XV. REMANENT MAGNETIZATION OF DEEP-SEA SEDIMENTS IN THE GH79-1 AREA

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Method and material

Natural remanent magnetization (NRM) was measured for 4 sediment cores with the piston corer, principally following the method and the procedure in the previous studies (JOSHIMA, 1977; 1979). Table XV-1 shows the specification of the sediment cores, and Fig. XV-1 shows the sampling stations and the outlined topography.

Table XV-1 Specification of the sediment cores.

Core No.	P137	P138	P140	P141
Latitude	10°00.72'N	9°59.21'N	11°59.29'N	10°58.74'N
Longitude	167°49.70'W	167°47.38'W	174°00.80'W	174°00.91'W
Water depth	5291 m	5270 m	5601 m	5541 m
Lithology	clay	brown clay	dark brown clay	dark brown clay
Mn nodules at the top	two pieces	one grape type	none	three pieces
First reversal	2.25 m	1.07 m	0.7 m	2.12 m
Magnetic stability	medium	medium	weak	medium
Core length	3.34 m	3.78 m	4.20 m	4.50 m
No. of measured specimen	129	90	90	174

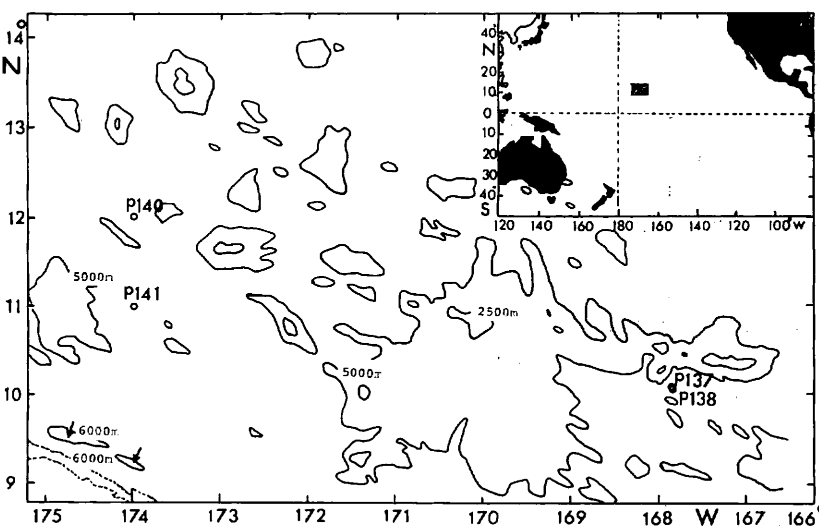


Fig. XV-1 Index map of the sampling staitons.

Results

Figure XV-2(a-d) shows the vertical distribution of NRM of the cores. In the figure, the vertical axis shows the depth below the sea bottom. NRM measurement has not been done in the uppermost part of each core because of the disturbance of the part during the core sampling. As the real direction in the horizontal plane is unknown, only the relative declination is shown clockwise. As a reference, IGRF (International Geomagnetic Reference Field) value at the point, 10°N, 170°W, near the survey area is as follows,

Total magnetic field	:	33,300 nT
Declination	:	+10° (clockwise from north)
Inclination	:	+15° (downward)

NRM distribution of each core is described below.

