11. SITE 284

The Shipboard Scientific Party[1]

SITE DATA

Location: Challenger Plateau

Position: 40°30.48′S; 167°40.81′E

Water Depth:
PDR, from sea level: 1066 meters
From drill pipe measurement from derrick floor: 1078 meters (adopted)

Dates Occupied: 15-16 April 1973

Depth of Maximum Penetration:
Hole 284: 208 meters
Hole 284A: 75 meters

Number of Holes: 2

Number of Cores:
Hole 284: 22
Hole 284A: 3

Total Length of Cored Section:
Hole 284: 208 meters
Hole 284A: 28.5 meters

Total Recovery:
Length:
Hole 284: 166.8 meters
Hole 284A: 22.4 meters
Percentage:
Hole 284: 80.2
Hole 284A: 78.6

Age of Oldest Sediment Cored: Late Miocene

Summary: Entire section is late Miocene to latest Pleistocene foraminifera nannofossil ooze and nannofossil foraminifera ooze. Minor unconformity in mid Pleistocene, otherwise sedimentation continuous and uniform. Magnificent temperate late Cenozoic calcareous biostratigraphic sequence. Obvious climatic fluctuations in these southern subtropical waters 400 km north of subtropical convergence.

BACKGROUND AND OBJECTIVES

Site 284 was drilled in shallow water (1078 m) on the Challenger Plateau, a western extension of the New Zealand Plateau (Figures 1, 2). The sediment cover above basement was not known. The deepest reflector is about 600 meters subbottom, and is too coherent to be basement. One faint reflector occurs at approximately 250 meters subbottom (Figure 3). Because of the possibilities of hydrocarbons in the region, maximum penetration was only about 200 meters.

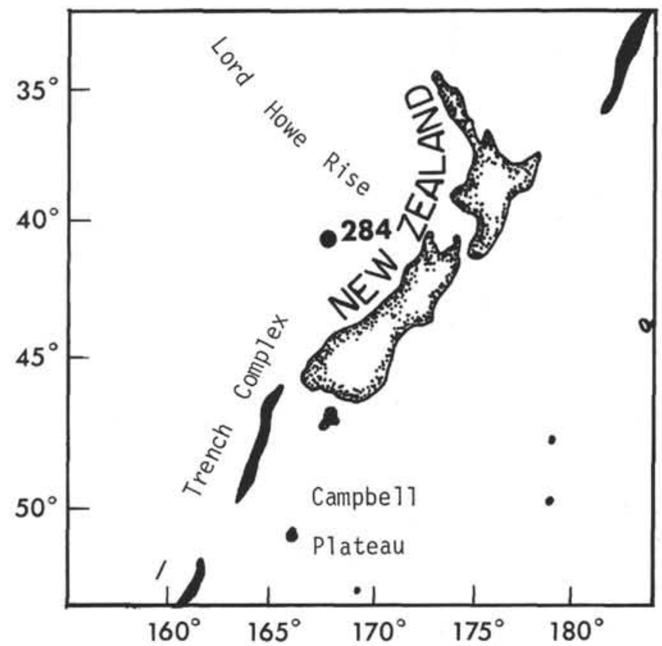

Figure 1. *Location of Site 284, DSDP Leg 29.*

The primary objective of this site was to obtain a continuous late Cenozoic sequence of calcareous microfossils, especially planktonic foraminifera and calcareous nannofossils. Because this site occurs in the southern subtropical (southern temperate) water mass 400 km north of the subtropical convergence, the late Cenozoic section should be of importance in the correlation of the section at DSDP Site 207 (southern Lord Howe Rise) in warmer subtropical latitudes and Site 281 (South Tasman Rise) in subantarctic latitudes. Alternations of subtropical and subantarctic water within the late Cenozoic at Site 284 will also provide much information on paleoclimatic history.

OPERATIONS

The approach to Site 284 on the Challenger Plateau was from the west, crossing a previous *Eltanin*-34 track (Figure 4). The bottom hole assembly and drill pipe were run in to a very soft sea floor at 1078 meters. Hole 284 was spudded and continuously cored to a total depth of 1286 meters, 208 meters of penetration. Core

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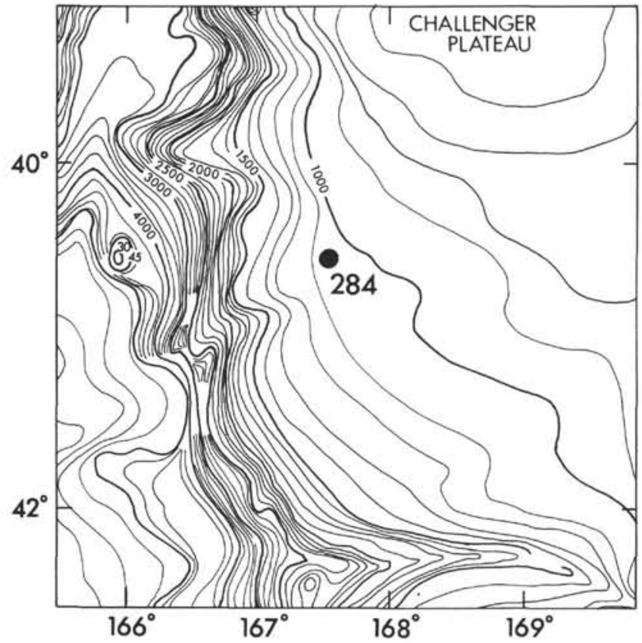

Figure 2. *Bathymetry at Site 284.*

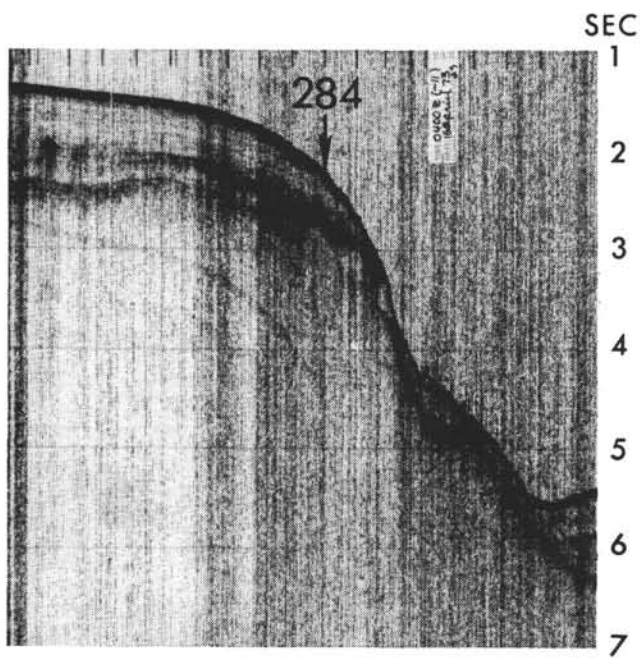

Figure 3. *Profiler section at Site 284.*

recoveries were very good on all but three cores (Table 1).

The drill string was pulled clear of the mudline and Hole 284A was spudded to recore these three intervals. Hole 284A was washed and cored to a total depth of 1153 meters, 75 meters of penetration. Details of the coring are included in Table 1.

TABLE 1
Coring Summary, Site 284

Core	Cored Interval Below Bottom (m)	Cored (m)	Recovery (m)	Recovery (%)
Hole 284				
1	0.0–8.5	8.5	8.5	100
2	8.5–18.0	9.5	CC	0
3	18.0–27.5	9.5	6.7	71
4	27.5–37.0	9.5	0.0	0
5	37.0–46.5	9.5	9.0	95
6	46.5–56.0	9.5	6.0	63
7	56.0–65.5	9.5	9.3	98
8	65.5–75.0	9.5	CC	0
9	75.0–84.5	9.5	9.1	96
10	84.5–94.0	9.5	8.3	87
11	94.0–103.5	9.5	9.0	95
12	103.5–113.0	9.5	9.2	97
13	113.0–122.5	9.5	8.4	88
14	122.5–132.0	9.5	9.5	100
15	132.0–141.5	9.5	9.3	98
16	141.5–151.0	9.5	9.2	97
17	151.0–160.5	9.5	9.4	99
18	160.5–170.0	9.5	9.4	99
19	170.0–179.5	9.5	9.3	98
20	179.5–189.0	9.5	9.5	100
21	189.0–198.5	9.5	8.6	91
22	198.5–208.0	9.5	9.1	96
Total		208.0	166.8	80.2
Hole 284A				
1	8.5–18.0	9.5	6.0	63
2	27.5–37.0	9.5	7.0	74
3	65.5–75.0	9.5	9.4	99
Total		28.5	22.4	78.6

LITHOLOGY

About 208 meters of relatively undisturbed calcareous biogenic sediment were recovered. The principal biogenic components, in order of occurrence, are calcareous nannofossils (coccoliths and rare discoasters), foraminifera, and rare ostracod shell fragments. The entire sequence consists of varying percentages of these components and range from nannofossil-rich foraminiferal ooze to foraminiferal nannofossil ooze to a fairly pure nannofossil ooze. There are no trends in the proportions of components, although foraminiferal oozes are found in Core 1, while Core 22 consists of almost pure nannofossil ooze (Figure 5).

Detrital minerals are almost completely lacking. Acid residues of relatively large volumes of sediment (100 cc) yielded one or two rounded fine quartz sand grains, silicic volcanic glass shards, small amounts of fine mica, clay, and unidentified opaque minerals. Glauconite, pyrite, and manganese micronodules frequently occur as infillings of tubes, burrows, and foraminifera and ostracod tests.

The only sedimentary structures present are streaks, mottles, laminae, and burrows outlined by finely divided black material. This material most likely consists of manganese, pyrite, or organic material. These structures seem to be related to drilling deformation rather than lithology, with dark streaks being preserved in less-deformed sections. The only significant variations of the sequence cored are with the colorations. Two subunits were defined in the sequence.

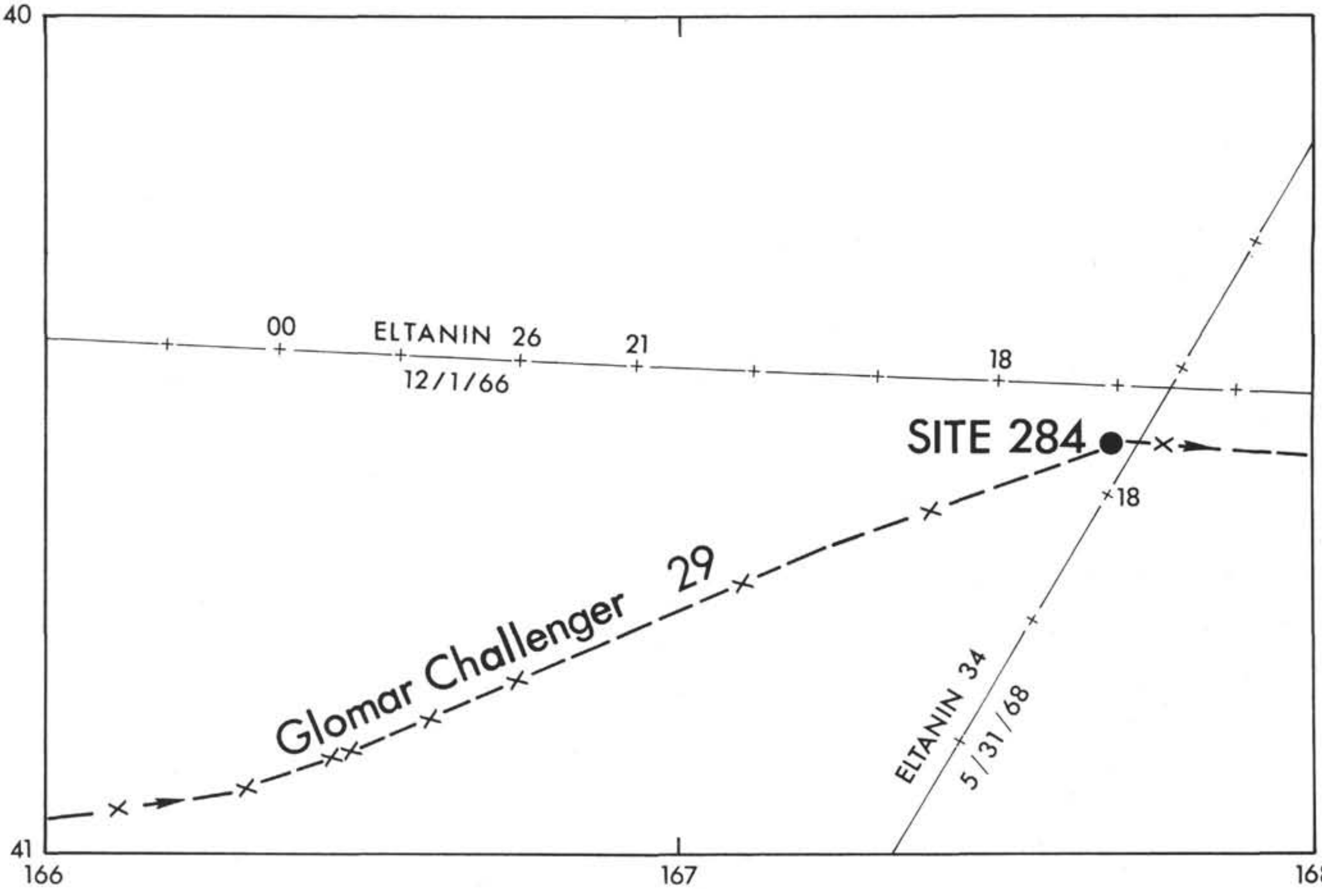

Figure 4. *Track chart.*

Unit 1 — Subunit A

Alternating very-light-gray, light-gray, grayish-yellow-green, bluish-white, light-greenish-gray, pinkish-gray, and light-olive-gray foraminiferal nannofossil ooze, with varying amounts of both components. Only trace amounts of detrital minerals are present. The subunit is locally streaked, mottled, and speckled with dark material believed to be manganese and organic material. Occasional tubes are found infilled with pyrite. Some foraminifera are filled with glauconite. The subunit is Pleistocene.

Unit 1 — Subunit B

Same as Subunit 1A in lithology, except colors are uniform bluish white, white, and very light gray. The subunit is late Miocene-late Pliocene.

Conclusions

This sequence is very consistent in its lithologic nature, and thus represents deposition in an environment which has changed little in depth and tectonic setting since the late Miocene. Lack of ice-rafted debris indicates that the site has been north of the iceberg limit since the late Miocene. The scarcity of terrigenous sediments indicates that bottom currents in this region have not been important, nor has the area been exposed to turbidity currents. The small amount of volcanic material present in sediments at this site indicates that the prevailing westerlies have existed since the late Miocene, and very little wind-blown volcanic debris has been transported from New Zealand. However, the mica and very fine-grained material may have been transported by prevailing westerlies from Australia, or by subaqueous suspension from the area of New Zealand.

The color changes which occur are interpreted as follows: Subunit 1A was deposited during a period of strongly fluctuating paleoclimatic conditions, resulting in alternating beds of light and dark colors. Subunit 1B, uniform in color, was deposited during the less rapidly fluctuating climatic conditions during the Pliocene and late Miocene.

GEOCHEMICAL MEASUREMENTS

Table 2 and Figure 6 show the variations in *p*H, alkalinity, and salinity in lithologic subunits 1A and 1B. The *p*H values are all uniformly lower than the surface seawater reference, with the punch-in values lower than

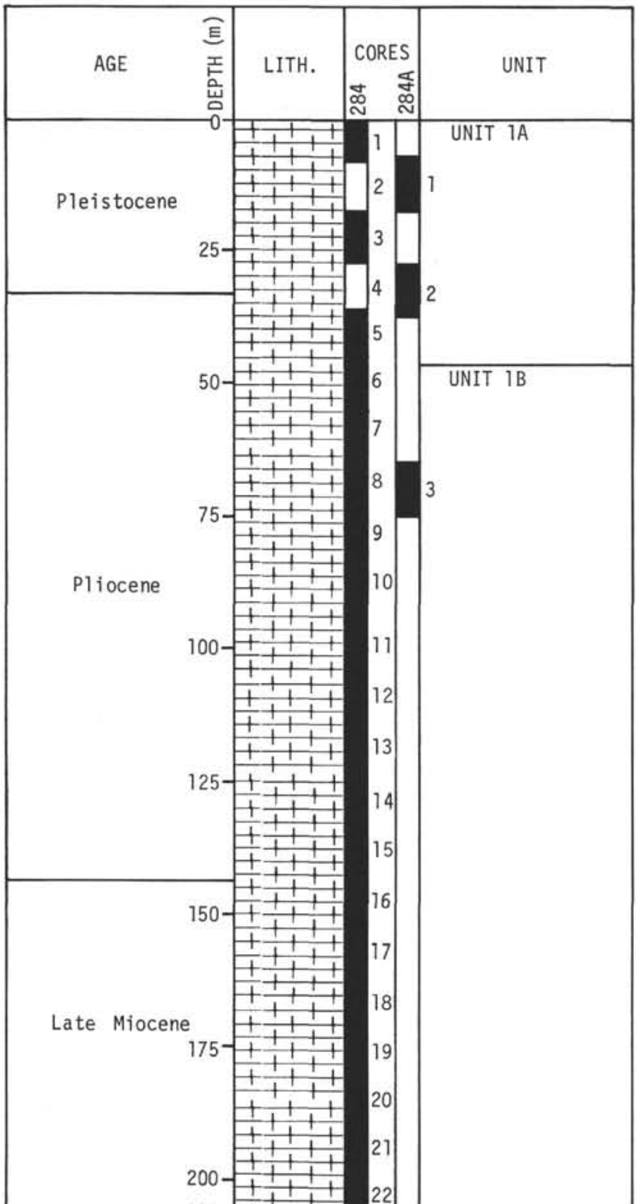

Figure 5. *Lithologic sequence at Site 284.*

the flow-through values. Alkalinity values in the sediments are all higher than the surface seawater reference value. Cores 1 and 22 have the lowest values. Salinity values are all lower than the surface seawater reference, and are all very close to the average 34.4°/oo.

BIOSTRATIGRAPHY

This highly biogenic latest Pleistocene to late Miocene sequence yielded common planktonic foraminifera and very abundant calcareous nannofossils throughout. Diversity is high for its mid-latitude position, and as might be expected in an upper bathyal sequence, the planktonic foraminifera show no indication of dissolution. A marked decrease in the preservation quality of the calcareous nannofossils near the base of the sequence recovered is attributed to incipient diagenesis. Obvious fluctuations in the climatic conditions prevailing near this site are indicated by both the planktonic foraminifera and the calcareous nannofossils. No siliceous microfossils were observed.

The late Pleistocene-early Pleistocene boundary, from the calcareous nannofossils, occurs between Samples 284A-1-2, 47 cm, and 284A-1-5, 43 cm. The Pleistocene-Pliocene boundary, from the planktonic foraminifera occurs between Samples 284A-2-3, 100 cm, and 284A-2-4, 20 cm. The last appearance of *Discoaster brouweri*, which is often taken as marking the Pleistocene-Pliocene boundary, occurs in Sample 284-5-5, 10 cm, 9 meters below the foraminiferal position. The late Pliocene-early Pliocene boundary, by the calcareous nannofossils, occurs between Samples 284-8, CC, and 284-9-1, 10 cm.

Foraminifera

A well-preserved late Miocene to Pleistocene sequence of planktonic foraminifera was obtained. Five zones were identified (Table 3). There is no evidence of solution at this relatively shallow water site, and even a few specimens of *Hastigerina pelagica*, very susceptible to solution, were recovered. The foraminiferal sequence records fluctuations in paleotemperatures, with left- and right-coiling populations of *Globorotalia (T.) pachyderma.*

Globorotalia (G.) truncatulinoides Zone

The faunas from the zone yielded relatively cool-water subtropical assemblages consisting of middle-high

TABLE 2
Shipboard Geochemical Data, Site 284

Core	Section	Sample Interval Top (m)	Sample Interval Avg. (m)	pH Punch-in	pH Flow-thru	Alkalinity (meq/kg)	Salinity (°/oo)	Lithologic Subunit
Surface Seawater Reference				8.08	8.09	2.49	35.2	
1	3	0.0	3.95	7.30	7.39	3.42	34.4	1A
6	4	46.5	54.53	7.23	7.34	3.91	34.4	1B
11	6	94.0	102.03	7.23	7.28	4.01	34.4	1B
16	6	141.5	149.53	7.24	7.29	4.01	34.4	1B
21	6	189.0	197.03	7.24	7.26	3.71	34.4	1B
22	0	198.5	198.95	7.18	7.31	3.32	34.6	1B
Average				7.24	7.31	3.73	34.4	

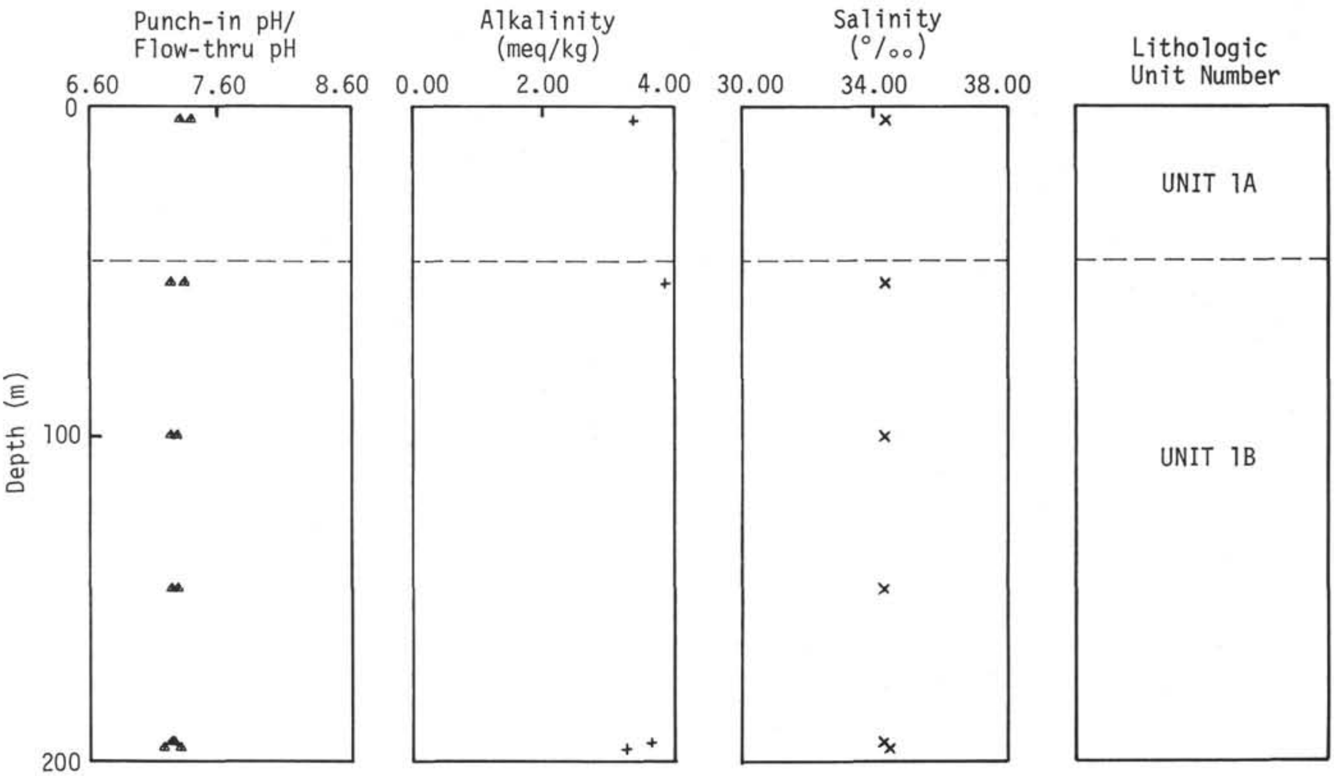

Figure 6. *Shipboard geochemical data versus depth, Site 284.*

TABLE 3
Planktonic Foraminiferal Zones, Site 284

International Unit	Planktonic Foraminiferal Zones	Taxa Used to Delimit Zones
Pleistocene	*Globorotalia (G.) truncatulinoides*	
		I.A. *G. (G.) truncatulinoides*
Pliocene	*Globorotalia (T.) inflata*	
		I.A. *G. (T.) inflata*
	Globorotalia (T.) puncticulata	
		E. *Globorotalia (G.) conomiozea*
	Globorotalia (G.) conomiozea	
Upper Miocene		I.A. *G. (G.) conomiozea*
	Globorotalia (T.) miotumida miotumida	

Note: I.A. = initial appearance; E. = extinction.

latitude taxa intermixed with a few warm-water specimens of *Globigerinella aequilateralis*, *Globigerinoides ruber*, and *Sphaeroidinella dehiscens*. Diversity is fairly high and preservation good. The zonal boundary between the *G.* (*G.*) *truncatulinoides* and *G.* (*T.*) *inflata* zones has been placed between Samples 284A-2-3, 100 cm, and 284A-2-4, 20 cm.

