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IX. HEAT FLOW MEASUREMENT ON THE EAST OFFSHORE OF THE BOSO PENINSULA

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A series of test runs of the new Applied Microsystems' multi-penetration type heat flow probe was carried out off the Boso Peninsula. Since instrument did not operate properly, heat flow value was not obtained. Only geothermal gradient was estimated.

Apparatus

We tested the GR-12 Acoustic Telemetering Marine Geothermal Heat Flux Probe (manufactured by Applied Microsystems Ltd.). HYNDMAN *et al.* (1979) gave details of this heat flow probe. The schematic view of the probe is shown in Fig. IX–1. Temperatures are measured by equally-spaced thermistors installed in the sensor tube, which is 2 m or 6 m long. The resolution of temperature is about 0.008°C. The digitized data are recorded on a magnetic tape in the pressure housing, and transmitted as acoustic pulses to the ship. After the temperature gradient is measured, a calibrated heat pulse is generated. By measuring the decay of temperature, *in situ* thermal conductivity can be determined. (LISTER, 1979, HYNDMAN *et al.*, 1979) Having these characteristics, the probe permits multiple penetration.

Practical test

The test was carried out around 34°55′N, 141°30′E off the Boso Peninsula. The probe made five penetrations with the 2 m sensor, and one penetration with the 6 m sensor.

The instrument did not function as expected. What happened are: (1) The hydrophone and receiver did not receive acoustic pulses, so that it was impossible to monitor the data. (2) The data obtained by the 2 m sensor were very scattered. Probably the connection between the recorder and the sensor was poor. (3) Heat pulses were not generated, so that thermal conductivities were not obtained. (4) The screw junction in the middle of the main shaft of the 6 m long probe was unscrewed while the probe was in the sea-bottom for unknown reason, therefore the 6 m sensor tube suffered tensional force and was broken.

Geothermal gradient

From the 6 m sensor, good records were obtained until the sensor tube was broken. In Fig. IX–2, the data are plotted and the positions of thermistors are shown in Fig. IX–3. It seems that the probe did not penetrate fully into the sediment. Considering the thermal time constant of the probe (0.95 cm-diameter) and the recording time of 4 minutes, the temperature corrections for extrapolating to the infinite time are believed to be very small,

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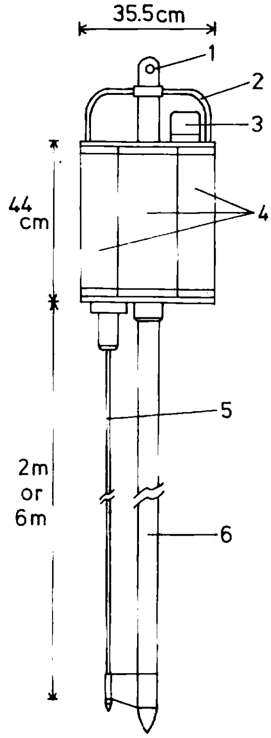

Fig. IX–1 Schematic view of the heat flow probe. 1: lifting eye, 2: protection cage, 3: acoustic transmitter, 4: pressure housings, 5: sensor tube, 6: main shaft.

less than 2 mK (BULLARD, 1954), although the record of TM7 seems to behave otherwise. If it is assumed that the temperature equilibrium was attained before the breakdown of the probe, the temperature profile is obtained as shown in Fig. IX–4. From this profile, the mean geothermal gradient at this site (34°55′N, 141°31′E) is estimated to be 0.049 ± 0.005°C/m. Because of the lack of heat pulse data, heat flow value was not obtained. If we assume the value of the thermal conductivity of the sediment as 0.8 W/m · K, the heat flow may be estimated to be about 40 mW/m^2 (1.0 HFU), a reasonable value for the location of the station (UYEDA, 1972).