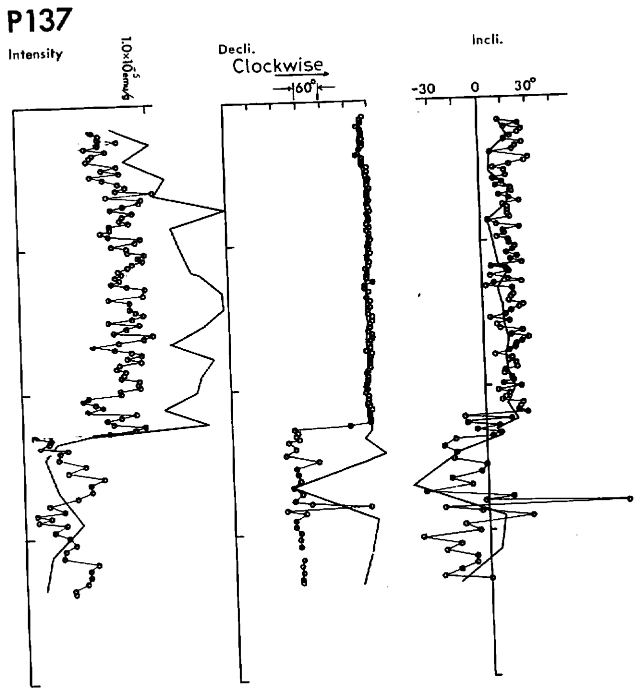
P137 (Fig. XV-2(a)) The first reversal appears at a depth of 2.25 m in the core, where the declination changes clearly by 180°. Intensity in the part lower than the normal-reversed boundary is approximately 0.4×10^{-5} emu/g, which is about 40% of that in the upper part. In the upper part, the inclination is about +15° (downward), and the deviation of that is smaller (±5°), while the former is −15° (upward) and the latter is larger (±10°) in the lower part. The inclination is reasonable as compared with the IGRF value mentioned above (+15°). This core contains Recent radiolarian remains (NISHIMURA, this cruise report) in the top, and the geomagnetic pattern of it shows good correlation with the standard from Recent through 1 Ma ago (see Fig. XV-4). Then the upper part may be of the Brunhes normal epoch, and the lower part, the Matuyama reversed epoch. And another normal part nearby the depth of 2.82 m may correspond to the Jaramillo event, although it depends on only one specimen. The sedimentation rate from the Jaramillo event through present for this core, which is calculated based on the age of the end of the Jaramillo event (0.89 Ma), is 3.2 mm/1,000 y. It corresponds with the other data in the central part of oceans (e.g. HARRISON, 1966; INOKUCHI and MIZUNO, 1977).

Below the Jaramillo layer, this core does not have any normal part which should correspond with the Olduvai normal event (1.71 Ma), but contains the late Oligocene coccolith assemblage in the core catcher sample (NISHIMURA, this cruise report). There should be a hiatus in or at the top of the cc sample (3.4 m below the sea bottom), between the late Oligocene and the Jaramillo.

P138 (Fig. XV-2(b)) Recent radiolarian remains occur at the top of this core (NISHIMURA, this cruise report), and the uppermost part is expected to be geomagnetically normal. The first reversal appears at a depth of 1.07 m. There are 4 normal parts below the first reversed interval, at the depths of 1.25 m, 2.18–2.40 m, 2.57–2.75 m, and 3.05–3.23 m. On the other hand, there is a discontinuity of the sedimentary facies at a depth of 2.5 m, between the upper, pelagic clay, and the lower, siliceous ooze and calcarious nanno ooze turbidite. The discontinuity is in a reversed part below the Olduvai. Furthermore, microfossils (coccolith) from the depth of 3.37 m shows the early Miocene (NISHIMURA, this cruise report).

The geomagnetic pattern of the upper part 0.0–2.40 m, has a good agreement with the standard from present to Olduvai event (Fig. XV-3). Regarding the part between the sedimentary discontinuity (2.5 m) and the depth of 3.23 m, although the geomagnetic

(a)



(b)