Globorotalia (T.) inflata Zone

Globorotalia (*T.*) *tosaensis*, ancestor of *G.* (*G.*) *truncatulinoides*, was not found in the upper part of the zone, therefore the latter taxon appears to be cryptogenic in this region. Warmer water taxa are mainly rare with a few specimens of *Globigerinella aequilateralis*, *Globigerinoides ruber*, *Globoquadrina altispira*, and *Hastigerina pelagica*. Diversity is fairly high and preservation good. The zonal boundary between the *G.* (*T.*) *inflata* and *G.* (*T.*) *puncticulata* zones has been placed between Samples 284-9-6, 100 cm, and 284-9, CC.

Globorotalia (T.) puncticulata Zone

A fairly distinctive fauna is found in the zone dominated by the zone fossil and with only *Globorotalia*

(*G.*) cf. *miotumida* representing the keeled *Globorotalia*. A few warmer water specimens of *Globigerinella aequilateralis*, *Globigerinoides obliquus*, and *Hastigerina pelagica* were found. Diversity is moderate and preservation good. The zonal boundary between the *G.* (*T.*) *puncticulata* and the *G.* (*G.*) *conomiozea* zones has been placed between Samples 284-12, CC, and 284-13-1, 110 cm.

Globorotalia (G.) conomiozea Zone

A number of keeled *Globorotalia* are present in the zone including *G.* (*G.*) *explicationis* previously only found in New Zealand and Morocco. Only a few warm water taxa were found in the upper part of the zone, including *Globigerina* cf. *nepenthes*, *Globigerinoides* cf. *obliquus*, and *Globoquadrina altispira*. Diversity is moderate and preservation good. The zonal boundary between the *G.* (*G.*) *conomiozea* and the *G.* (*G.*) *miotumida miotumida* zones has been placed between Samples 284-17-6, 20 cm, and 284-17, CC. The Miocene-Pliocene boundary is placed at the first appearance of *G. puncticulata* which occurs in 284-15, CC.

Globorotalia (G.) miotumida miotumida Zone

Keeled *Globorotalia* are fairly well developed in the zone with good numbers of the zone fossil and *G.* (*G.*) *miozea conoidea*. A few specimens of the warmer water taxa *Globigerinella aequilateralis*, *Globigerinoides trilobus*, and *Hastigerina pelagica* are present. Diversity is moderate and preservation good.

Calcareous Nannofossils

This upper bathyal sequence contains very abundant, moderately well preserved, and relatively diverse nannofloras which indicate the presence of a thick and apparently continuous latest Pleistocene to mid late Miocene succession. The Pleistocene to latest early Pliocene nannofloras of this site can be readily subdivided into relatively small biostratigraphic units. The underlying early Pliocene and late Miocene cannot be as finely subdivided. The biostratigraphy of this site more closely resembles that utilized for the southern DSDP Leg 21 sites, than that used for the other Leg 29 sites because of the site's geographically intermediate position.

The consistent common occurrence throughout this sequence of both the cool-water preferring *Coccolithus pelagicus* and the climatically tolerant *Cyclococcolithina leptopora*, *Helicopontosphaera kamptneri*, *Rhabdosphaera claviger*, and *Syracosphaera hystrica*, clearly indicates that deposition was associated with either a cool subtropical or mid subtropical surface climate. Furthermore, the distribution and variations in the abundance of warm-water preferring taxa such as members of *Ceratolithus*, *Discoaster*, *Pontosphaera*, *Scaptolithus*, *Scyphosphaera*, *Sphenolithus*, and *Triquetrorhabdulus* suggest that late Miocene and early Pliocene deposition was associated with a more or less mid subtropical climate, whereas the late Pliocene and Pleistocene was from a cool subtropical climate. For example Sample 284-9, CC (latest early Pliocene) contains both the highest occurrence of *Ceratolithus* and the highest common occurrence of *Sphenolithus*; Sample 284A-3, CC (basal late Pliocene) the highest common *Scyphosphaera*; Sample 284-6-4 ("mid" late Pliocene) both the highest common occurrence of *Discoaster* and the highest occurrences of *D. pentaradiatus* and *D. surculus*; and Sample 284-3-2 ("mid" Pleistocene) the highest occurrence of common *Pontosphaera*. This pattern may well have resulted from relatively minor paleocirculation changes, a consequence of the changing paleogeography of the New Zealand landmass. Compare Stanton (1969, fig. 10) with Fleming (1962, figs. 10, 11). Present day summer surface temperatures at this site range from about 15°-21° C according to Nasu and Morita (1973). Winnowing of the nannofloras was only very sporadically observed.

The late Pleistocene *Coccolithus pelagicus* Zone includes all of Core 284-1 and extends down to within the 284A-1-3 to 284A-1-4 interval. The mid-early Pleistocene *Pseudoemiliania lacunosa* Zone occurs between Sections 284A-1-5, and 284-5-4. *Gephyrocapsa oceanica* has its lowest occurrence within this zone at Section 284-3-1.

The latest Pliocene *Discoaster brouweri* Zone occurs between Sections 284-5-5, and 284-6-3. *D. brouweri* is rare, but no other discoasters were observed, so its presence is unlikely to be due to reworking. Definite *Cyclococcolithina macintyrei* occurs throughout this and the underlying sediments. The late Pliocene *Discoaster surculus* Zone occurs between Sections 284-6-4 and 284-8, CC. *D. pentaradiatus*, *D. surculus* and *D.* sp. have their highest appearances at the top of this zone.

The latest early Pliocene part of the *Reticulofenestra pseudoumbilica* Zone occurs between Sections 284-9-1 and 284-9-5. It represents the overlap of rare *Pseudoemiliania lacunosa* with upward decreasing numbers of *Reticulofenestra pseudoumbilica*. *Sphenolithus* has its highest unreworked occurrence (rare) within the upper part of this interval. The very large undifferentiated early Pliocene to late Miocene part of the *R. pseudoumbilica* Zone occurs between Sections 284-9-6 and 284-21, CC. It represents the interval between the first appearance of *Pseudoemiliania lacunosa* and the last occurrence of *Triquetrorhabdulus rugosus*. The upper part of this interval is almost certainly early Pliocene in age for the last appearance of *Ceratolithus tricorniculatus* occurs about Section 284-11-2, and rare *Discoaster asymmetricus* occurs in the 284-13-4 to 284-14-1 interval. Further study may result in the basal Pliocene key species *Ceratolithus amplificus* being recognized within this interval. However, so far this taxon has not been recognized south of the marginally tropical Leg 21 Site 208 where it has its base at Sample 208-10-5, 30 cm. Because the sequential positions of the base *G. puncticulata* and top *G. conomiozea* events are different at Site 284, it is not yet possible to extrapolate the Site 284 horizon which is equivalent to the first appearance of *C. amplificus* in Site 208.

The late Miocene part of the *Reticulofenestra pseudoumbilica* Zone occurs between the top and the base of Core 284-22, the lowest core taken at this site. The nannofloras of this interval differ from those of the overlying intervals in containing very rare *Triquetrorhabdulus rugosus*. The late Miocene age inferred for this interval is supported by the presence of very rare

Ceratolithus, which has its base within the late Miocene, and the absence, except for extremely rare and sporadic specimens attributed to reworking, of the pre-late mid Miocene key species *Cyclicargolithus neogammation*.

Siliceous Microfossils

The samples from the site are barren of diatoms and other siliceous microfossils: silicoflagellates, sponge spicules.

SEDIMENTATION RATES

Sedimentation rates within the early Pleistocene to late Miocene sequence at Site 284 are based on three biostratigraphic horizons that could be correlated with the paleomagnetically dated New Zealand sequence. The surfaces defined by the lowest occurrences of *Globorotalia conomiozea* and *G. puncticulata* are paleomagnetically dated in New Zealand at 4.7 m.y. and 4.3 m.y., respectively (Kennett and Watkins, in press). The age of the surface defined by the lowest occurrence of *G. truncatulinoides* is taken to be 1.8 m.y. (Berggren, in preparation). These three horizons fall near a straight line on an age versus depth plot (Figure 7). Thus the net sedimentation rate was probably constant at 4.7 cm/1000 yr in the late Miocene to early Pleistocene. A minor unconformity separates the early and late Pleistocene sediments (Figure 5).

Site 284 represents a sequence of nannofossil oozes that show relatively uniform, slow rates of sediment deposition throughout the sequence with only one minor apparent break in sedimentation. Increased bottom water in the region during the middle Pleistocene has removed that part of the sequence. The nannofossil ooze being deposited at the present time may well have a precompaction rate close to that of the older sediments.

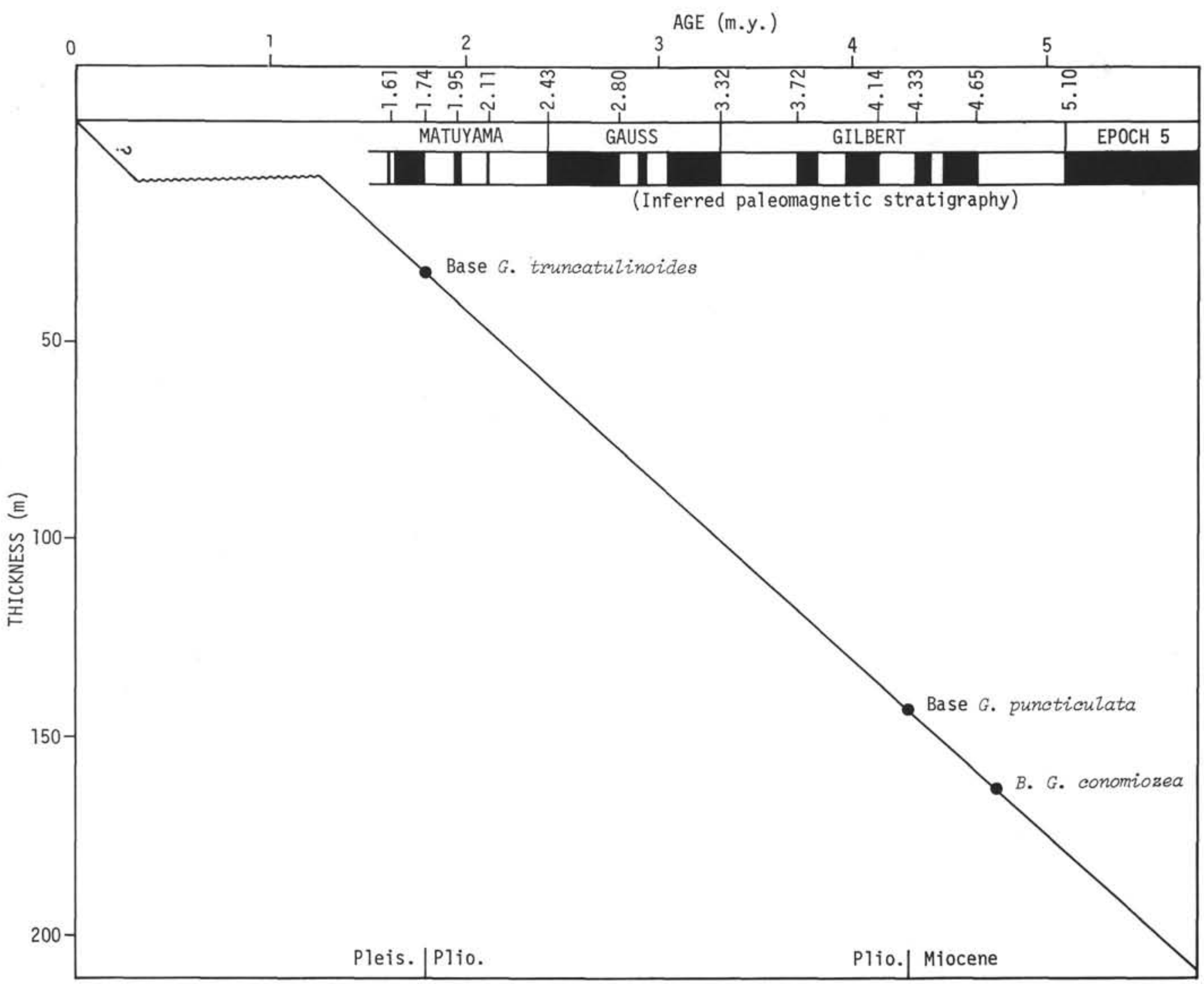

Figure 7. *Sedimentation rate curve at Site 284.*

SUMMARY AND CONCLUSIONS

Site 284 located in shallow water (1066 m) on the Challenger Plateau was continuously cored to a depth of 208 meters to obtain a late Cenozoic biostratigraphic and paleoclimatic sequence. The sequence consists of nannofossil ooze and foraminiferal ooze of late Miocene to latest Pleistocene age. The sequence has been divided into two subunits on the basis of slight color differences.

Except for a minor disconformity in the middle Pleistocene, sedimentation was continuous throughout and at the rate of 4.7 cm/1000 years. This is moderately rapid for this type of sediment. There is essentially no detrital influence, and no ice-rafted quartz grains have been observed. This indicates that the northern limit of icebergs has been south of this site during the late Cenozoic.

Common well preserved planktonic foraminiferal faunas and very abundant calcareous nannofossils of varying preservation occur throughout, providing useful biostratigraphic information. Obvious paleo-oceanographic fluctuations over the site are indicated by both the planktonic foraminifera and the calcareous nannofossils. See Kennett and Vella (Chapter 19, this volume), and Shackleton and Kennett (Chapter 20, this volume).

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APPENDIX A
Summary of X-Ray[a], Grain Size, and Carbon-carbonate Results, Site 284

				X-Ray									Classification			Carbon Carbonate				
				Bulk Sample Major Constituent			2-20μ Fraction Major Constituent			<2μ Fraction Major Constituent										
Section	Sample Depth Below Sea Floor (m)	Lithology	Age	1	2	3	1	2	3	1	2	3	Sand (%)	Silt (%)	Clay (%)	Classification	Total (%)	Org. (%)	$CaCO_3$ (%)	Comments
284-1-2	2.7	**Unit 1A**	Pleistocene	Calc.	Mica	Plag.	Mica	Plag.	Quar.	Mica	Quar.	Plag.	23.3	30.6	46.2	Sand-silt-clay	10.5	0.1	87	Amph in 2-20μ
284-3-2	20.2-20.3	Foram/1		Calc.	Mica	Quar.	Mica	Quar.	Plag.	Mica	Quar.	Plag.	39.9	34.0	26.1	Sand-silt-clay	10.5	0.1	87	Kaol in <2μ
284A-2-2	29.6-29.7	Nannofossil		Calc	Mica	Quar.	Mica	Plag.	Quar.	Mica	Plag.	Quar.	18.7	26.3	55.0	Silty clay	10.2	0.2	84	K-Fe in 2-20 & <2μ; Kaol in <2μ
284-5-3	40.7-41.0	Ooze		Calc.	Mica	Quar.	Mica	Plag.	Quar.	Mica	Plag.	Quar.	19.2	34.6	46.2	Silty clay	10.4	0.1	86	K-Fe and Kaol in <2μ
284-6-2	48.6	**Unit 1B**	Late	Calc.	Mica	Quar.	Mica	Plag.	Quar.	Mica	Plag.	Quar.	15.1	36.1	48.9	Silty clay	10.6	0.1	88	
284-7-2	58.1	Foram/1	Miocene	Calc.	Mica	Quar.	Quar.	Mica	Plag.	Mica	Quar.	Plag.	15.1	27.9	56.9	Silty clay	10.8	0.1	89	Pyri in 2-20μ
284-9-2	77.2	Nannofossil	to	Calc.	Mica	Quar.	Quar.	Plag.	Mica	Mica	Quar.	Plag.	15.4	24.8	58.9	Silty clay	10.9	0.1	90	Pyri in 2-20μ
284-10-2	86.6	Ooze	late	Calc.	Quar.	–	Quar.	Plag.	Mica	Mica	Quar.	Plag.	8.6	25.5	65.9	Silty clay	11.0	0.1	91	Pyri in 2-20μ; Gyps in <2μ
284-11-2	96.1-96.2		Pliocene	Calc.	Quar.	–	Quar.	Plag.	Mica	Mica	Quar.	Plag.	7.7	23.0	69.4	Silty clay	11.4	0.1	94	Pyri in 2-20μ; Gyps in <2μ
284-12-3	107.1-107.2			Calc.	Quar.	–	Quar.	Plag.	Mica	Mica	Quar.	Plag.	8.7	29.5	61.8	Silty clay	11.4	0.0	94	Pyri in 2-20μ; Gyps in <2μ
284-13-3	116.5-116.6			Calc.	Quar.	–	Quar.	Mica	Plag.	Mica	Quar.	Plag.	8.6	25.7	65.7	Silty clay	11.3	0.0	94	Pyri in 2-20μ; Gyps in <2μ
284-14-2	124.6-124.7			Calc.	–	–	Quar.	Plag.	Mica	Mica	*	Kaol.	6.9	25.9	67.2	Silty clay	11.6	0.1	96	*Quar, Plag. equal in abund. Gyps in <2μ
284-16-2	143.7			Calc.	Quar.	–	Mica	Quar.	Plag.	Mica	Quar.	Plag.	5.5	24.0	70.6	Silty clay	11.3	0.1	94	Kaol in 2-20μ; Gyps in <2μ; Pyri in <2μ
284-17-2	153.2			Calc.	–	–	Quar.	Plag.	Mica	*	*	*	7.9	31.6	60.4	Silty clay	11.4	0.0	95	Pyri in 2-20μ; *No results available
284-19-2	171.9			Calc.	Quar.	–	Mica	Quar.	Plag.	Mica	Quar.	Plag.	6.0	38.9	55.1	Silty clay	11.3	0.0	94	Pyri in 2-20μ, <2μ; Gyps in <2μ
284-21-2	191.1			Calc.	–	–	–	–	–	Mica	Quar.	Plag.	3.4	31.5	65.0	Silty clay	11.5	0.0	95	Pyri in <2μ; Gyps in <2μ; *No results avail.
284-26-6	206.6			Calc.	–	–	Quar.	Plag.	Mica	Mica	Quar.	Plag.	3.4	28.4	68.2	Silty clay	0.2	0.0	2	Clin in 2-20μ

[a]Complete X-ray results – Site 284 will be found in Appendix I, Tables 13 and 14.

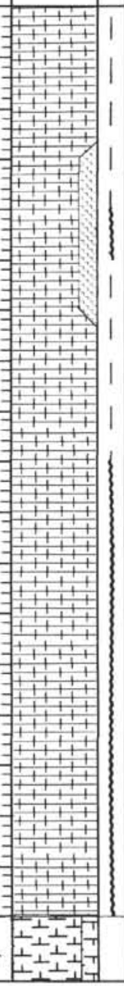
[b]Unusual mica peak intensities throughout hole. Peak at 4.98A is 1.4 × usual deep sea intensity as compared to 9.93A intensity peak. Peak not normally present at 3.31A is equal (approx.) in intensity to 9.93A peak.

Site 284 Hole Core 1 Cored Interval: 0.0-8.5 m

AGE: LATE PLEISTOCENE

ZONE: G. (G.) truncatulinoides / C. pelagicus

Section	Meters	Fossil	Abund.	Pres.	Litho. Sample
1	0.5, 1.0	N	A	M	
		N	A	M	
		N	A	M	130
2		N	A	M	
		N	A	M	
		N	A	M	111
3		N	A	M	
		N	A	M	
		N	A	M	
4		N	A	M	
		N	A	M	
		N	A	M	
5		N	A	M	
		N	A	M	
		N	A	M	
6		N	A	M	30
		N	A	M	
		N	A	M	
Core Catcher		F D S R N	A A	G M	CC



LITHOLOGIC DESCRIPTION

Core contains variations of NANNO FORAM OOZE, i.e. a foram-rich nanno ooze, and nanno-rich foram ooze; ostracods generally 5% to a high of 20% at Sec. 2 (111 cm); core is soft, with Mn stains and streaks and color variations that include: very light gray (N7, N8), grayish yellow green (5GY 7/2), bluish white (5B 9/1), light greenish gray (5GY 8/1), yellowish gray (5Y 8/1) and pinkish gray (5YR 8/1).

SS 1-130		SS 2-111		SS 6-30		SS CC	
N	-30%	OST	-20%	F	- 8%	F	-15%
OST	- 5%	F	-35%	OST	- 5%	N	-85%
F	-65%	N	-45%	N	-87%		
		G	-TR				
		Op	-TR				

X-ray 2-119 (Bulk)
Calc - M
Quar - TR
Plag - TR
Mica - P

Grain Size 2-117 (23.2, 30.6, 46.2)

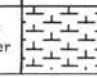
Carbon Carbonate 2-115 (10.5, 0.1, 87)

Site 284 Hole Core 2 Cored Interval: 8.5-19.0 m

AGE: LATE PLEISTOCENE

ZONE: G. (G.) truncatulinoides / P. lacunosa

Section	Fossil	Abund.	Pres.
Core Catcher	F D S R N	A A	G M



LITHOLOGIC DESCRIPTION

Core catcher only, a FORAM-BEARING NANNO OOZE, very light gray (N8).

SS CC	
F	- 8%
N	-92%
Ech	-TR

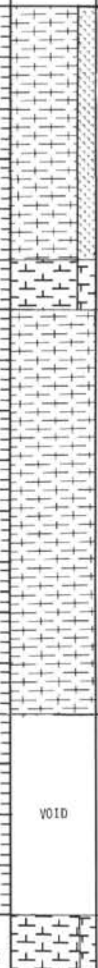
Explanatory notes in Chapter 1

Site 284 Hole Core 3 Cored Interval: 18.0-27.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION
LATE PLEISTOCENE		N	A	M	1
		N	A	M	1
		N	A	M	1
		N	A	M	2
		N	A	M	2
		N	A	M	2
		N	A	M	3
		N	A	M	3
		N	A	M	3
EARLY PLEISTOCENE	G. (G.) truncatulinoides / P. lacunosa	N	A	M	4
		N	A	M	5
		N	A	M	5
		N	A	M	5
					6
		F	A	G	Core Catcher
		D S R N	A	M	Core Catcher

METERS: 0.5, 1.0

LITHOLOGY:



LITHO. SAMPLE: 131, CC

LITHOLOGIC DESCRIPTION

FORAM BEARING-RICH TO FORAM NANNO OOZE light gray (N7) to very light gray (N8) with zones of OSTRACOD BEARING TO RICH FORAM NANNO OOZE. Core is soft with color banding of: light olive gray (5Y 6/2), light bluish gray (5B 7/1), light olive gray (5Y 6/1), bluish white (5B 9/1), yellowish gray (5Y 8/1), light gray (7.5YR 7/0) to (N7) and light gray (N7) swirled with olive gray (5Y 6/3). Some Mn streaks occur throughout.