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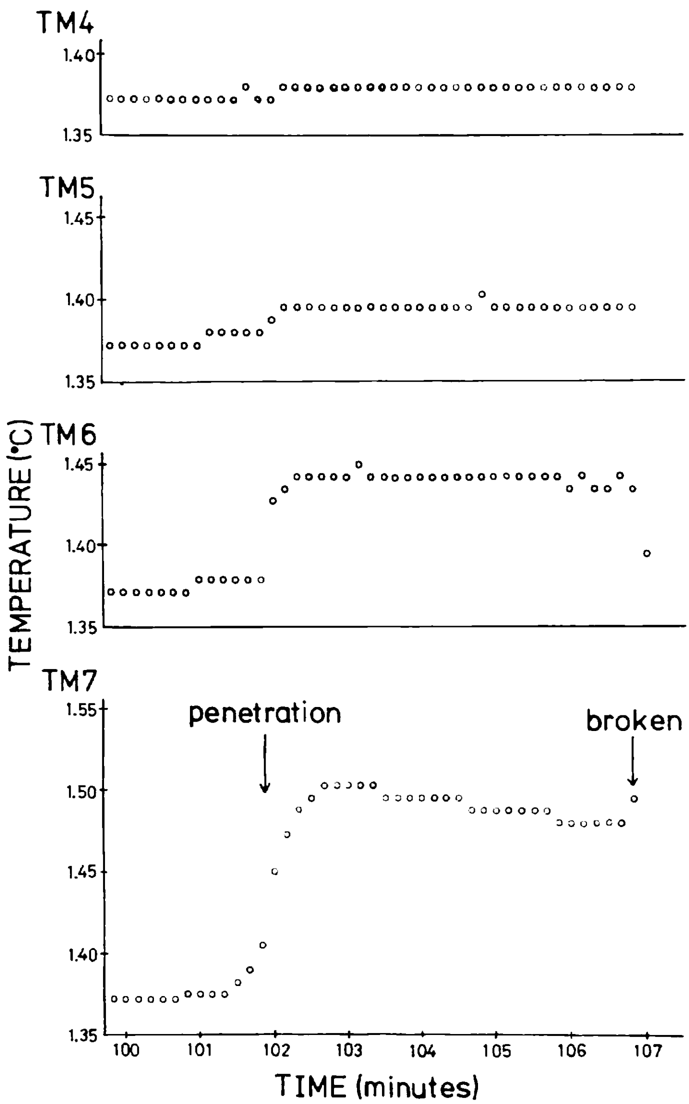

Fig. IX–2 Temperature data of the 6 m sensor. The record of upper three thermistors is about the same as that of TM4, and not shown.

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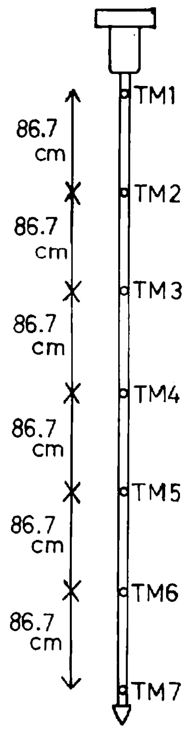

Fig. IX–3 Positions of thermistors in the sensor tube.

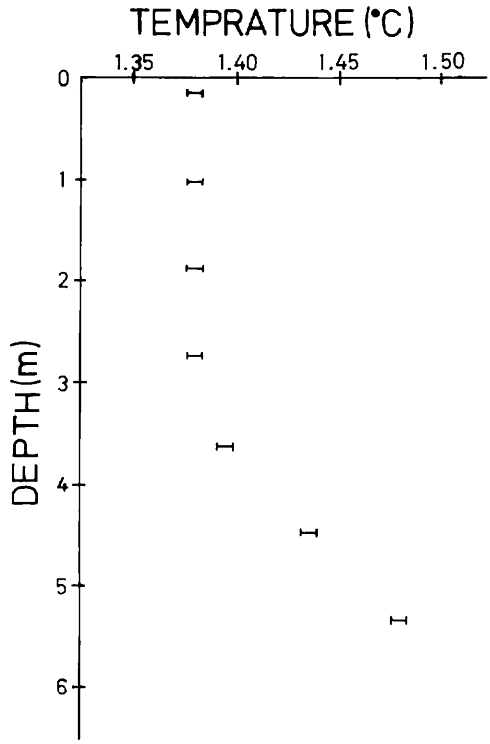

Fig. IX–4 Temperature profile at 34°55′N, 141°31′E. The ordinate means the relative depth, not the depth from the bottom surface.