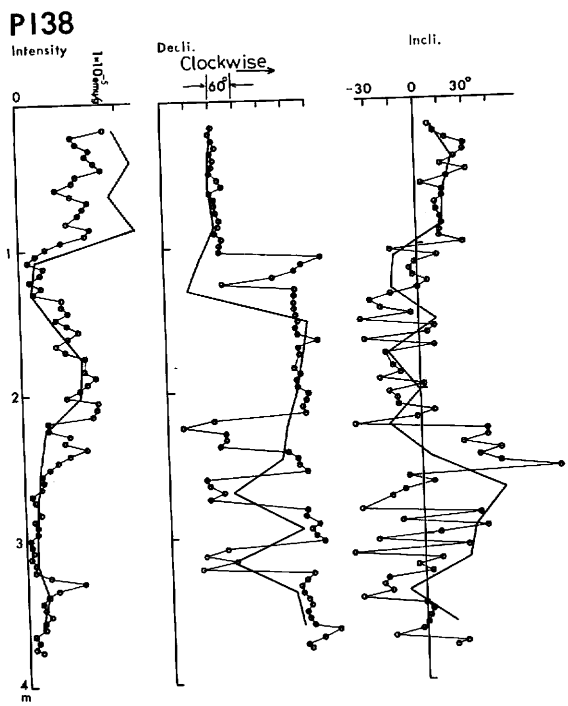
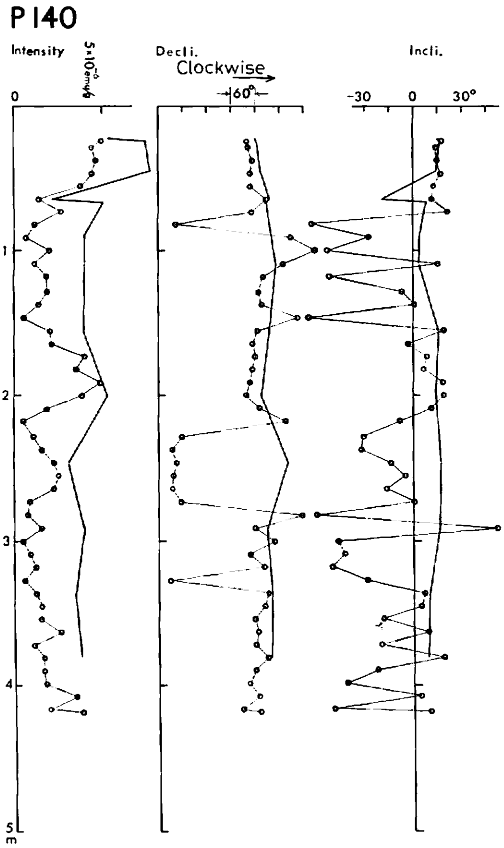
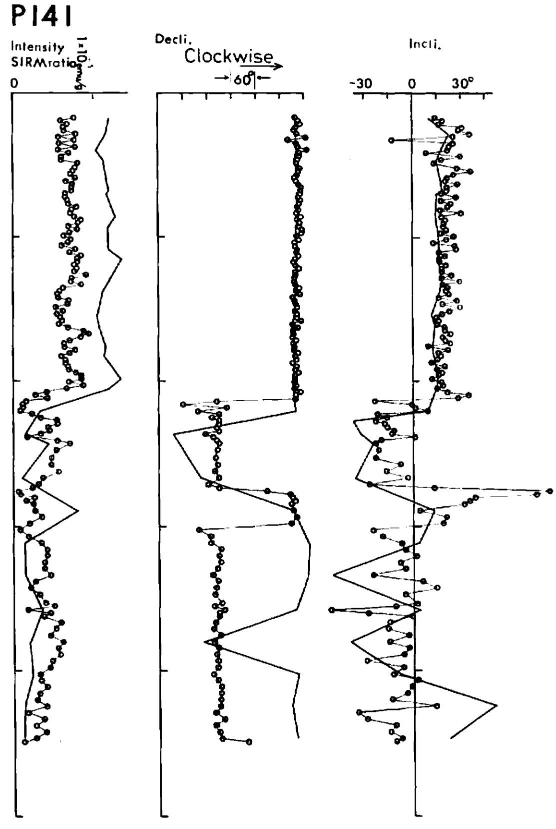


Fig. XV-2 Vertical distribution of the remanent magnetization. Open circles: remanent magnetization measured every 4.5 cm, after the demagnetization by 100 Oe (peak alternative magnetic field; 50 Hz), except for Core P140 which was demagnetized by 50 Oe because of the unstable remanent magnetization. Folded lines: natural remanent magnetization every 22.5 cm before the demagnetization.



