaque layer west to the 4:25 point and relatively concordant feature with the inclined semi-opaque layer east to the point. The water depth of the 4:25 point is 127 m, and the thickness of the transparent layer is about 25 m. Then the paleo-sea-level which made the erosional surface of the opaque layer falled down at least about 150 m, if the tectonic movement is negligible.

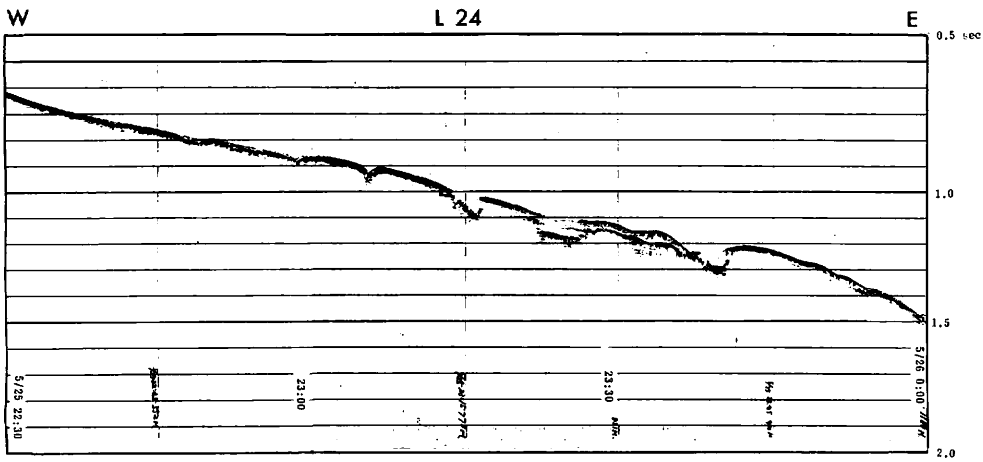

Fig. X–5 Subbottom profile L24. Note thick transparent sediment in the channel, and the thin transparent wedge on the slope between channels considered as channel-overflow sediments.