SS 131		SS CC	
OST	-20%	F	-10%
F	-35%	N	-85%
N	-45%	OST	- 3%
HM	-TR	Q	-TR
Ech	-TR	Mi	-TR
		HM	-TR

X-ray 2-76 (Bulk)
Calc - M
Quar - TR
Plag - TR
Mica - P

Grain Size 2-73 (39.9, 34.0, 26.1)

Carbon Carbonate 2-72 (10.5, 0.1, 87)

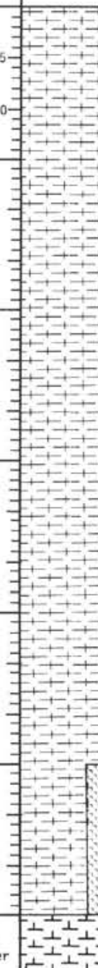
Core 4 Cored Interval: 27.5-37.0 m NO RECOVERY

Site 284 Hole Core 5 Cored Interval: 37.0-46.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION
LATE PLIOCENE		N	A	M	1
		N	A	M	1
		N	A	M	1
		N	A	M	2
		N	A	M	2
		N	A	M	2
	G. (T.) inflata	N	A	M	3
		N	A	M	3
		N	A	P	3
	D. brouweri	N	A	M	4
		N	A	M	4
		N	A	G	4
	P. lacunosa	N	A	M	5
		N	A	M	5
		N	A	M	5
		N	A	M	6
		N	A	M	6
		N	A	M	6
		F	A	G	6
		D B R N	A	M	Core Catcher

METERS: 0.5, 1.0

LITHOLOGY:



LITHO. SAMPLE: 80, 60, CC

LITHOLOGIC DESCRIPTION

Core is a light gray (N7) FORAM NANNO OOZE, soft with Mn streaks. Other colors noted are: bluish white (5B 9/1), greenish gray (5GY 6/1) light bluish white (5B 7/1) (with olive gray swirled deformation) and light bluish gray (5B 7/1). Other lithologies include OSTRACOD-RICH FORAM NANNO OOZE (SS 6-60) and a FORAM BEARING NANNO OOZE in the core catcher.

SS 1-80		SS 6-60		SS CC	
OST	- 5%	OST	-20%	OST	- 2%
F	-40%	F	-35%	F	- 5%
N	-55%	N	-45%	N	-92%
M	-TR	OP	-TR	Py	-TR
S	-TR	M	-TR	M	-TR
Ech	-TR			DE	-TR

X-ray 3-95 (Bulk)
Calc - M
Quar - TR
Plag - TR
Mica - TR

Grain Size 3-68 (19.2, 34.6, 46.2)

Carbon Carbonate 3-66 (10.4, 0.1, 86)

Explanatory notes in Chapter 1

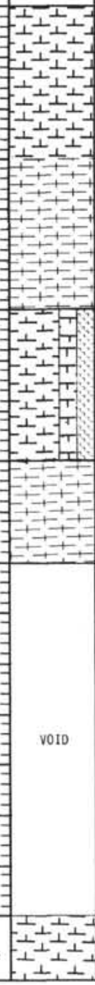
Site 284 Hole Core 6 Cored Interval: 46.5-56.0 m

AGE: LATE PLIOCENE

ZONE: G. (T.) inflata; D. brouweri | D. surculus

FOSSIL	ABUND.	PRES.
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	G
N	A	M
N	A	M
N	A	M
N	A	M
F	A	MG
D S R N	A	M

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher — METERS: 0.5, 1.0



LITHO. SAMPLE: 100, 141, CC

LITHOLOGIC DESCRIPTION

Core is basically a FORAM-BEARING NANNO OOZE, light gray (N7) soft, with slight Mn dark streaks, mottles and bluish white (5B 9/1) colors. A FORAM-NANNO OOZE becomes dominant in Secs. 2 and 4. In Sec. 3 (141 cm) it is ostracod-rich. Other colors noted include: greenish gray (5GY 6/1) (with deformation swirling), light gray (N7) with greenish gray (5GY 6/1) mottles and slightly stiff-bluish white (5B 9/1) to (N7).

SS 2-100		SS 3-141		SS CC	
F	-50%	OST	-25%	F	- 5%
N	-50%	F	-25%	N	-92%
		N	-50%	Di	- 2%
		Mi	-TR	OST	-TR
		HM	-TR		
		OP	-TR		

X-ray 2-63 (Bulk)
Calc - M
Quar - TR
Plag - TR
Mica - TR

Grain Size 2-61 (15.1, 36.1, 48.9)

Carbon Carbonate 2-59 (10.6, 0.1, 88)

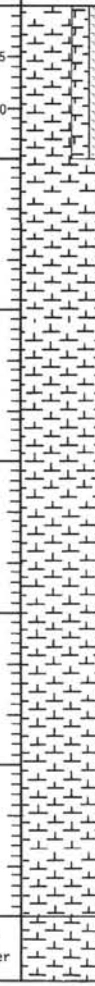
Site 284 Hole Core 7 Cored Interval: 56.0-65.5 m

AGE: LATE PLIOCENE

ZONE: G. (T.) inflata; D. surculus

FOSSIL	ABUND.	PRES.
N	A	M
N	A	M
N	A	M
N	A	M
N	A	G
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
N	A	M
F	A	MG
D S R N	A	M

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher — METERS: 0.5, 1.0



LITHO. SAMPLE: 44, CC

LITHOLOGIC DESCRIPTION

Core is basically a MICRONODULE BEARING, FORAM, OSTRACOD-RICH NANNO OOZE light gray (N7) to bluish white (5B 9/1) in color with Mn streaks and mottles. Generally soft. Sec. 2 has fewer micronodules and is a FORAM AND OSTRACOD-BEARING NANNO OOZE.

SS 1-44		SS CC	
MicroN	- 3%	F	- 8%
F	-20%	OST	- 8%
OST	-25%	N	-83%
N	-52%	DE	-TR
Di	-TR		
Mi	-TR		

X-ray 2-61 (Bulk)
Calc - M
Quar - TR
Mica - TR

Grain Size 2-59 (15.1, 27.9, 56.9)

Carbon Carbonate 2-57 (10.8, 0.1, 89)

Explanatory notes in Chapter 1

Site 284 Hole Core 8 Cored Interval: 65.5-75.0 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE PLIOCENE	G. (T.) inflata / D. surculus	F	A	MG	Core Catcher					No recovery except for core catcher which contains a OSTRACOD FRAGMENT-RICH FORAM NANNO OOZE.
		D S R N	A	M						

SS CC
OST -15%
F -35%
N -50%
G -TR
OP -TR

Site 284 Hole Core 9 Cored Interval: 75.0-84.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY PLIOCENE	G. (T.) inflata / R. pseudoumbilica	N	A	M	1				90	FORAM NANNO OOZE, bluish white (5B 9/1), soft with some Mn mottles, streaks, and pyrite burrows appear. The core gets slightly stiffer in Sec. 6. The core catcher is a FORAM AND OSTRACOD-BEARING NANNO OOZE.
		N	A	P		0.5				
		N	A	P		1.0				
		N	A	M	2					
		N	A	M						
		N	A	M						
		N	A	M	3					
		N	A	M						
		N	A	M						
		N	A	M	4					
		N	A	M						
		N	A	M						
		N	A	M	5					
		N	A	M						
		N	A	M						
	G. (T.) puncticulata	N	A	P	6					
		N	A	M						
		F	A	MG						
		N	A	M						
		F	A	MG						
		D S R N	A	M	Core Catcher				CC	

SS 1-90
F -35%
N -65%
Di -TR
OP -TR

SS CC
F - 7%
OST - 5%
N -87%
Mi -TR

X-ray 2-70 (Bulk)
Calc - M
Quar - TR
Mica - TR

Grain Size 2-68 (15.4, 24.8, 59.8)

Carbon Carbonate 2-66 (10.9, 0.1, 90)

Explanatory notes in Chapter 1

Site 284 Hole Core 10 Cored Interval: 84.5-94.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (T.) puncticulata / R. pseudoumbilica	N	A	M	1	0.5, 1.0	VOID		
		N	A	M	2				
		N	A	M	3				
		N	A	M	4				
		N	A	M	5				
		N	A	M	6		VOID		
		F	A	MG					
		D							
		S							
		R							
		N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

Bluish white (5B 9/1) FORAM-RICH NANNO OOZE. Core is very soft with Mn specks, burrows, mottles, and traces of pyrite. The core catcher contains a OSTRACOD RICH FORAM/NANNO OOZE.

SS CC
OST -20%
F -30%
N -50%
OP -TR

X-ray 2-64 (Bulk)
Calc - M
Quar - TR

Grain Size 2-59 (8.6, 25.5, 65.9)

Carbon Carbonate 2-58 (11.0, 0.1, 91)

Site 284 Hole Core 11 Cored Interval: 94.0-103.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (T.) puncticulata / R. pseudoumbilica	N	A	P	1	0.5, 1.0			
		N	A	M	2				
		N	A	M	3				
		N	A	M	4				
		N	A	M	5				
		N	A	M	6				
		F	A	MG					
		D							
		S							
		R							
		N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

The core is a FORAM/NANNO OOZE bluish white (5B 9/1) in color, a few dark spots of Mn. The core becomes white (2.5Y 8/0) in Sec. 4 with a few Mn streaks. The lithology changes to a FORAM-BEARING NANNO OOZE in the core catcher.

SS CC
F - 5%
N -95%

X-ray 2-67 (Bulk)
Calc - M
Quar - TR

Grain Size 2-65 (7.7, 23.0, 69.4)

Carbon Carbonate 2-64 (11.4, 0.1, 94)

Explanatory notes in Chapter 1

Site 284 Hole Core 12 Cored Interval: 103.5-113.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (T.) puncticulata R. pseudoumbilica	N	A	M	1	0.5 1.0			
		N	A	M	2				
		N	A	M	3				
		N	A	M	4				
		N	A	M	5				
		N	A	M	6				
		F	A	MG					
		D S R N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

OSTRACOD-BEARING FORAM/NANNO OOZE bluish white (5B 9/1). Core is soft with intense deformation. The core catcher contains a FORAM AND OSTRACOD-BEARING NANNO OOZE.

SS CC
F - 5%
OST - 5%
N -90%

X-ray 3-67 (Bulk)
Calc - M
Quar - TR

Grain Size 3-55 (8.7, 29.5, 61.8)

Carbon Carbonate 3-63 (11.4, 0.0, 94)

Site 284 Hole Core 13 Cored Interval: 113.0-122.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (G.) midzea conomiozea R. pseudoumbilica	F	M	MG	1	0.5 1.0			
		N	A	M	2				
		N	A	M	3				
		N	A	P	4				
		N	A	M	5				
		N	A	M	6				
		F	M	AG					
		D S R N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

FORAM AND OSTRACOD-BEARING NANNO OOZE, soft with a bluish white (5B 9/1) color and a few dark streaks.

SS CC
F - 4%
OST - 2%
N -94%

X-ray 3-57 (Bulk)
Calc - M
Quar - TR

Grain Size 3-55 (8.6, 25.7, 65.7)

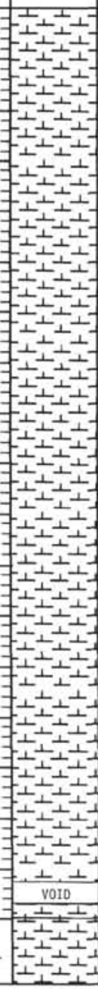
Carbon Carbonate 3-54 (11.3, 0.0, 94)

Explanatory notes in Chapter 1

Site 284 Hole Core 14 Cored Interval: 122.5-132.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (G.) miozea conomiozea / R. pseudoumbilica	N	A	M	1	0.5, 1.0		
		N	A	M	2			
		N	A	M	3			
		N	A	M	4			
		N	A	M	5			
		N	A	M	6			
		F	M	AG				
		D S R N	A	P	Core Catcher			CC

LITHOLOGY



LITHOLOGIC DESCRIPTION

Core is soft, FORAM AND OSTRACOD-BEARING NANNO OOZE, bluish white (5B 9/1) in color with a small amount of dark streaks which increase in Sec. 4. Secs. 4 and 5 show more dark streaking, burrowing, mottling and faint laminations to distinct dark, thin, curved laminations. There is no noticeable increase in opaques.

SS CC
F -10%
OST - 8%
N -82%

X-ray 2-65 (Bulk)
Calc - M

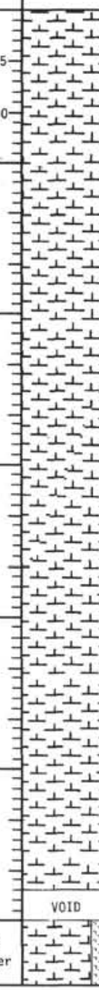
Grain Size 2-62 (6.9, 25.9, 67.2)

Carbon Carbonate 2-61 (11.6, 0.1, 96)

Site 284 Hole Core 15 Cored Interval: 132.0-141.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	DEFORMATION	LITHO. SAMPLE
EARLY PLIOCENE	G. (G.) miozea conomiozea / R. pseudoumbilica	N	A	M	1	0.5, 1.0		
		N	A	M	2			
		N	A	M	3			
		N	A	M	4			
		N	A	M	5			
		N	A	M	6			
		F	A	MG				
		D R S N	A	M	Core Catcher			CC

LITHOLOGY



LITHOLOGIC DESCRIPTION

Core is typically a FORAM AND OSTRACOD-BEARING NANNO OOZE, bluish white (5B 7/1) in color. There are some faint pyrite streaks, mottles and abundant dark stained burrows in Sec. 6. The core catcher is a FORAM-BEARING OSTRACOD-RICH NANNO OOZE.

SS CC
F -10%
OST -25%
N -65%

Explanatory notes in Chapter 1

Site 284 Hole Core 16 Cored Interval: 141.5-151.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE MIOCENE	G. (G.) miozea conomiozea / R. pseudoumbilica	N	A	M	1	0.5, 1.0		O	
		N	A	M	2				
		N	A	M	3				
		N	A	M	4				
		N	A	P	5				
		N	A	P	6		VOID		
		F	A	MG					
		F D S R N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

FORAM AND OSTRACOD-BEARING NANNO OOZE, soft, and bluish white (5B 9/1) in color. There are Mn specks and laminations plus faint burrows and mottles of Mn and pyrite.

SS CC
F - 5%
OST - 5%
N -90%

X-ray 2-72 (Bulk)
Calc - M
Quar - TR

Grain Size 2-69 (5.5, 24.0, 70.6)

Carbon Carbonate 2-68 (11.3, 0.1, 94)

Site 284 Hole Core 17 Cored Interval: 151.0-160.5 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE MIOCENE	G. (G.) miozea conomiozea / R. pseudoumbilica	N	A	M	1	0.5, 1.0			
		N	A	P	2				
		N	A	M	3				
		N	A	M	4				
		N	A	M	5				
	G. (G.) miotumida miotumida	F	A	MG					
		N	A	M	6		VOID		
		F	A	MG					
		F D S R N	A	M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

Core is typically a FORAM AND OSTRACOD-BEARING NANNO OOZE, soft and bluish white (5B 9/1) in color with a small amount of pyrite streaks and stains. The core becomes slightly stiffer in Sec. 4 with Mn mottles and curved laminations in Sec. 6.

SS CC
F - 5%
OST - 4%
N -91%

X-ray 2-72 (Bulk)
Calc - M

Grain Size 2-69 (7.9, 31.6, 60.4)

Carbon Carbonate 2-68 (11.4, 0.0, 95)

Explanatory notes in Chapter 1

Site 284 Hole Core 18 Cored Interval: 160.5-170.0 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	G. (G.) miotumida miotumida / R. pseudoumbilica				1	0.5, 1.0				FORAM AND OSTRACOD BEARING NANNO OOZE, bluish white (5B 9/1) with very few Mn and dark streaks, except Sec. 4 which shows an increase in dark streaks and mottles. Sec. 6 shows an increase in wavy lamination of dark material. The core catcher is a FORAM AND OSTRACOD RICH NANNO OOZE.
		N	A	M	2					SS CC: F -10%; OST -15%; N -75%; OP -TR
		N	A	M	3					
		N	A	M	4					
		N	A	M	5					
		N	A	P	6					
		F	A	MG						
		DSRN	A	M	Core Catcher				CC	

SS CC
F -10%
OST -15%
N -75%
OP -TR

Site 284 Hole Core 19 Cored Interval: 170.0-179.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	G. (G.) miotumida miotumida / R. pseudoumbilica	N	A	P	1	0.5, 1.0				FORAM/NANNO OOZE, bluish white (5B 9/1). There are swirled areas of Mn streaks and greenish gray (5GY 6/1) streaks. The core catcher is a FORAM AND OSTRACOD BEARING NANNO OOZE.
		N	A	P	2					
		N	A	P	3					
		N	A	P	4					
		N	A	M	5					
		N	A	P	6					
		F	A	MG						
		DSRN	A	M	Core Catcher				CC	

SS CC
F - 5%
OST - 3%
N -92%

X-ray 2-42 (Bulk)
Calc - M
Quar - TR

Grain Size 2-39 (6.0, 38.9, 55)

Carbon Carbonate 2-37 (11.3, 0.0, 94)

Explanatory notes in Chapter 1

Site 284 Hole Core 20 Cored Interval: 179.5-189.0 m

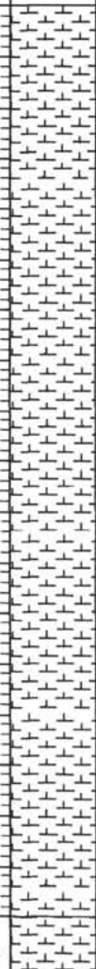
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	*G. (G.) miotumida miotumida* / *R. pseudoumbilica*	N	A	P	1	0.5, 1.0				Core is typically a FORAM AND OSTRACOD-BEARING NANNO OOZE, bluish white (5B 9/1), soft, only slight dark streaking increasing in Sec. 2. Sec. 6 shows wavy laminations of faint dark material. The core catcher is a FORAM BEARING NANNO OOZE. SS CC F - 3% N -96% M -TR Q -TR
		N	A	M	2					
		N	A	P	3					
		N	A	P	4					
		N	A	P	5					
		N	A	P	6					
		F	A	MG						
		D S R N	A	M	Core Catcher				CC	

Site 284 Hole Core 21 Cored Interval: 189.0-198.5 m

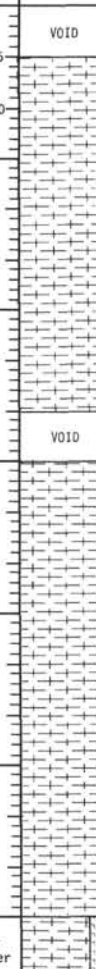
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	*G. (G.) miotumida miotumida* / *R. pseudoumbilica*	N	A	P	1	0.5, 1.0				FORAM-BEARING NANNO OOZE, bluish white (5B 9/1), soft, with no dark streaking except toward bottom of core. The core catcher is a OSTRACOD AND FORAM BEARING NANNO OOZE. SS CC OST -10% F -10% N -80% Mi -TR OP -TR X-ray 2-61 (Bulk) Calc - M Grain Size 2-58 (3.4, 31.5, 65.0) Carbon Carbonate 2-56 (11.5, 0.0, 95)
		N	A	P	2					
		N	A	P	3					
		N	A	P	4					
		N	A	P	5					
		N	A	P	6					
		F	A	MG						
		D S R N	A	M	Core Catcher				CC	

Explanatory notes in Chapter 1

Site 284 Hole Core 22 Cored Interval: 198.5-208.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	G. (G.) miotumida miotumida / R. pseudoumbilica	N	A	P	1	0.5, 1.0				FORAM-BEARING NANNO OOZE bluish white (5B 9/1), soft, with some Mn, pyrite and organic streaking. Secs. 4-6 show dark mottles and laminations. Core catcher lithology: NANNO OOZE.
		N	A	P	2					SS CC: F - 2%; N -98%; Mn -TR
		N	A	P	3					X-ray 6-62 (Bulk): Calc - M
		N	A	P	4					Grain Size 2-59 (3.4, 28.4, 68.2)
		N	A	P	5					Carbon Carbonate 6-58 (0.2, 0.0, 2)
		N	A	P	6					
		F	A	MG						
		FDSRN	A	M	Core Catcher				CC	

Site 284 Hole A Core 1 Cored Interval: 8.5-18.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY PLEISTOCENE	C. pelagicus	N	A	M	1	0.5, 1.0	VOID 			Core is typically a FORAM, NANNO OOZE, very light gray (N8) to light gray (N7) in color. Sec. 5 shows a light gray with light olive gray (5Y 6/1) deformation (swirling). The core catcher contains a OSTRACOD, FORAM, NANNO OOZE.
		N	A	M	2					SS CC: OST -30%; F -30%; N -40%; Ech -TR
					3		VOID			
					4					
		N	A	M	5					
	P. lacunosa	N	A	M	6					
		F	A	G						
		FDSRN	A	M	Core Catcher				CC	

Explanatory notes in Chapter 1

Site 284 Hole A Core 2 Cored Interval: 27.5-37.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION
EARLY PLEISTOCENE	G. (G.) truncatulinoides	N	A	M	1
		N	A	M	
		N	A	M	
		N	A	M	2
		N	A	M	
		N	A	M	
		N	A	M	3
		N	A	M	
		F	A	G	
	P. lacunosa	N	A	M	
LATE PLIOCENE	G. (T.) inflata	N	A	M	4
		F	A	G	
		N	A	M	
		N	A	M	
		N	A	M	5
		N	A	M	
		N	A	M	
					6
		F	A	G	
		D			
		R			Core Catcher
		S			
		N	A	M	

Meters: 0.5, 1.0

LITHOLOGY · DEFORMATION · LITHO. SAMPLE: CC

LITHOLOGIC DESCRIPTION

Core is a FORAM-RICH/FORAM-NANNO OOZE light gray (N7) in color. Other color variations occur and include: light gray (2.5Y 7/0) with a small amount of Mn and pyrite streaks in Sec. 2; olive green (5Y 6/4) (pale olive) with light gray (N7) in Sec. 3; swirled olive and gray with light gray (2.5Y 7/0) in Sec. 4; Mn burrows, light gray (N7) with light olive bands (5Y 6/1) in Secs. 4 and 5. The core catcher contains a FORAM AND OSTRACOD RICH NANNO OOZE.