(c)



(d)

pattern corresponds to one of the standards of three time-intervals (Fig. XV-3, folded lines (1)–(3)), the second one, i.e. the lower Miocene (21–22 Ma), is most suitable to the biostratigraphic evidence mentioned above.

P140 (Fig. XV-2(c)) This core has many magnetically unstable parts, where the remanent magnetization decreases to one-fifth or less after the demagnetization and show other directions after repeated or more intensive demagnetizations. Although the uppermost part contains some recent radiolarian remains (NISHIMURA, this cruise report), geomagnetic pattern is not chased through the lower part because of the unstability.

P141 (Fig. XV-2(d)) The first reversal appears at a depth of 2.05 m. The normal part below the reversal is between the depths of 2.75 m and 3.0 m, which is compared to the Jaramillo event as shown in Fig. XV-4. Assuming the continuous sedimentation, sedimentation rate of this core is calculated as 3.05 mm/1,000 y and this suggests the age of the bottom is 1.45 Ma, just after the end of Olduvai event.

Summary

The geological age of the sediment cores is presumed based on the geomagnetic pattern, fossil evidence and sedimentary facies, except for the core P140 which is magnetically unstable. All three cores other than P140 have the Brunhes top. P137 has the base of

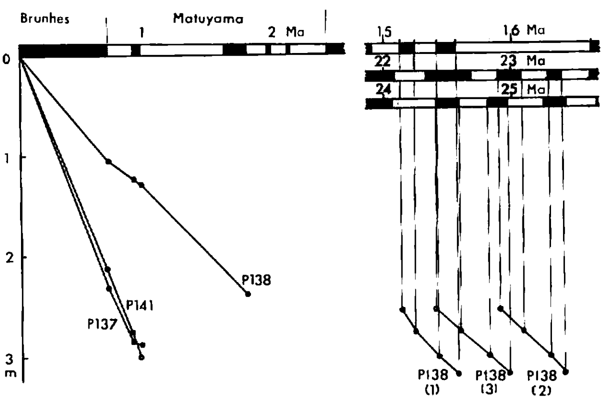


Fig. XV-3 Relationship between the thickness of sediment and the ancient geomagnetism.

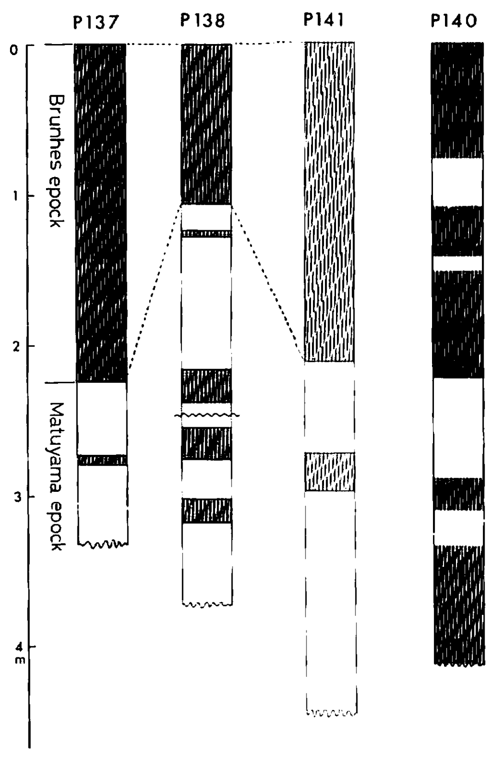


Fig. XV-4 Geomagnetic patterns of cores.

late Oligocene, and P138 does the lower half of Early Miocene. The conclusion is summarized in Fig. XV-4.

References

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