SS CC
F -20%
OST -25%
N -35%
G -TR
OP -TR

X-ray 2-67 (Bulk)
Calc - M
Quar - TR
Plag - TR
Mica - TR

Grain Size 2-65 (18.7, 26.3, 55.0)

Carbon Carbonate 2-63 (10.2, 0.2, 84)

Site 284 Hole A Core 3 Cored Interval: 65.5-75.0 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION
LATE PLIOCENE	D. surculus	N	A	M	1
		N	A	M	
		N	A	M	
		N	A	M	2
		N	A	M	
		N	A	M	
		N	A	M	3
		N	A	M	
		N	A	M	
					4
					5
					6
		F	A	MG	
		D			
		R			Core Catcher
		S			
		N	A	M	

Meters: 0.5, 1.0

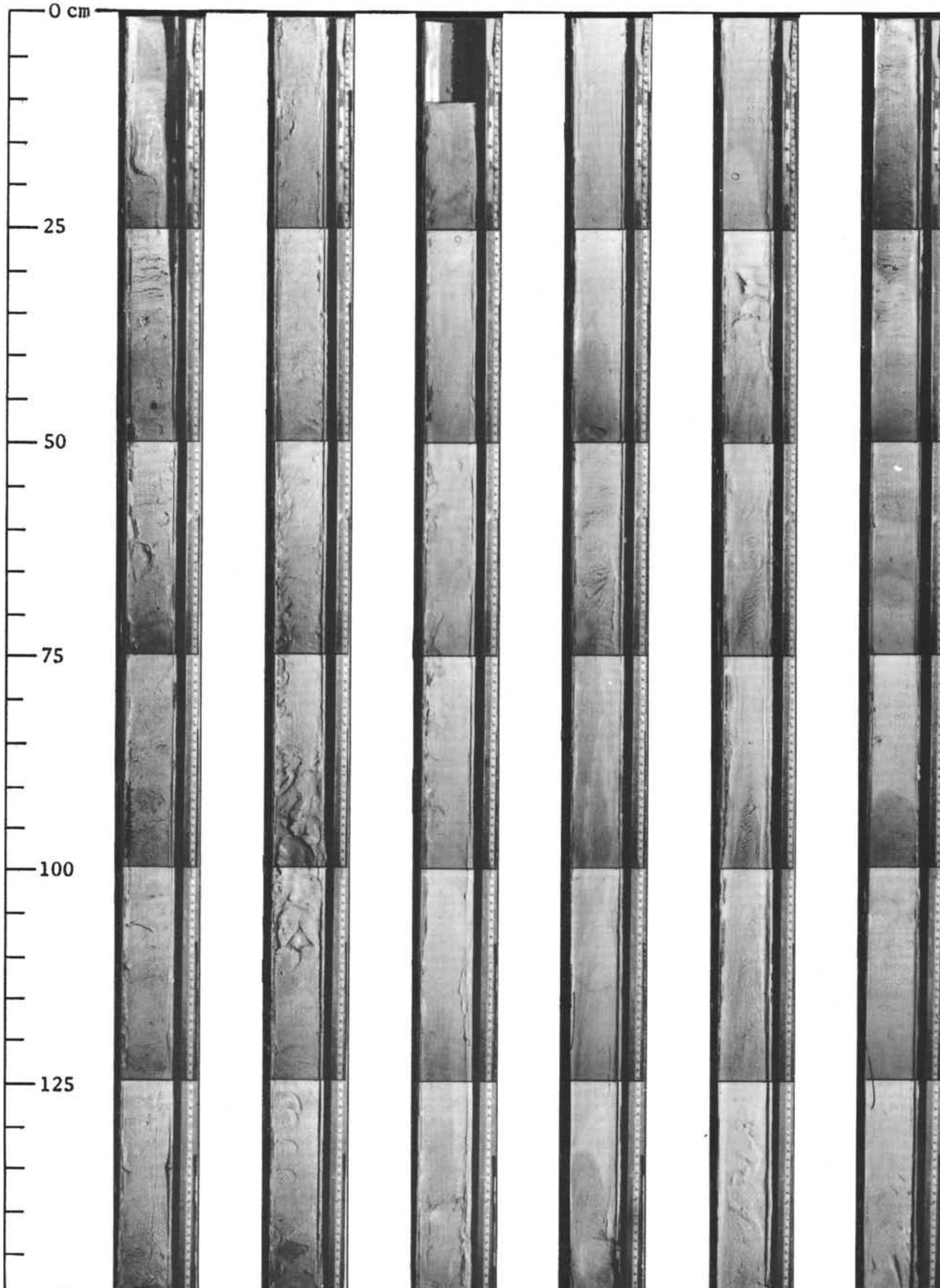
LITHOLOGY · DEFORMATION · LITHO. SAMPLE: CC

LITHOLOGIC DESCRIPTION

Core is typically a FORAM NANNO OOZE, bluish white (5B 9/1), soft, with dark streaks, burrows and mottles of Mn.

SS CC
F -35%
N -65%
Ech -TR

Explanatory notes in Chapter 1



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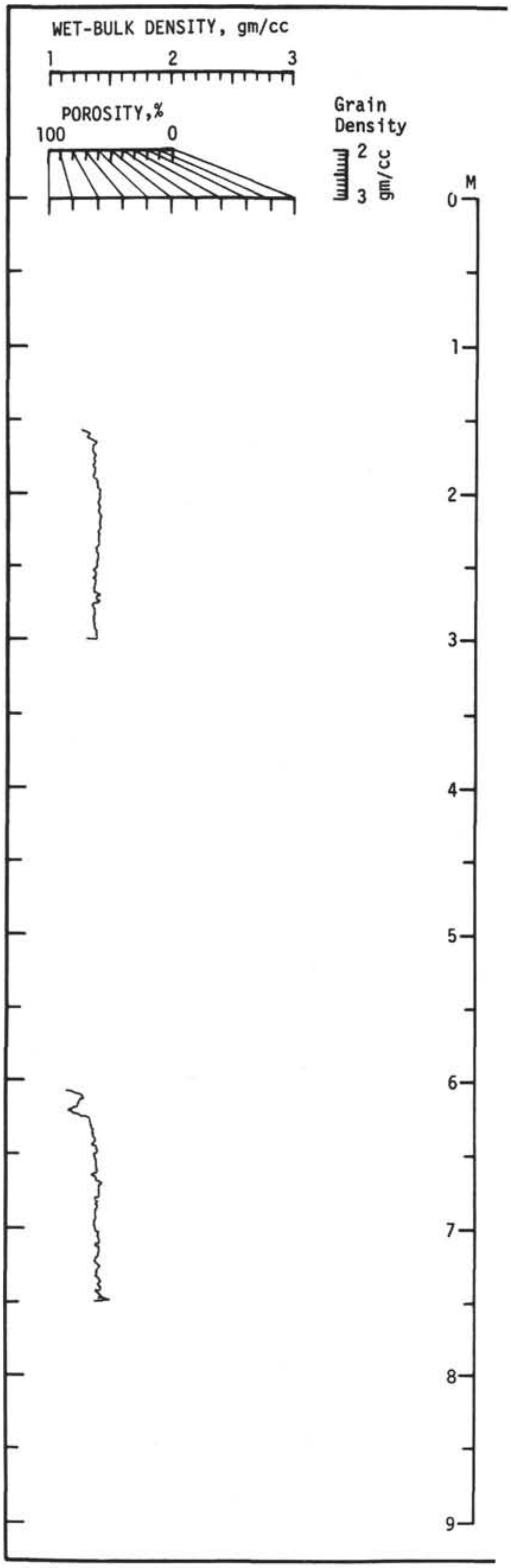
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gm/cc
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8
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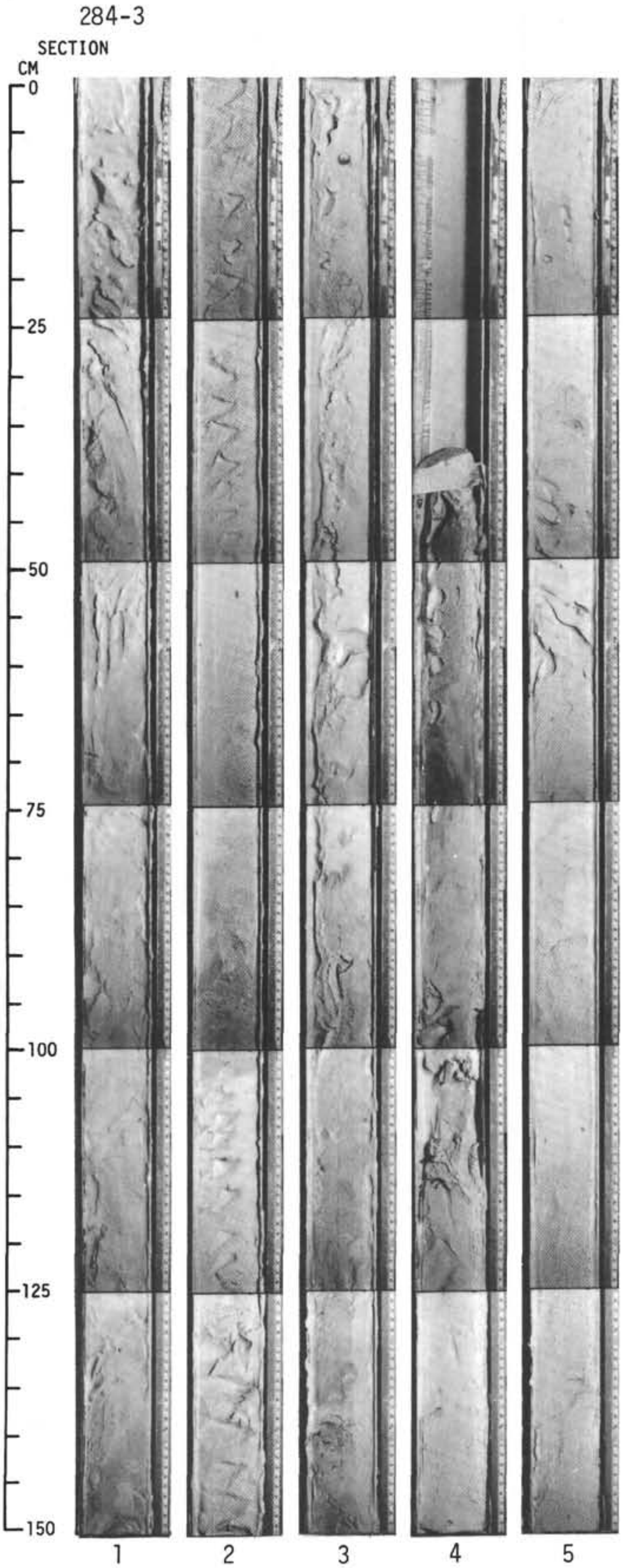
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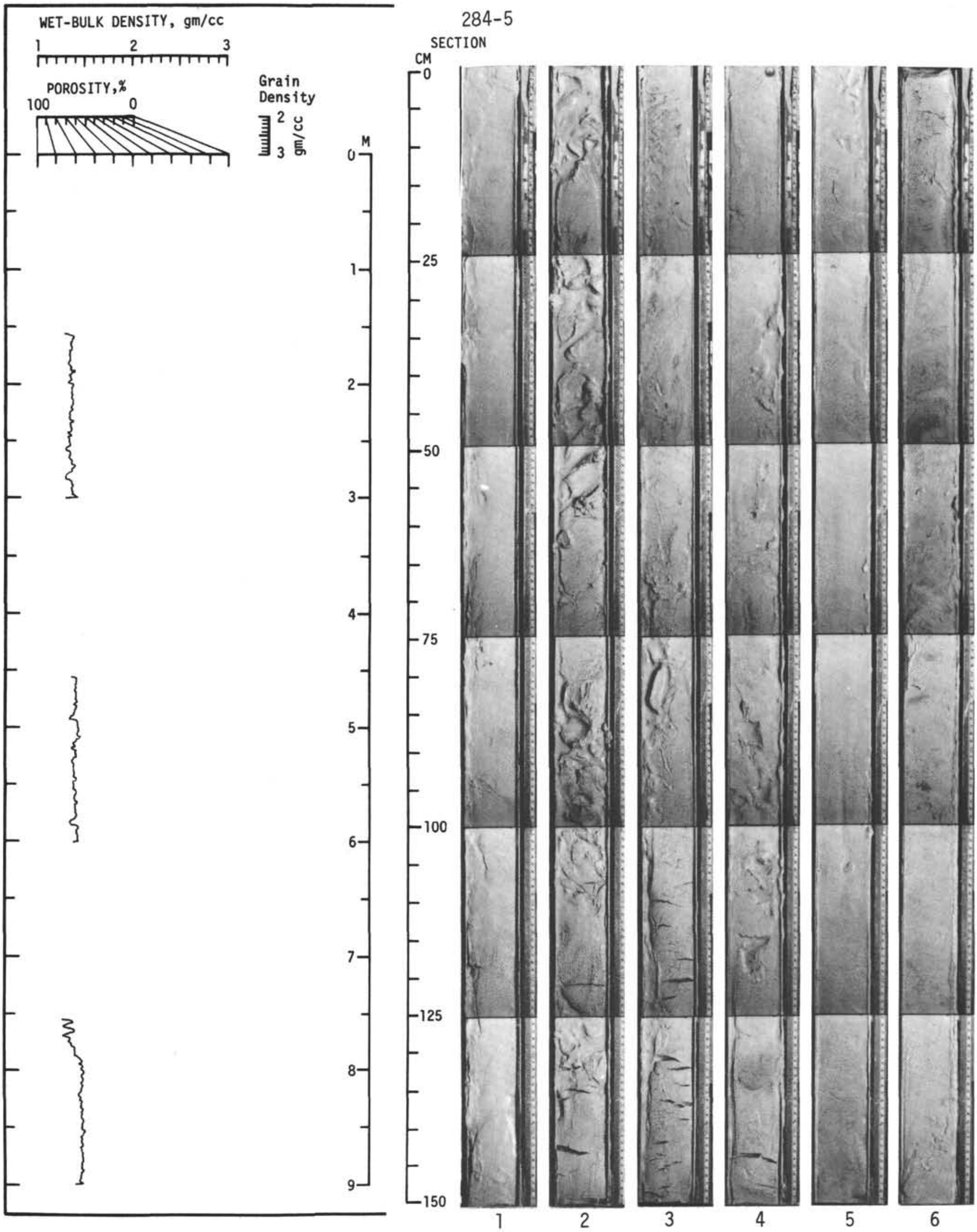
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gm/cc
M
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3
4
5
6
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8
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284-5
SECTION
CM
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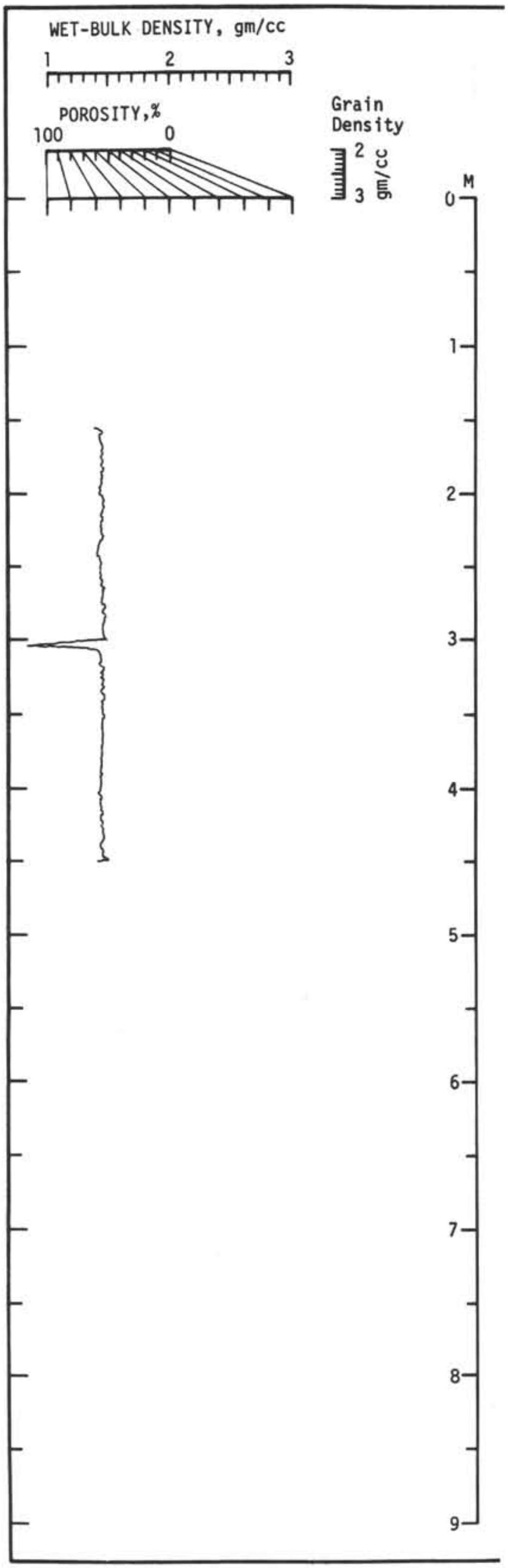
50
75
100
125
150
1
2
3
4
5
6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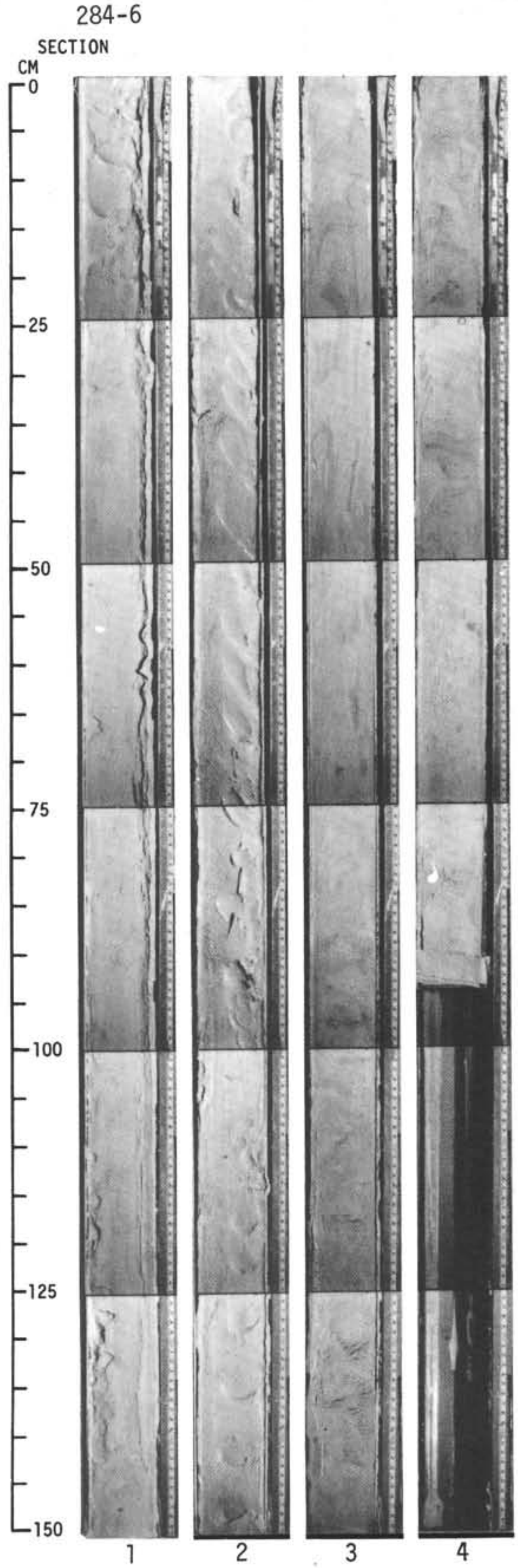
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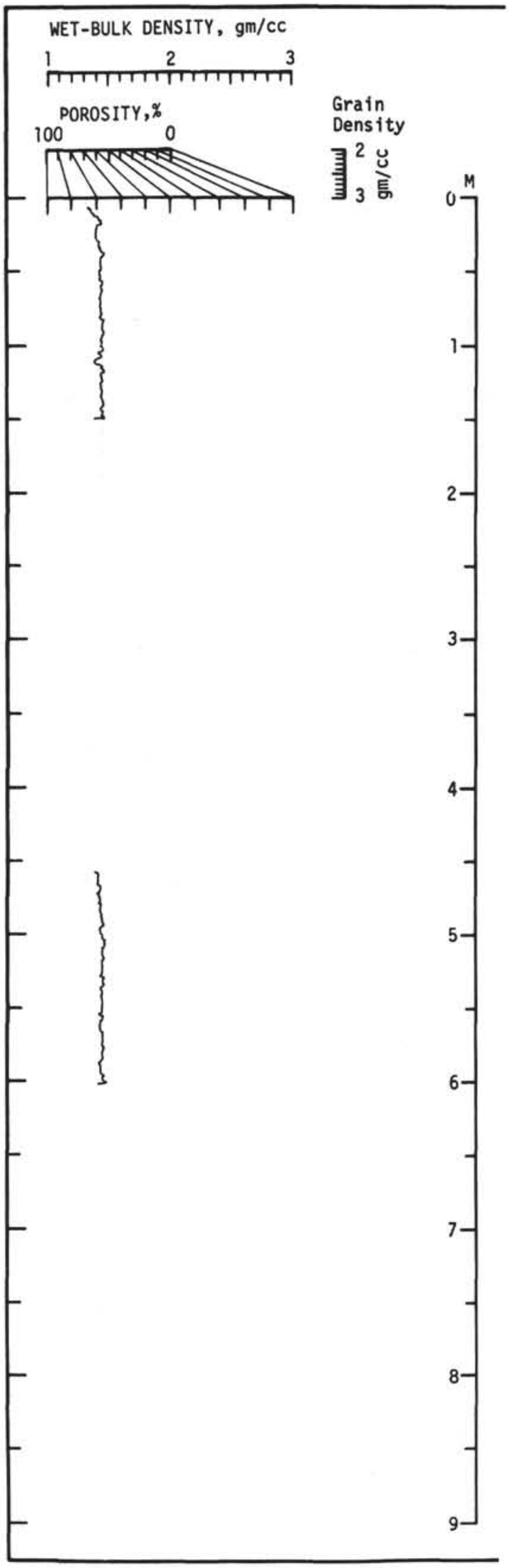
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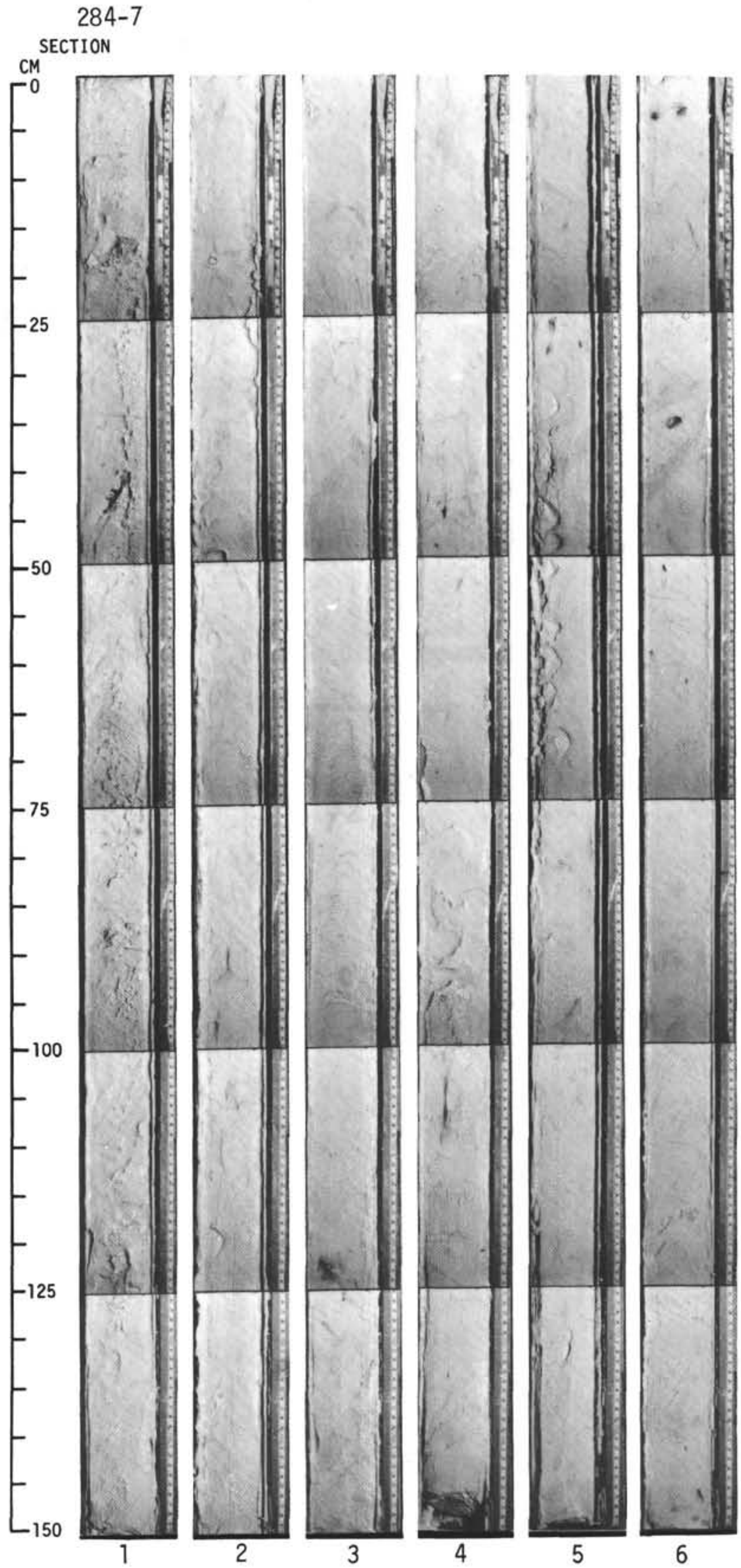
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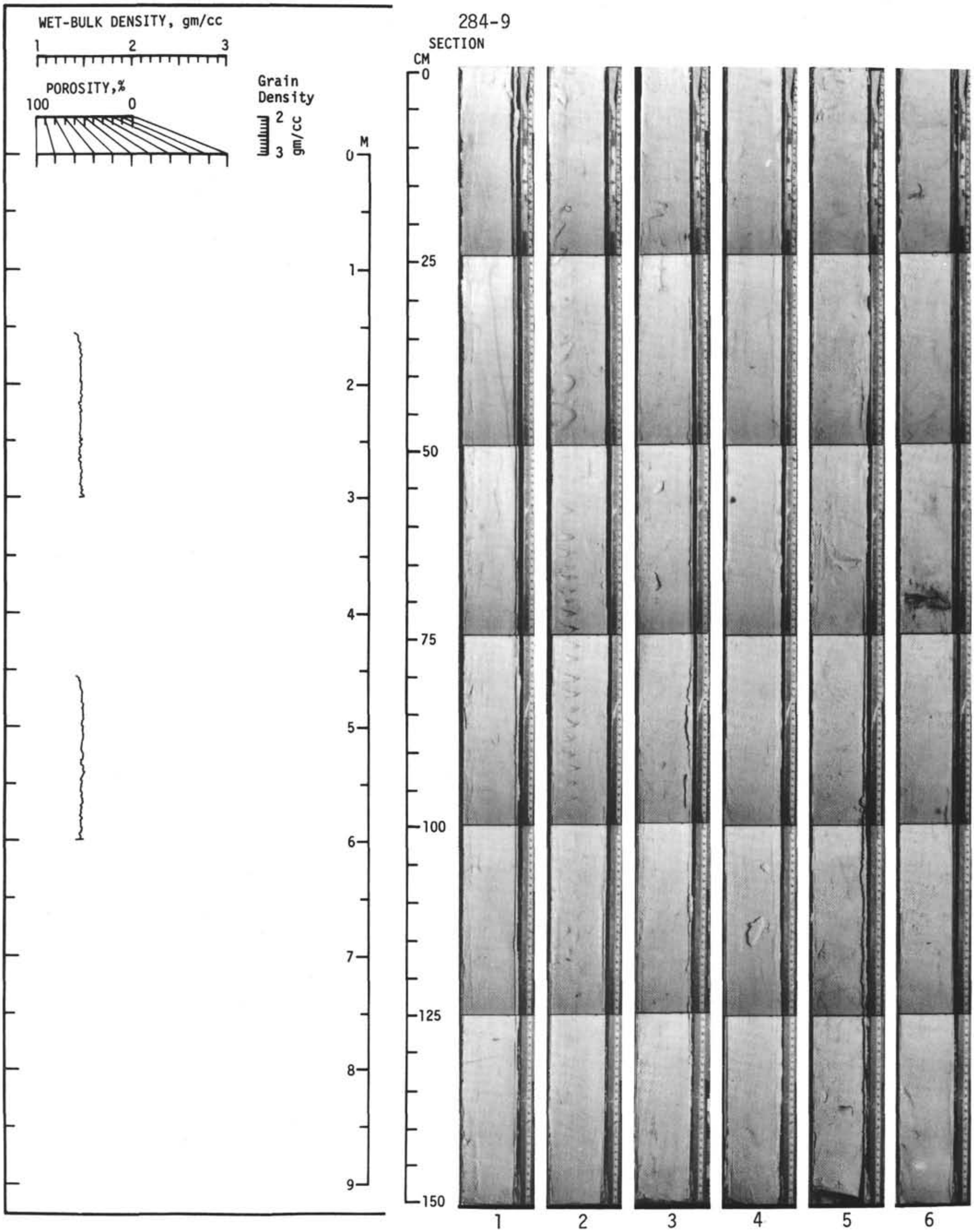
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gm/cc
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4
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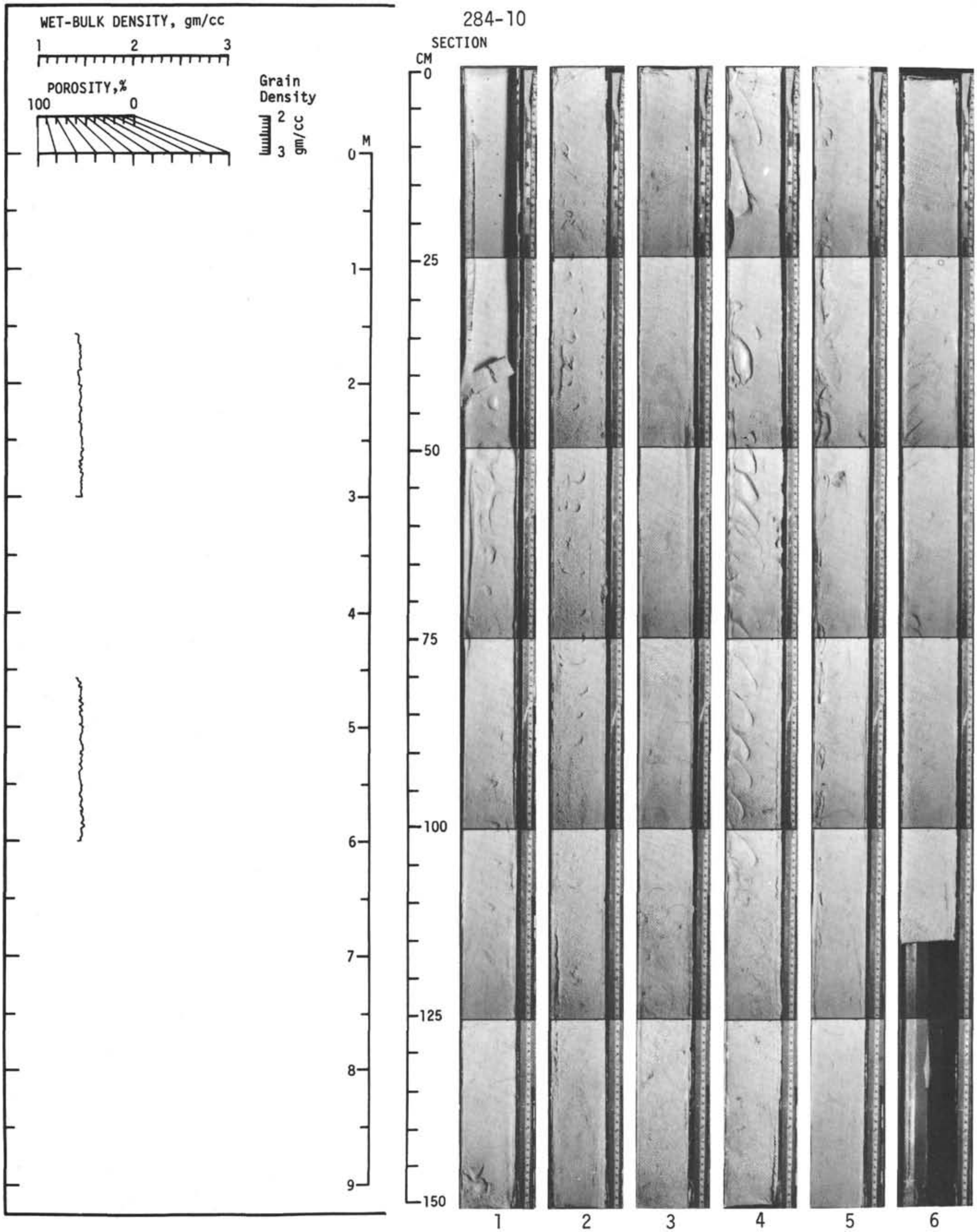
6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SECTION
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50
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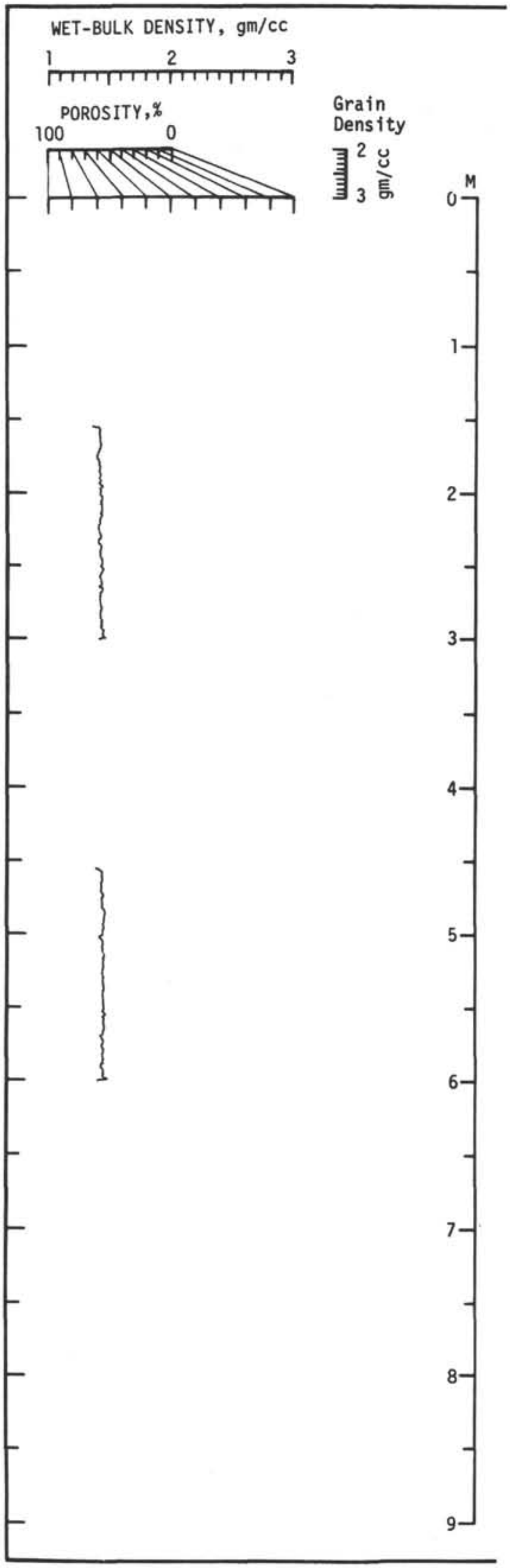
100
125
150
1 2 3 4 5 6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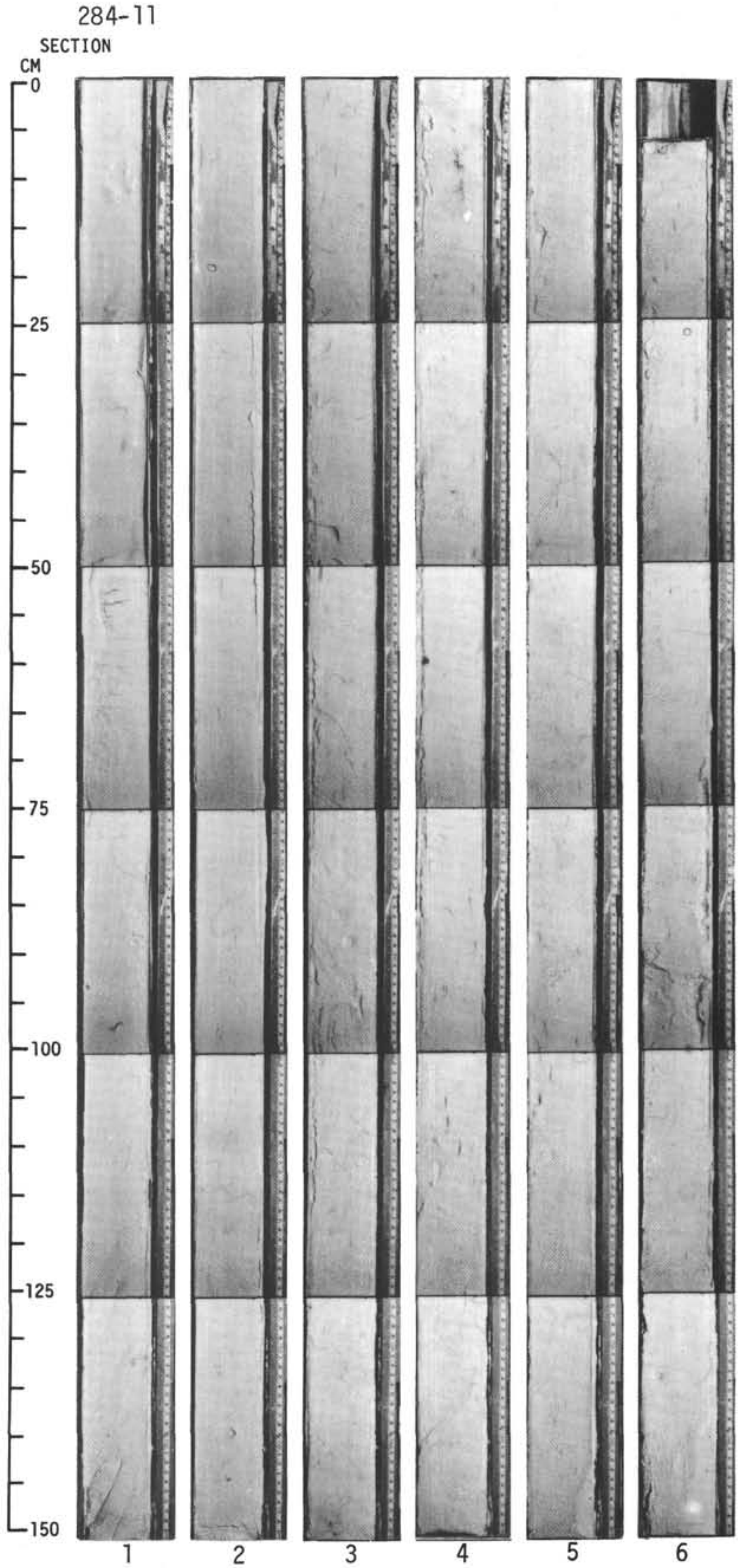
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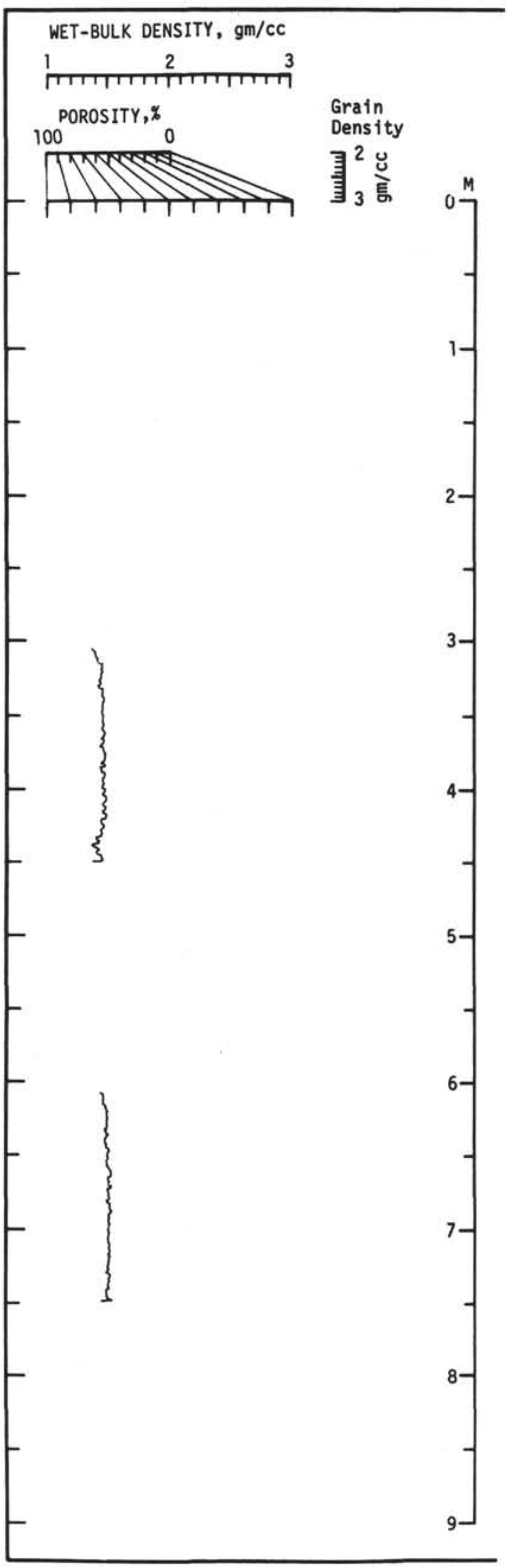
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POROSITY,%
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Grain Density
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gm/cc
M
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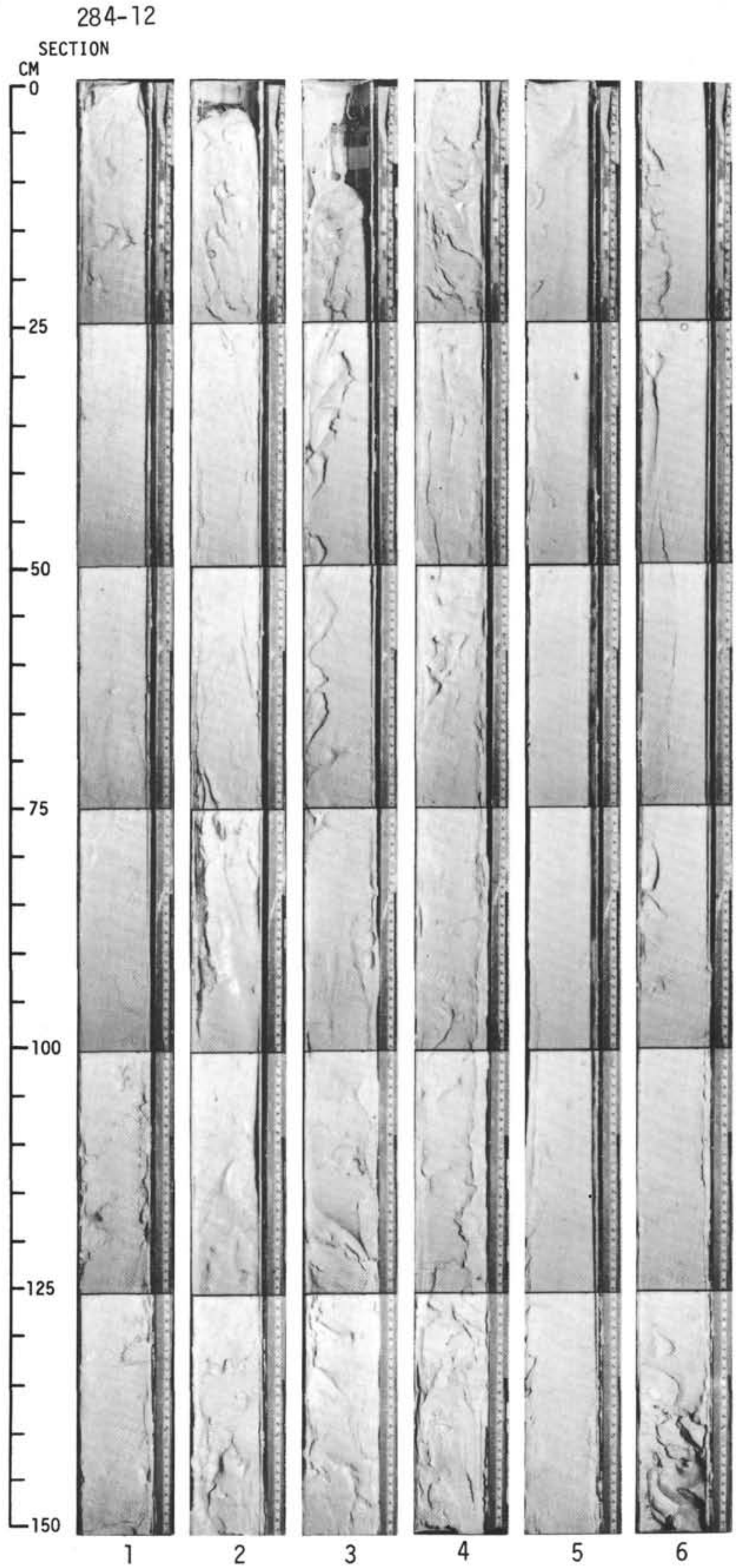
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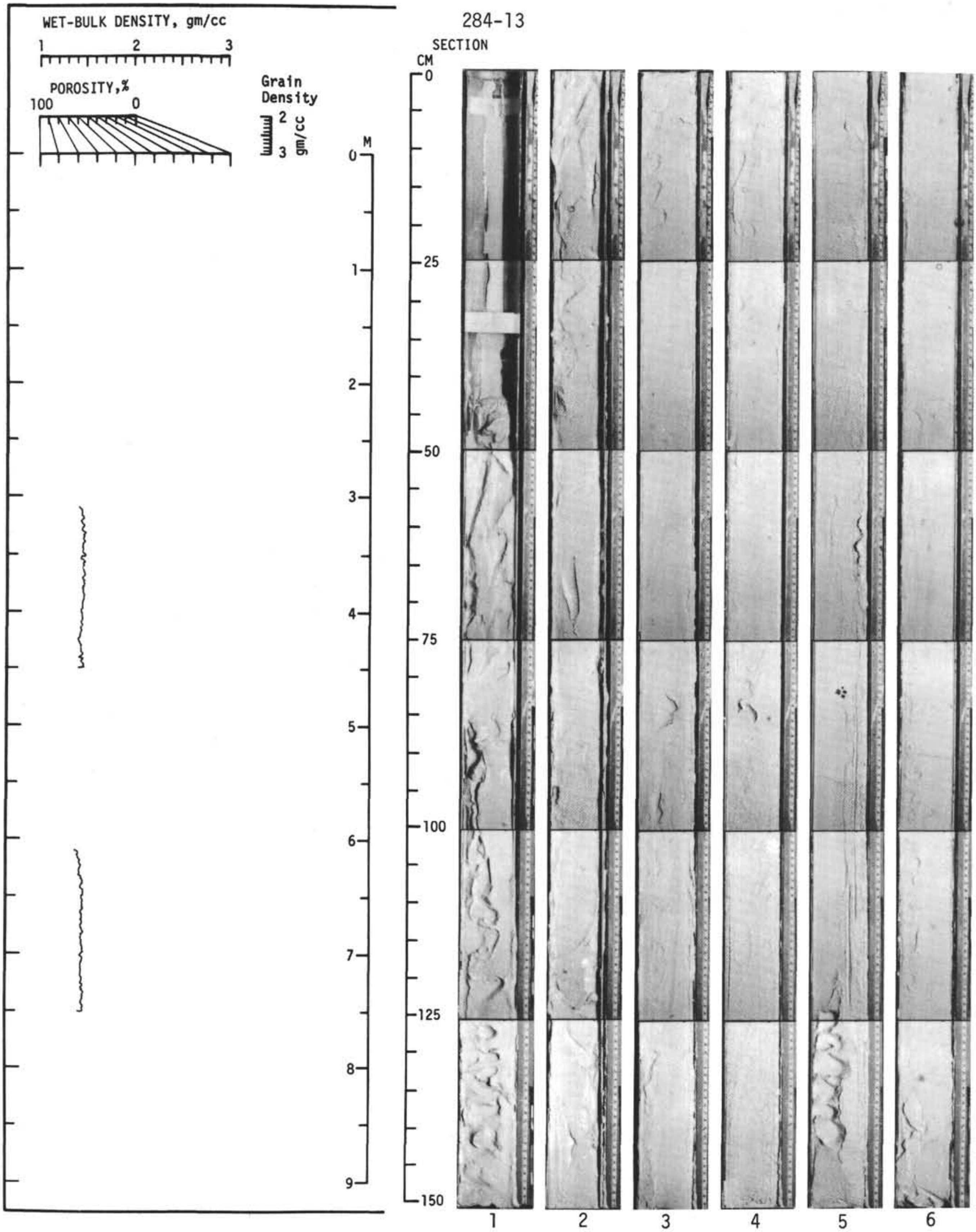
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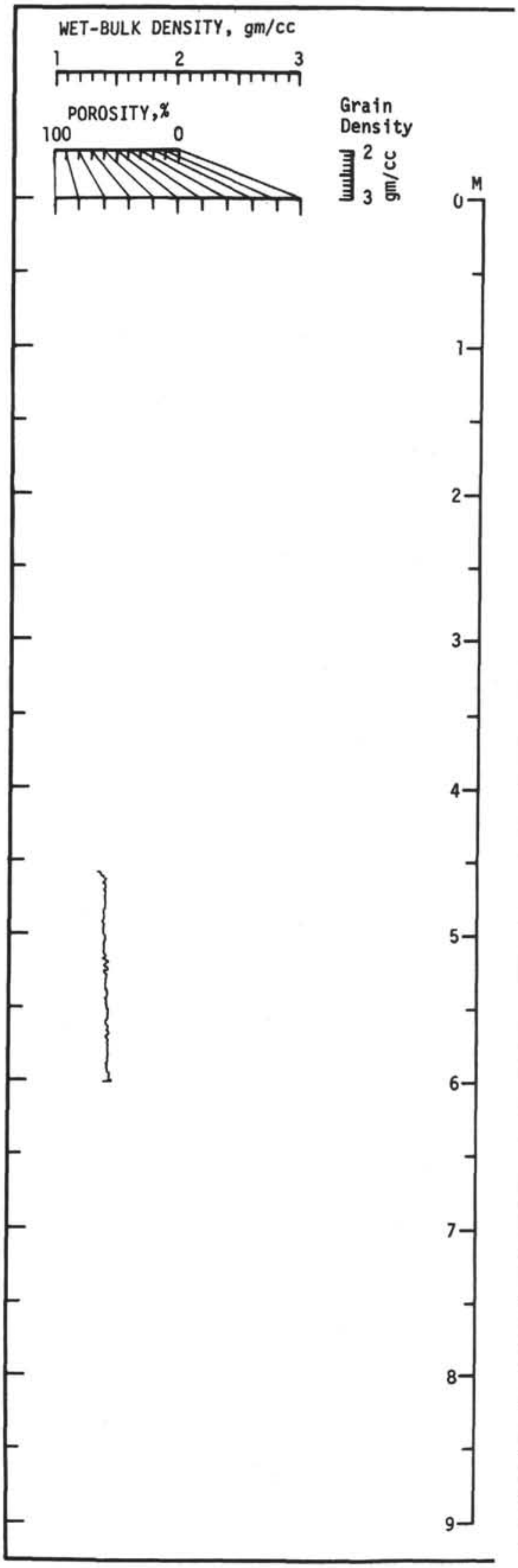
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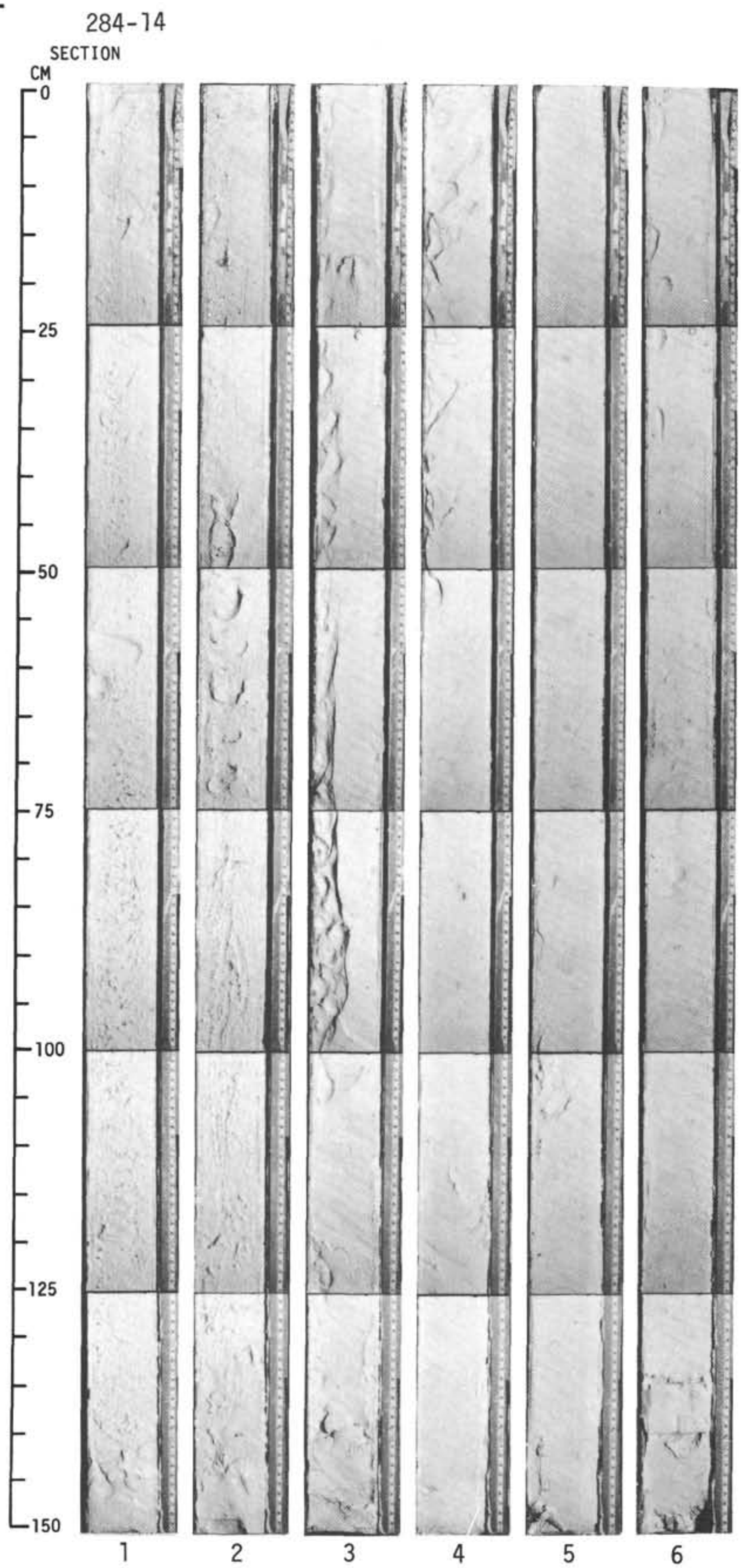
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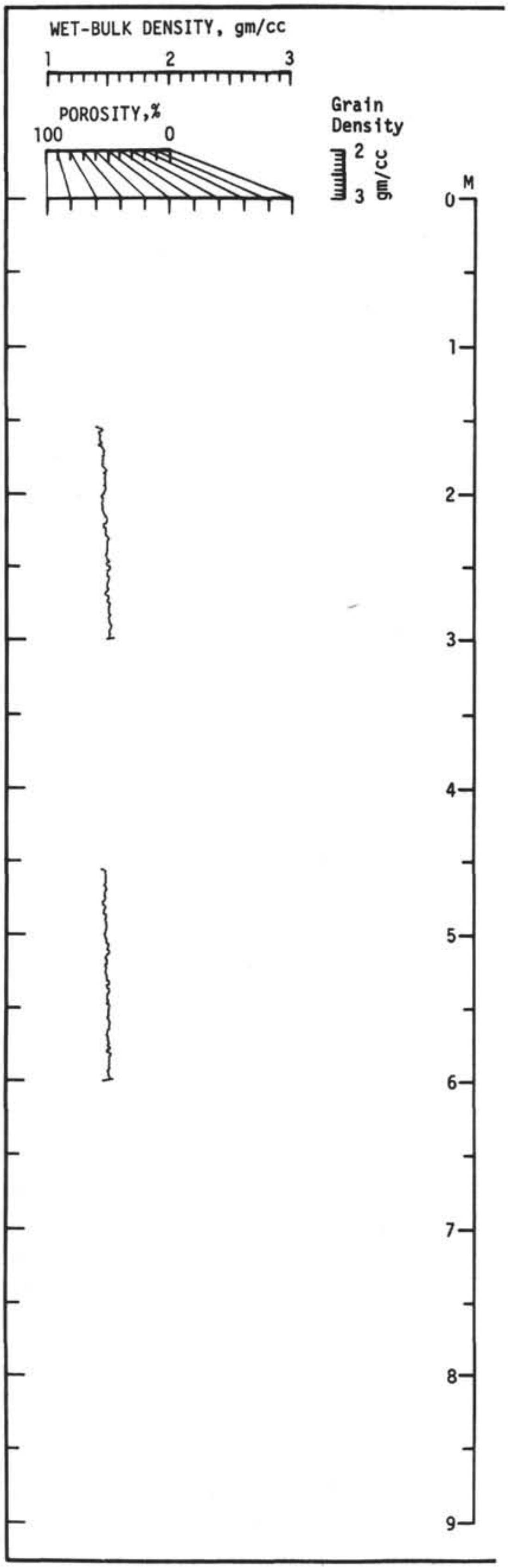

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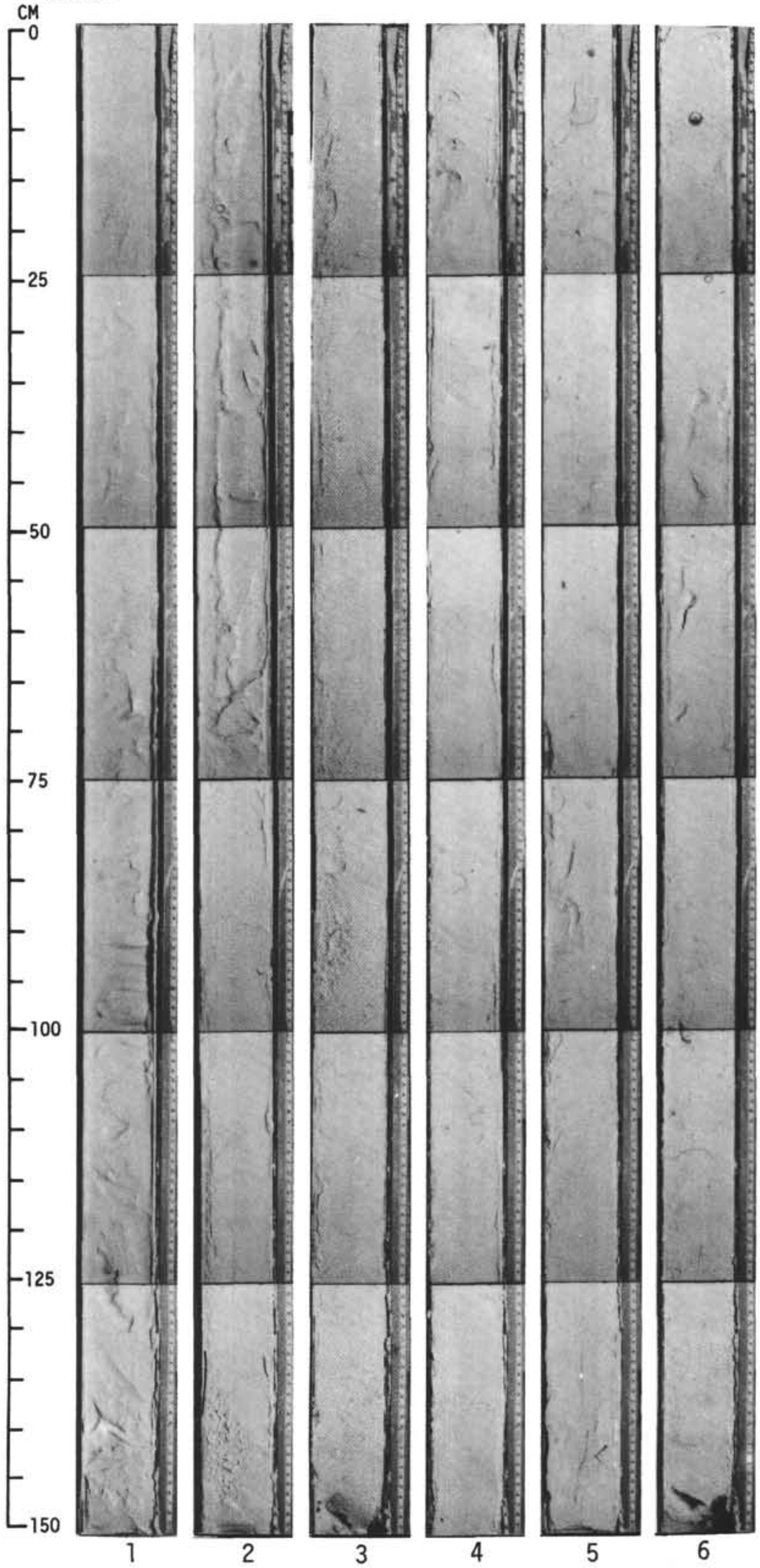
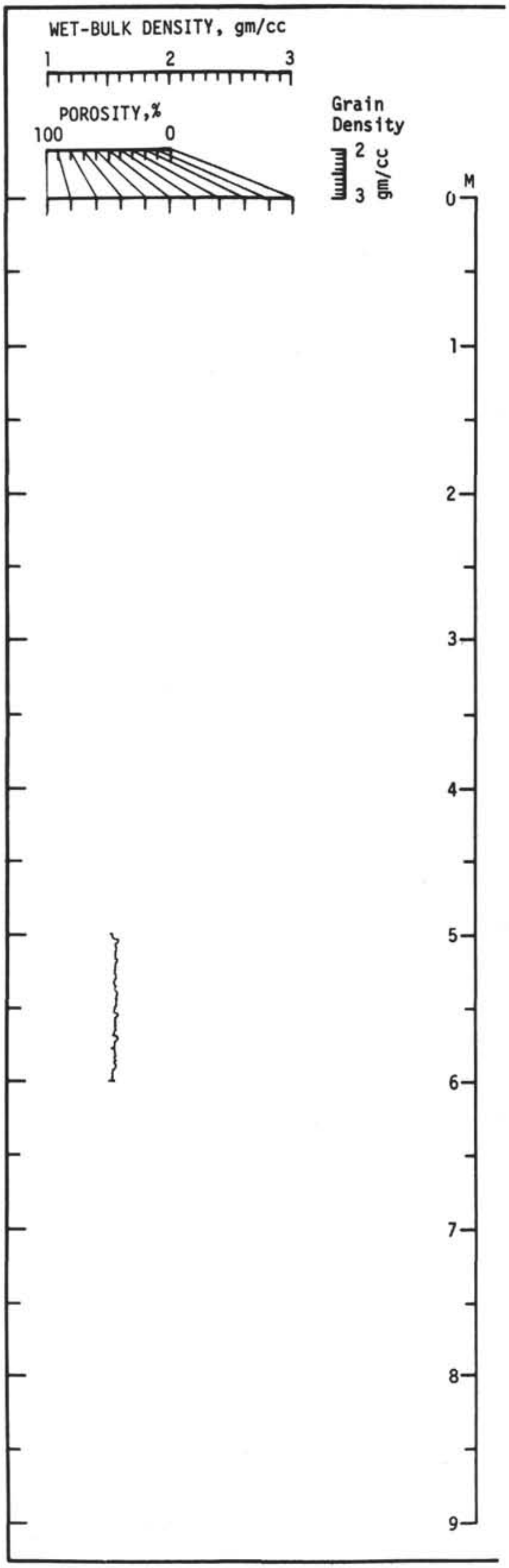
SECTION

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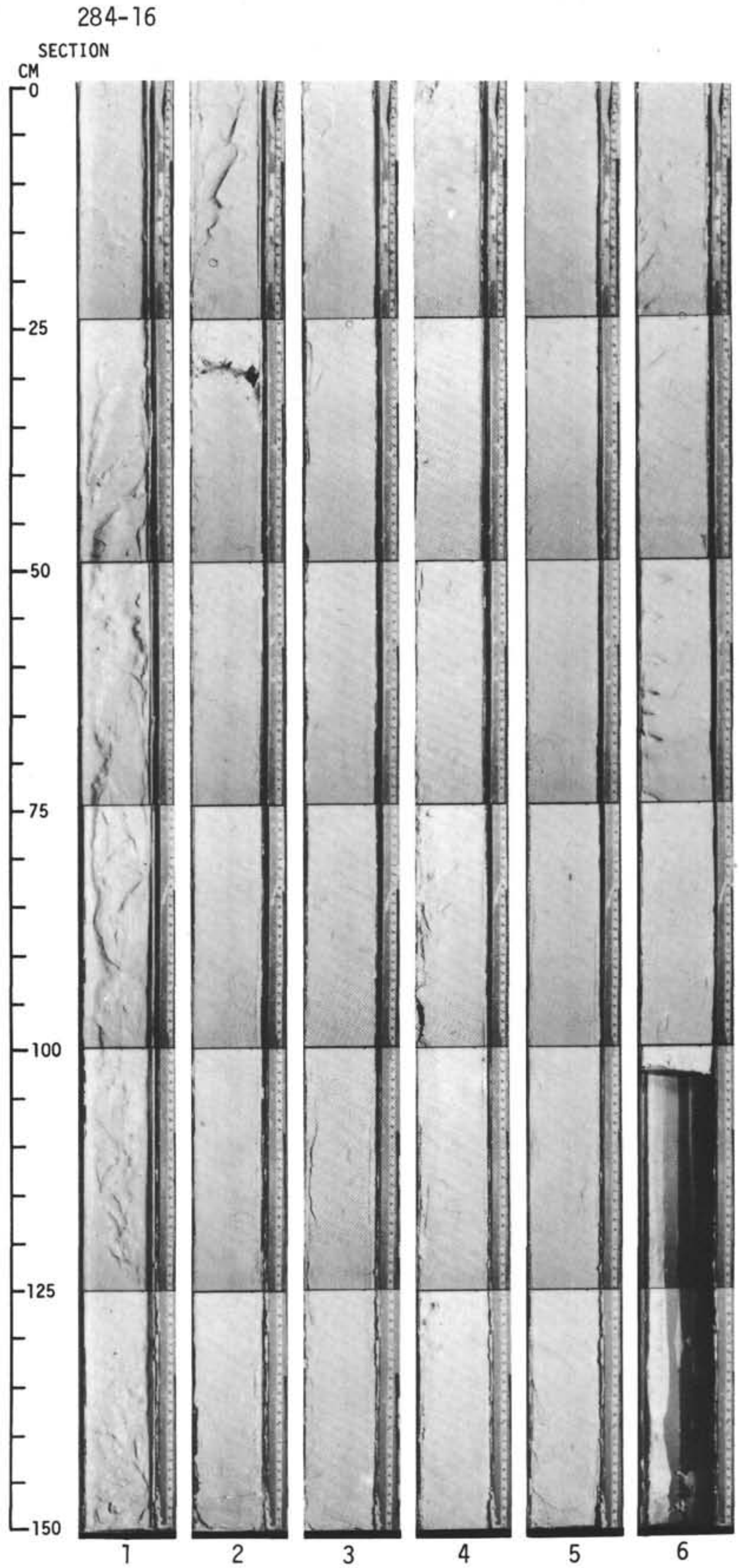
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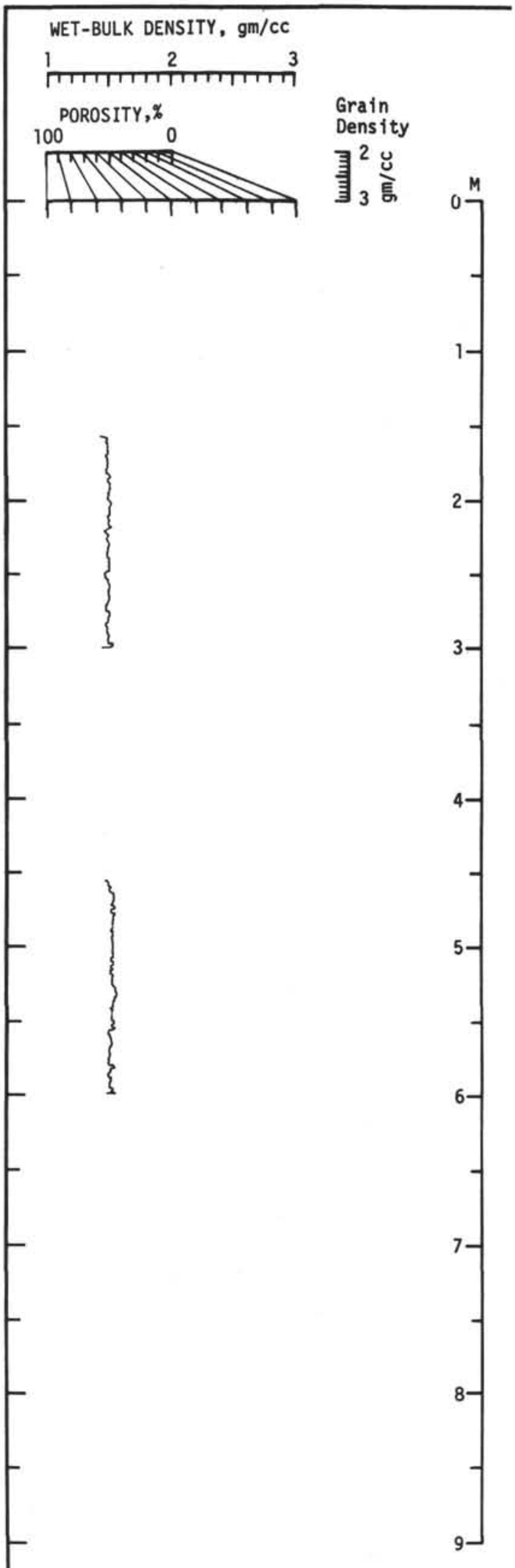
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POROSITY,%
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Grain Density
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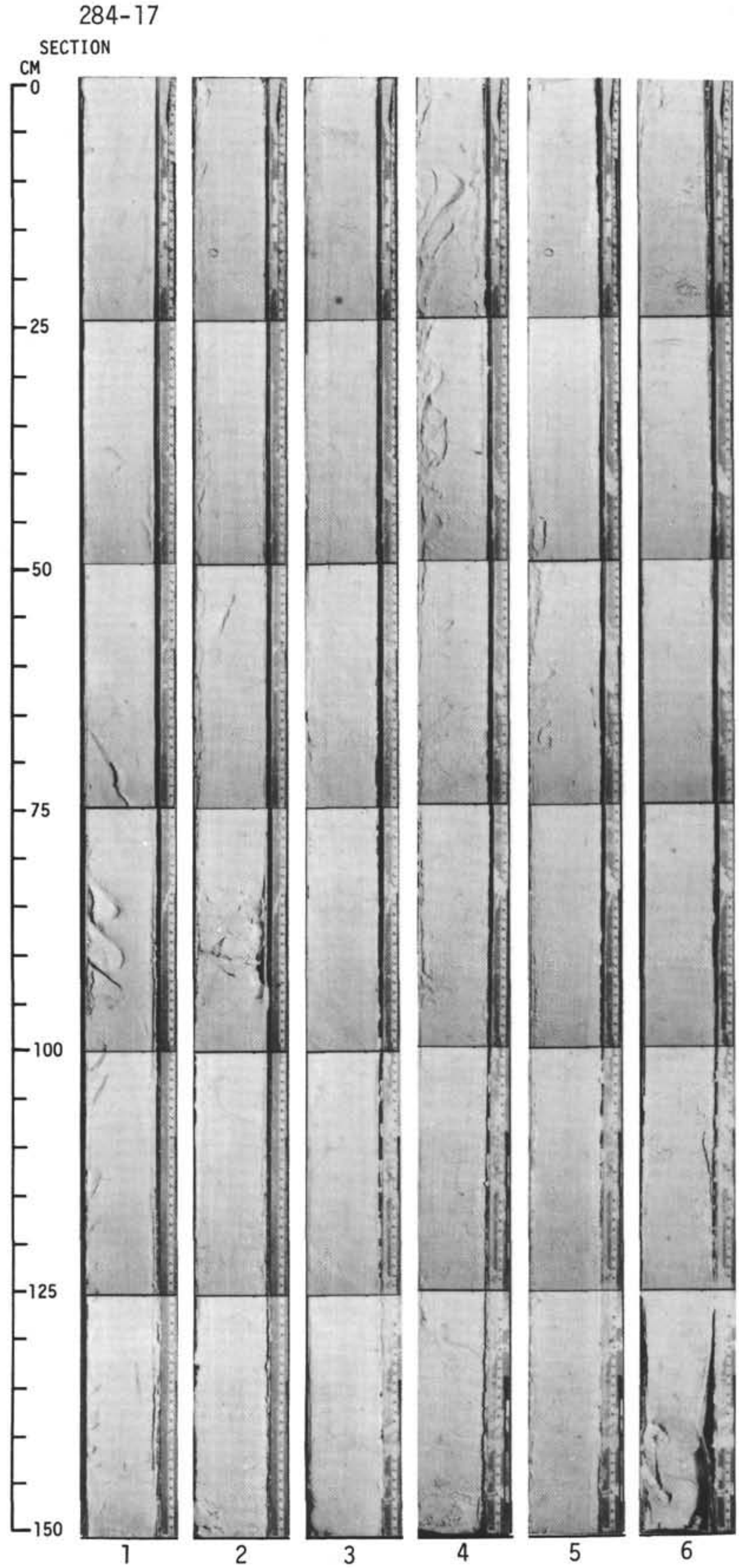
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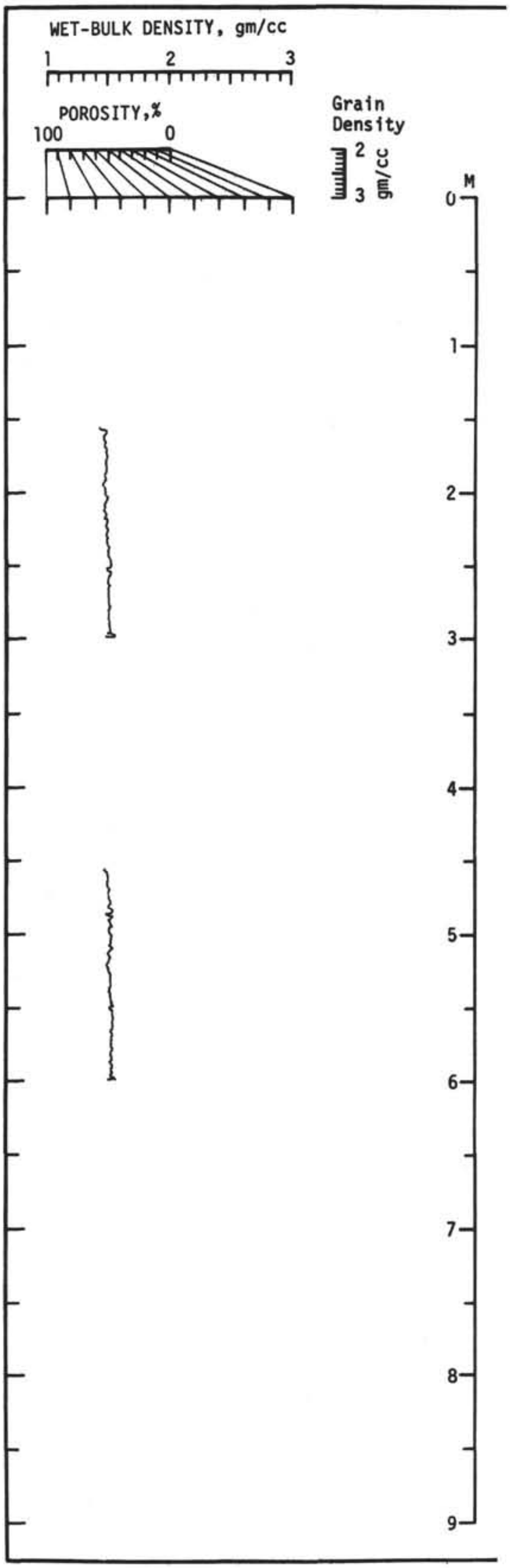
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gm/cc
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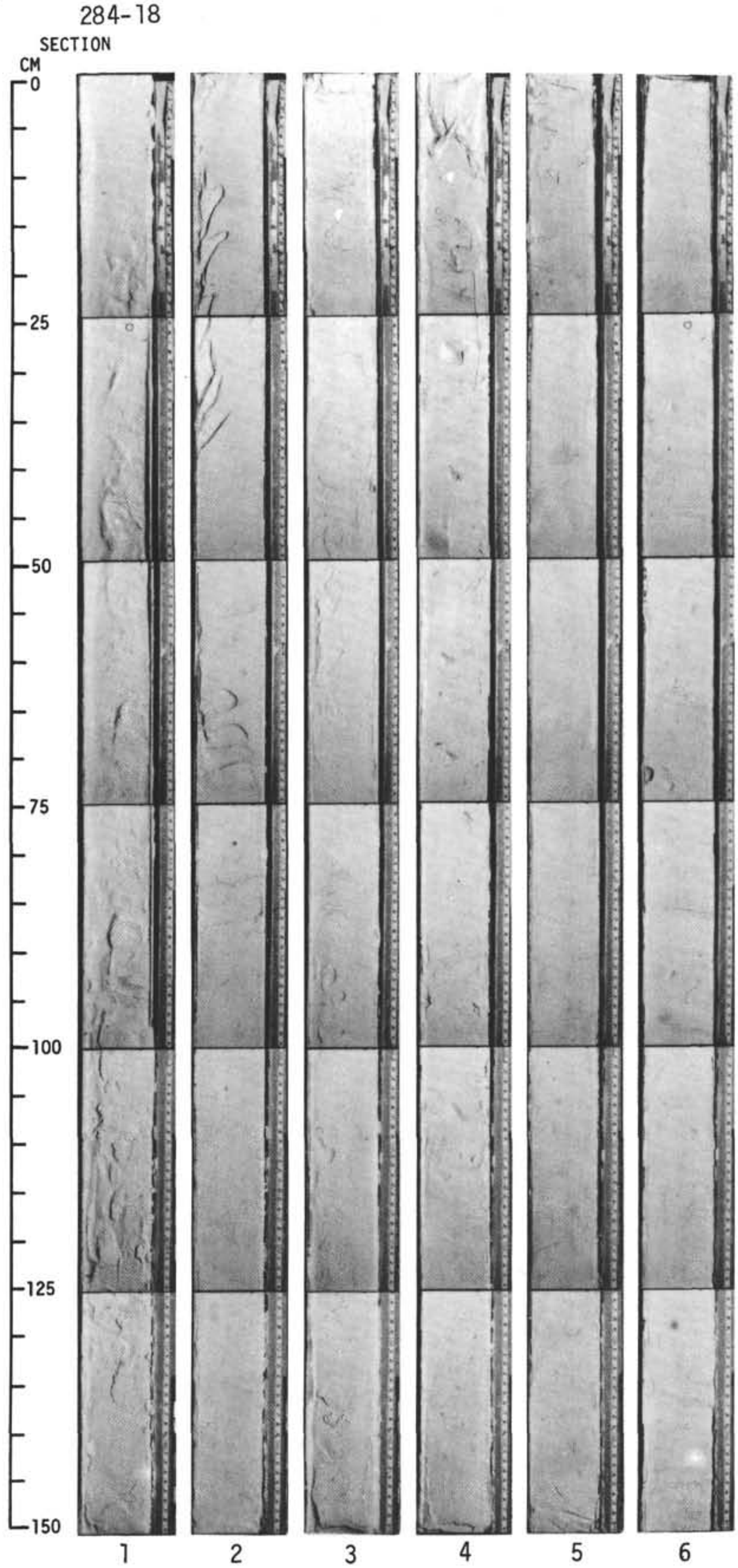
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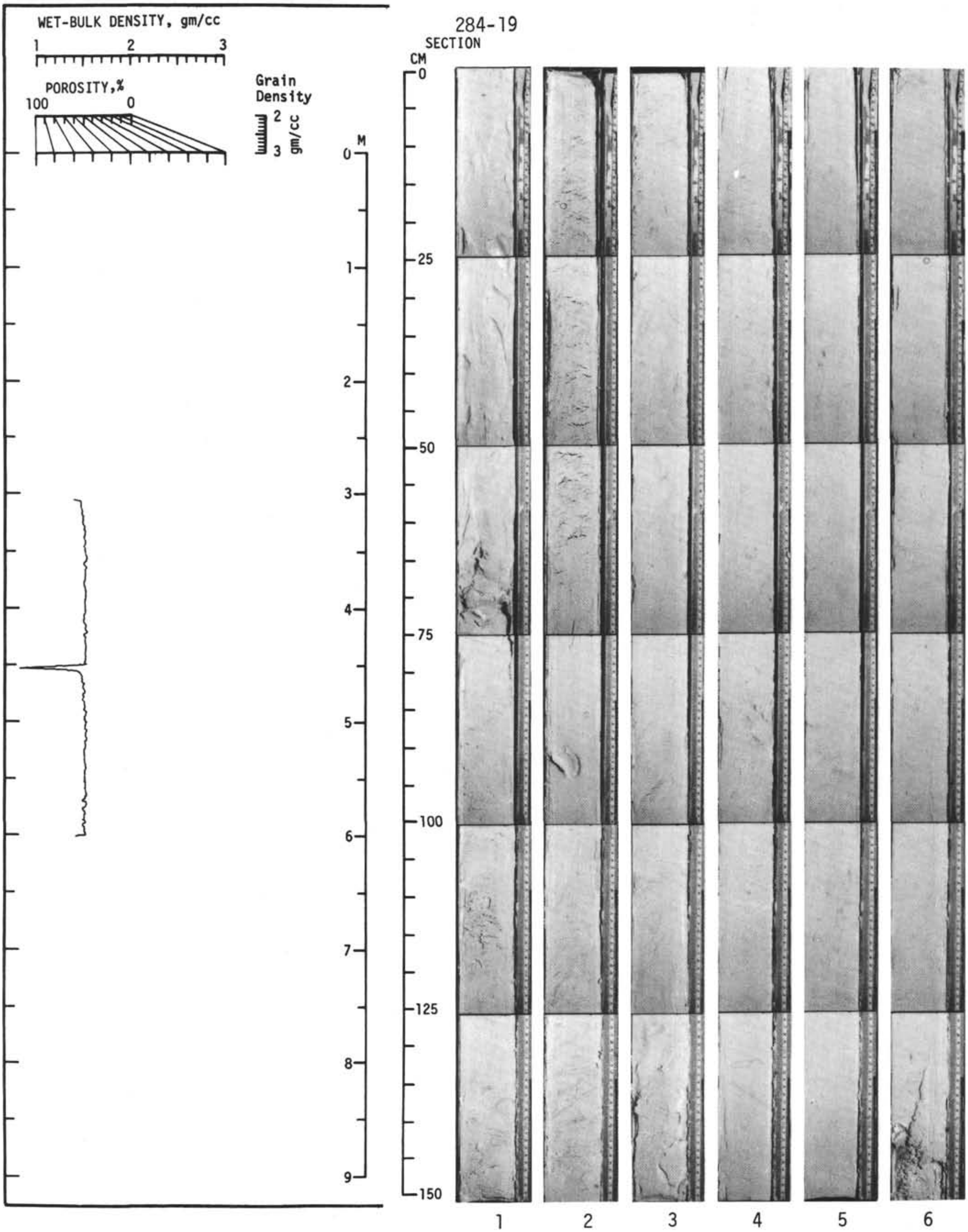
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Grain Density
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M
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SECTION
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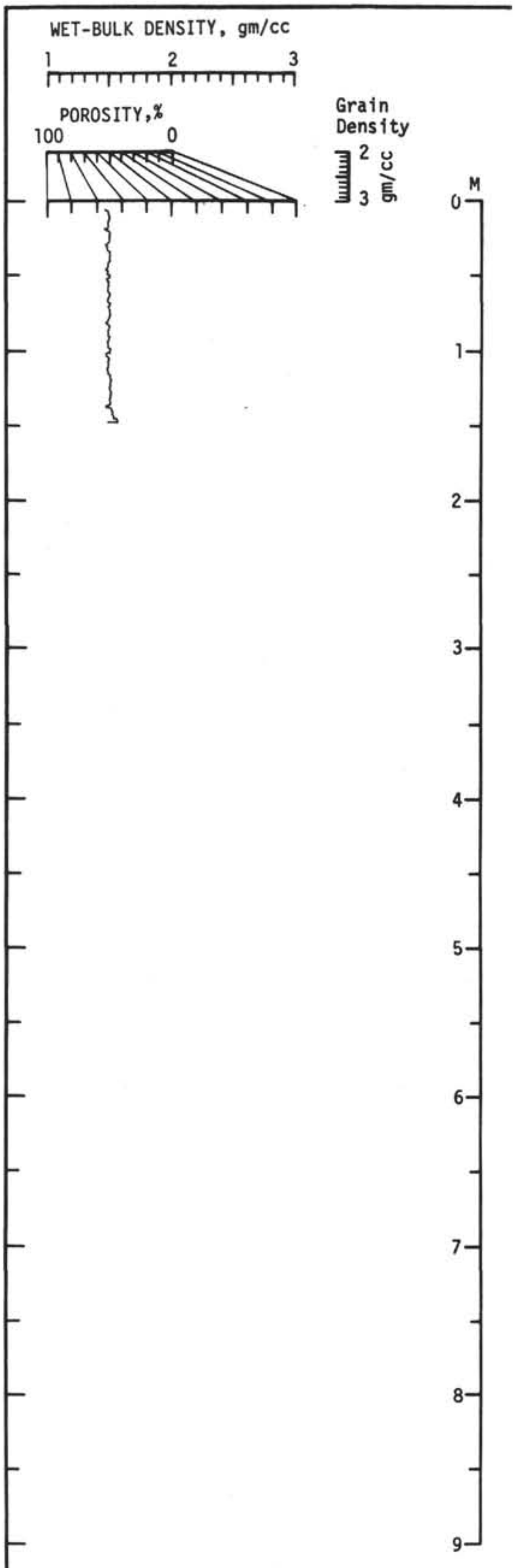
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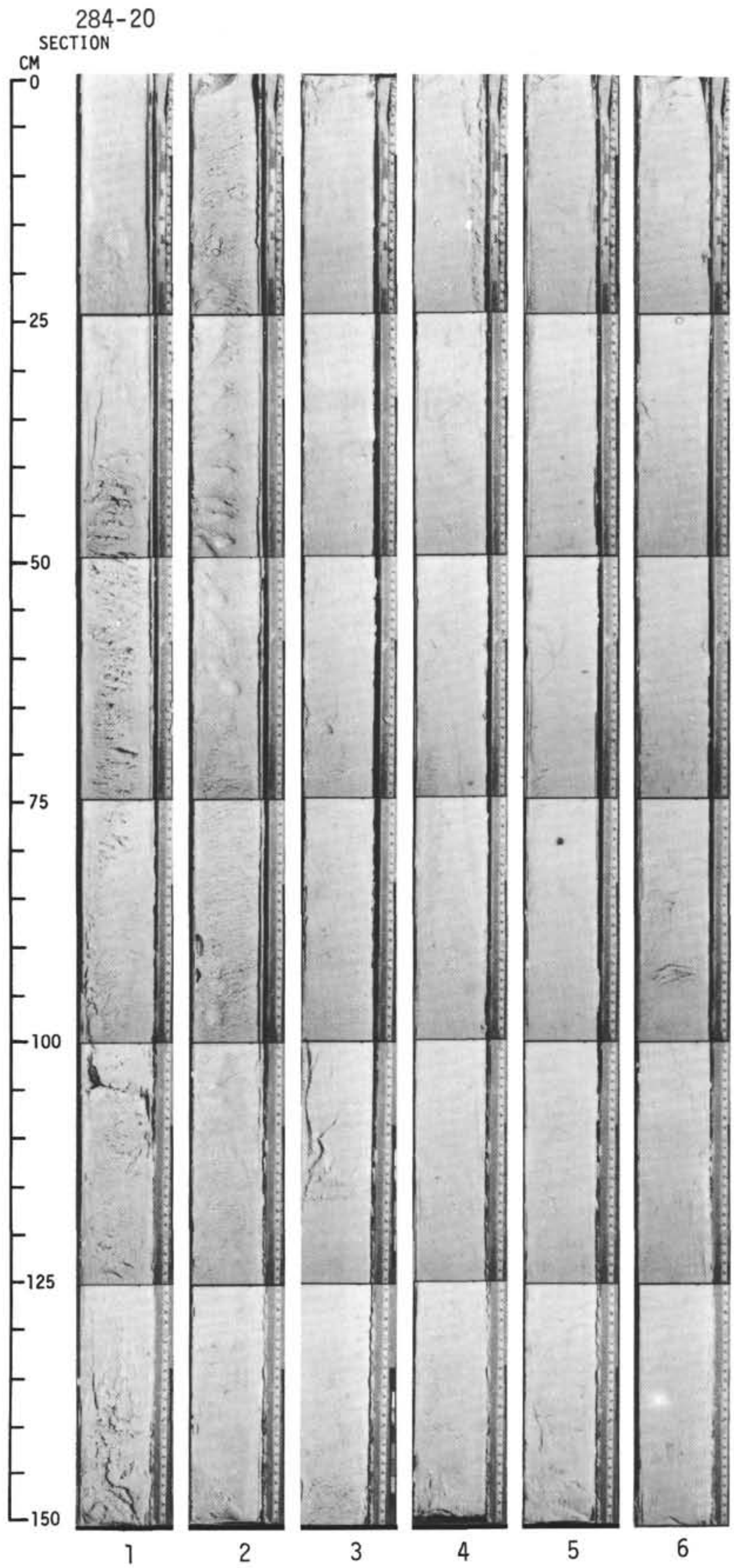
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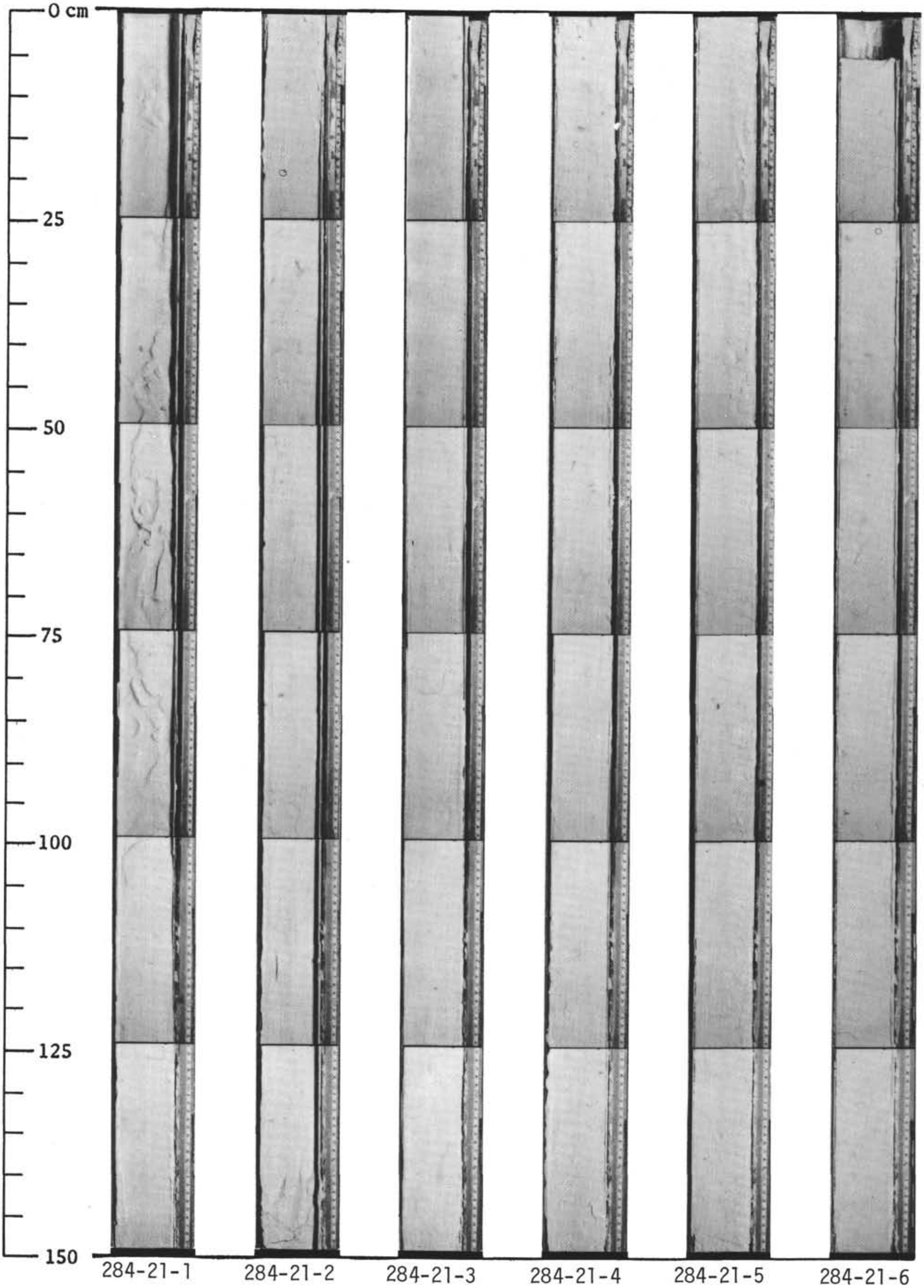
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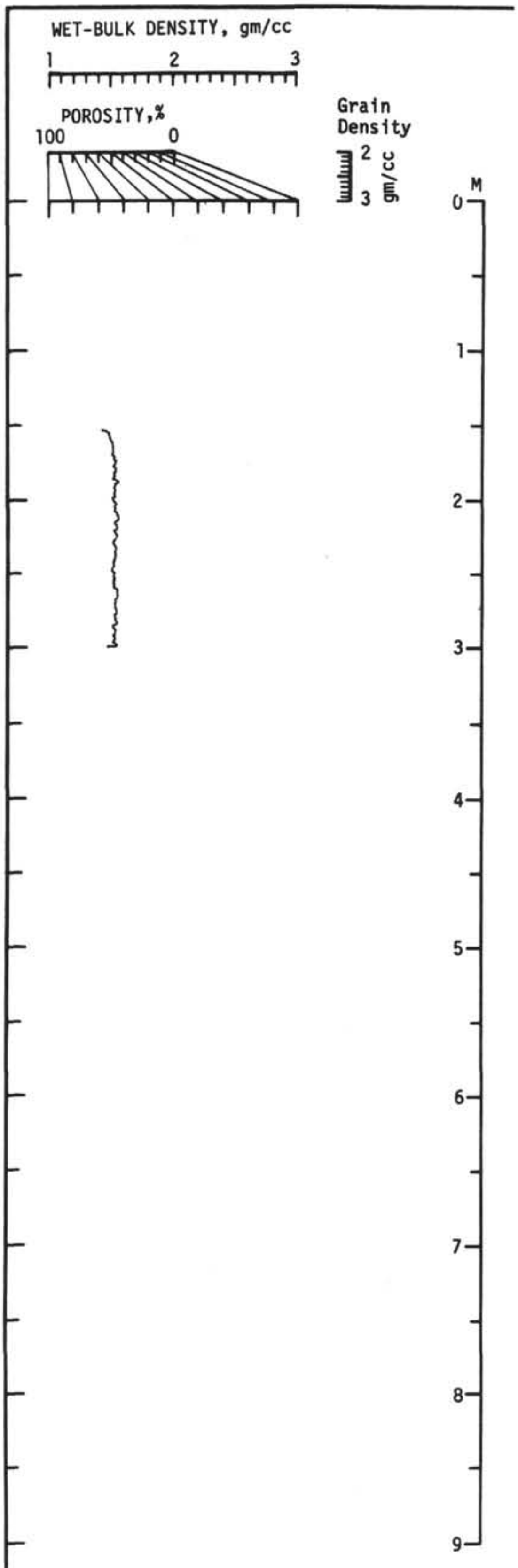
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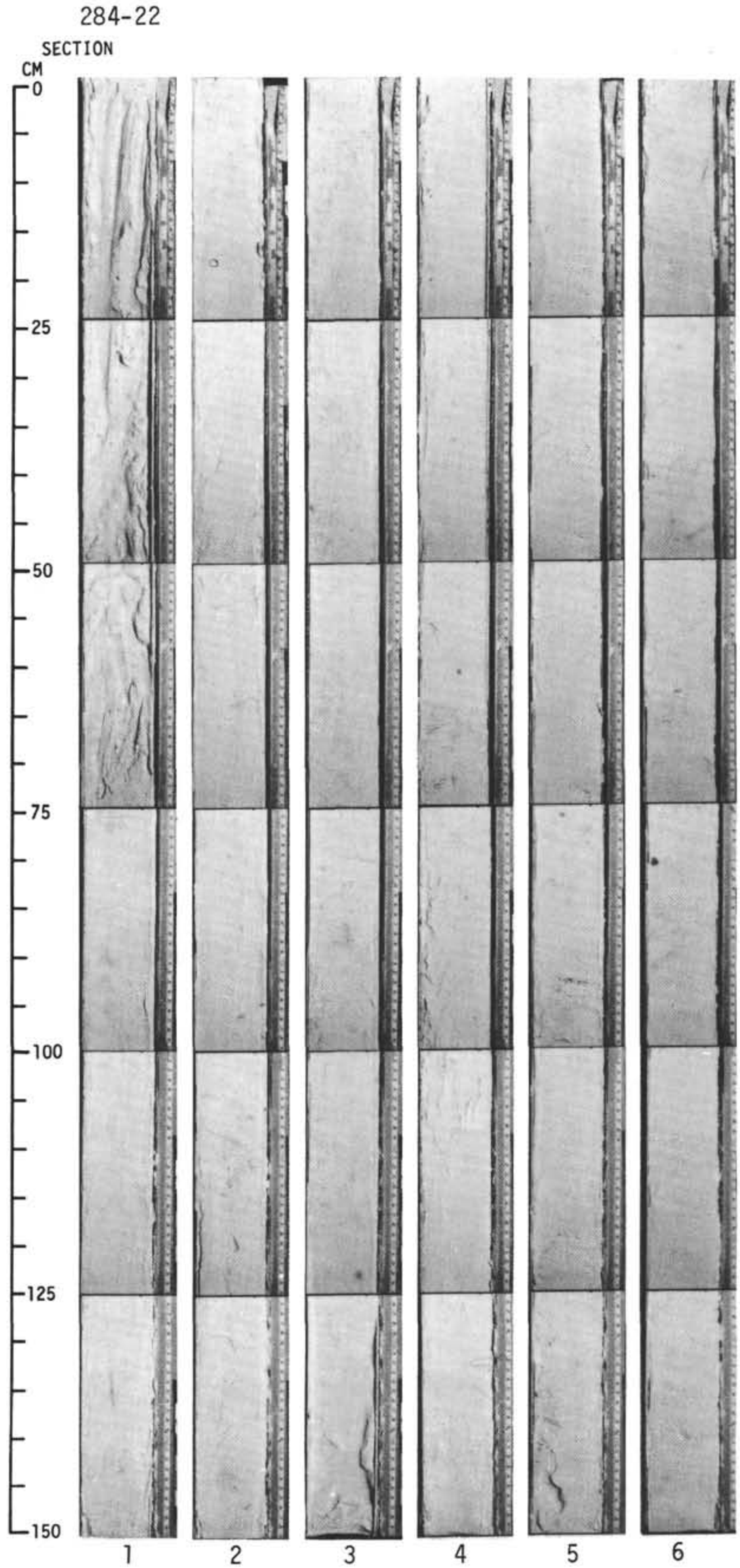
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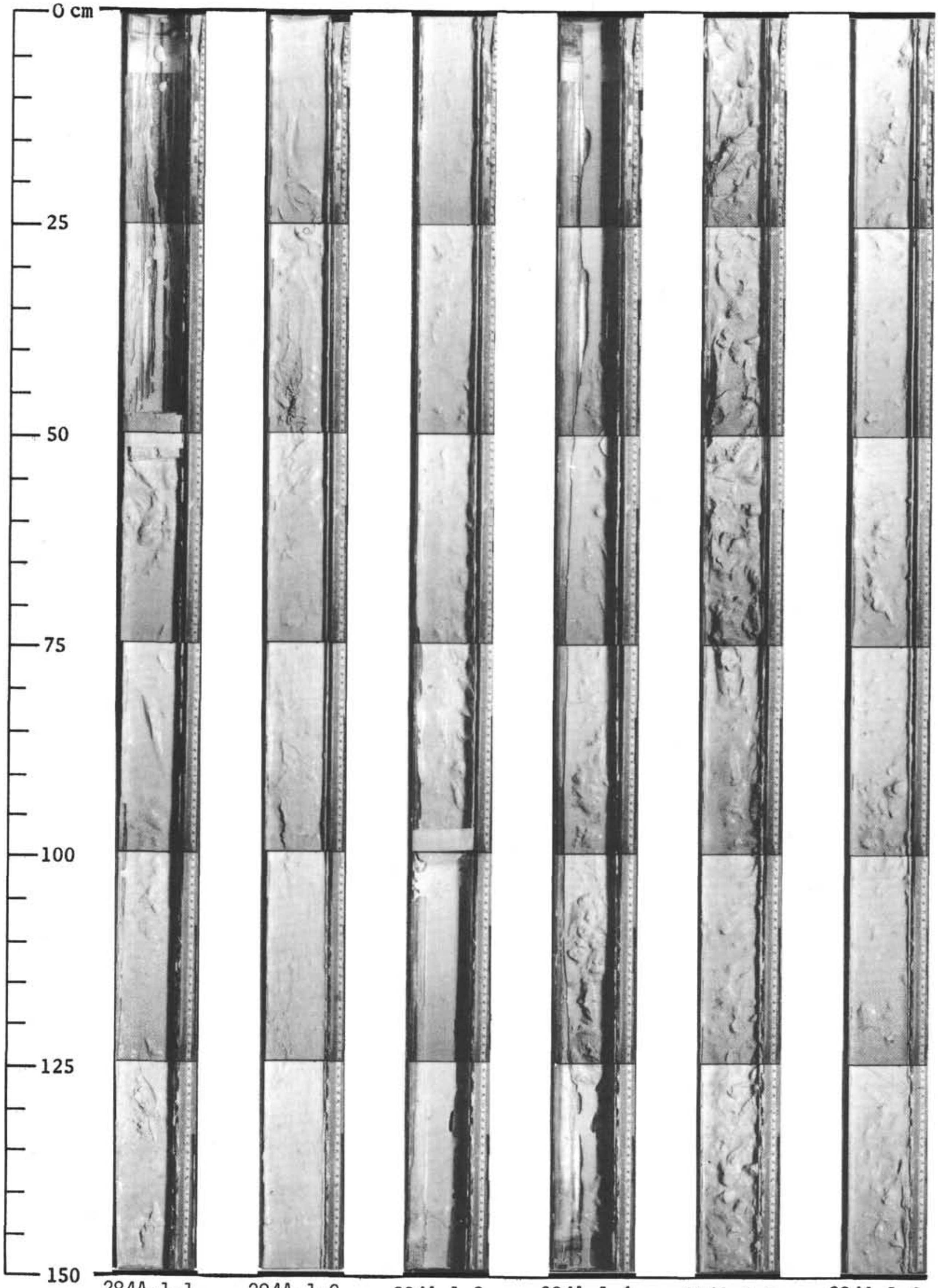
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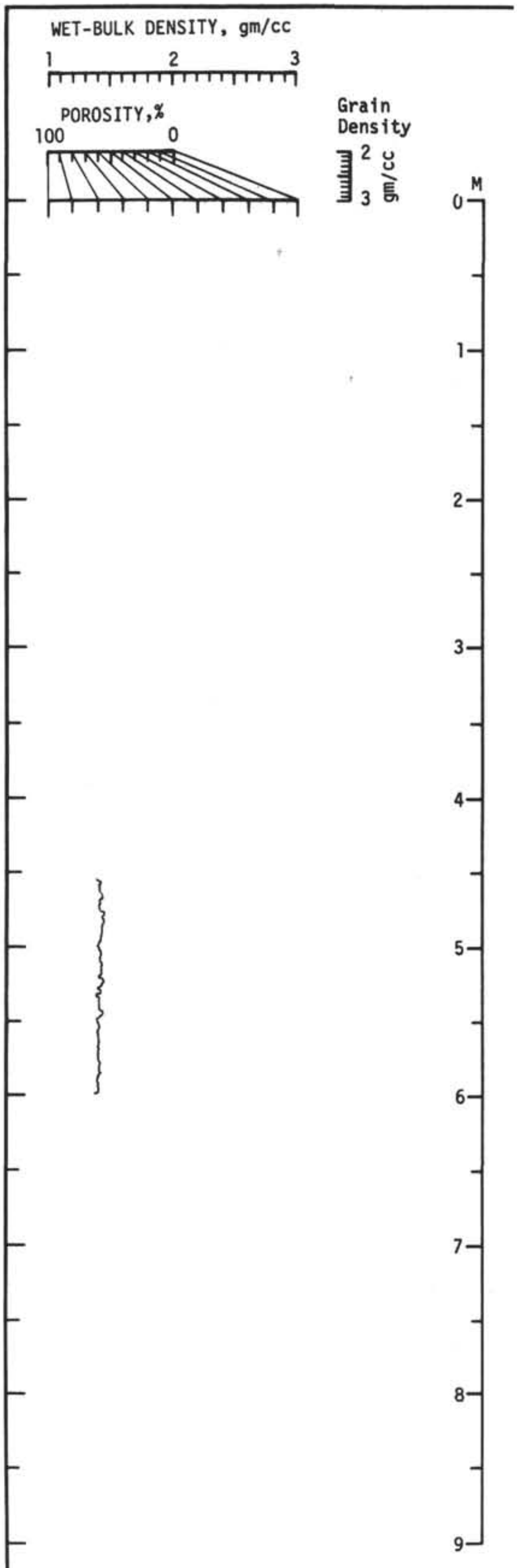
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POROSITY,%
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Density
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gm/cc
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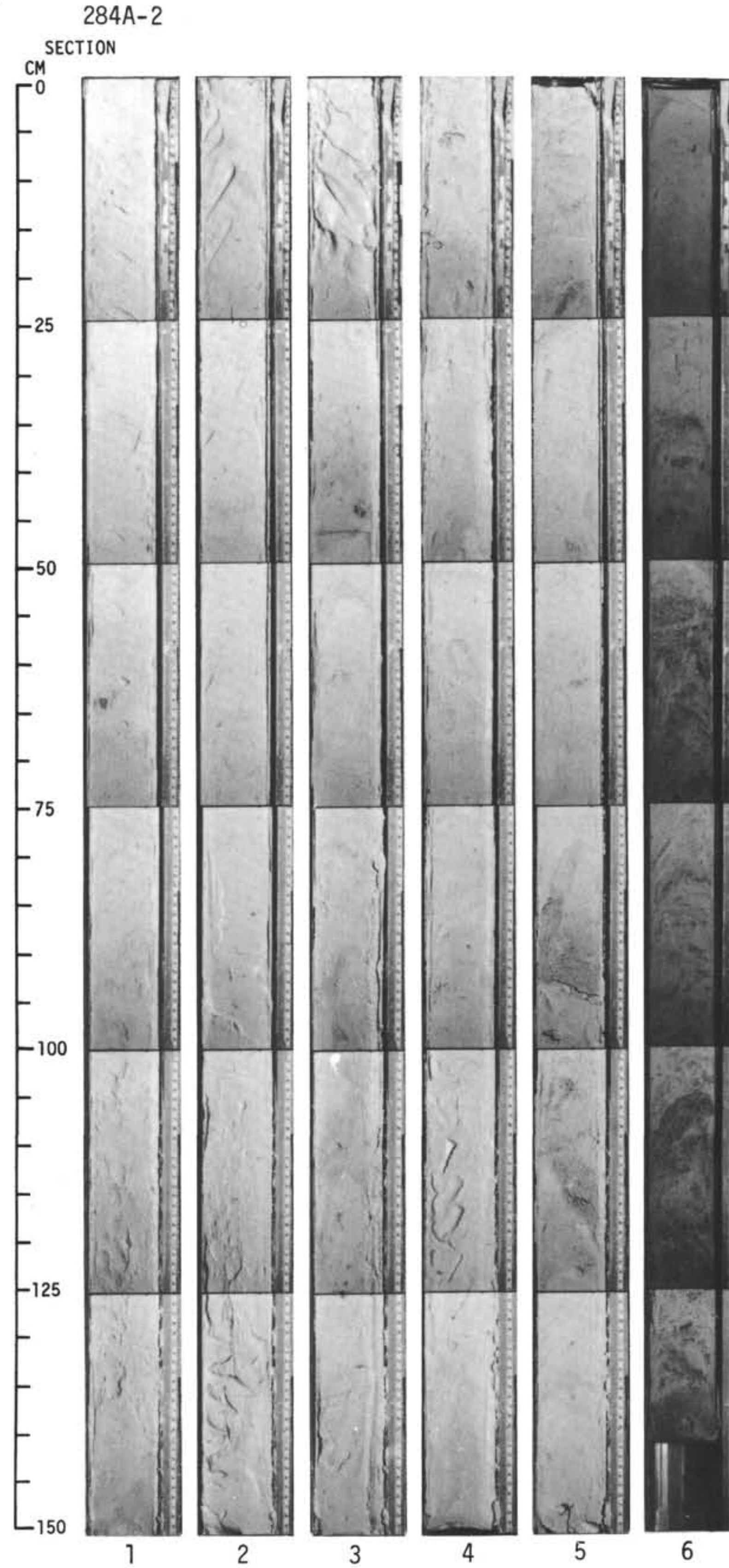
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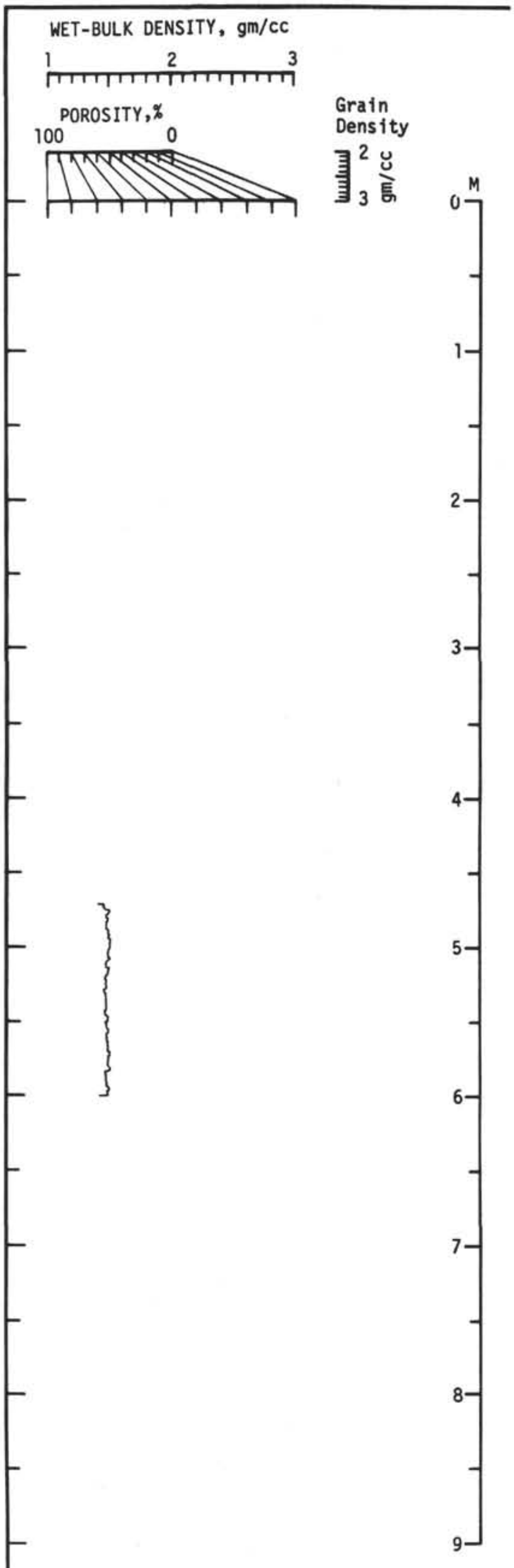
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gm/cc
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2
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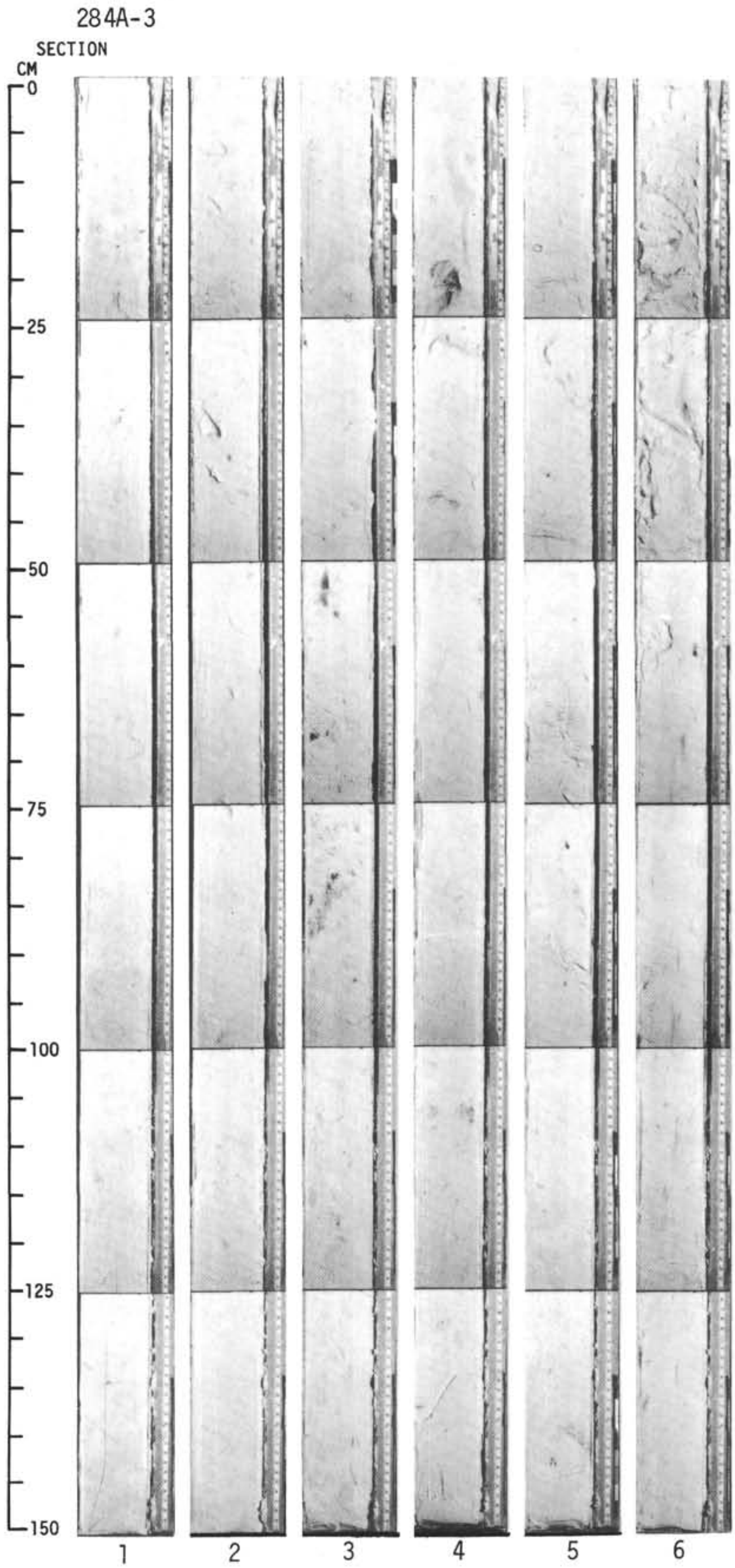
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