5. SITE 167

The Shipboard Scientific Party[1]

SITE DATA

Position:
Latitude: 07°04.1′N
Longitude: 176°49.5′W.

Geography: On Magellan Rise.

Water Depth:
PDR, to derrick floor: 3166 meters.
From drill pipe measurement from derrick floor (adopted): 3176 meters.

Date Occupied: 23 Apr-3 May 71.

Time On Location: Nine days, 12 hours.

Depth of Maximum Penetration: 1185 meters.

Cores Taken: 95.

Total Length of Cored Section: 867 meters.

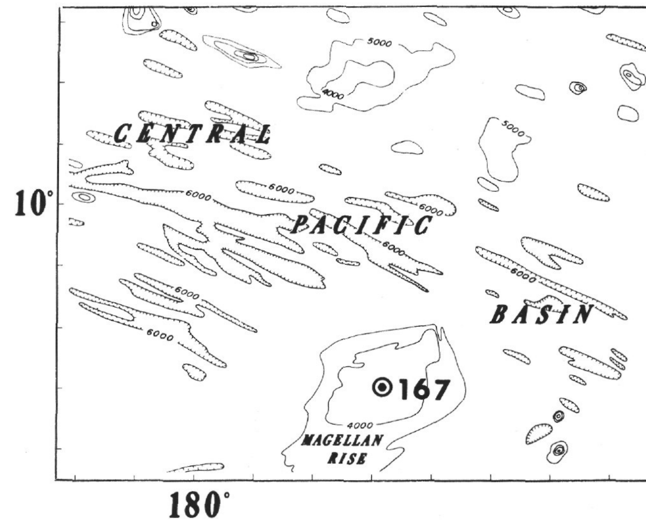
Total Recovery:
Length: 198.6 meters.
Percentage: 34.4.

Percentage of Penetrated Section Cored: 73.

Principal Results: At Site 167 the sedimentary section resting on basalt is 1172 meters thick and comprises five stratigraphic units:

1) Early Miocene to Quaternary calcareous ooze (220 m);
2) Late Eocene and Oligocene calcareous ooze and chalk (380 m).
3) Danian to middle Eocene cherty chalk (80 m);
4) Coniacian to Maestrichtian cherty chalk (147 m); and
5) Tithonian or Berriasian to Turonian cherty limestone (345 m).

Accumulation rates were fast (about 25 m/m.y.) during the late Oligocene and late Cretaceous (20 m/m.y.) but were much slower in the early Tertiary and middle and early Cretaceous (4-10 m/m.y.). (See Figure 1.)



BACKGROUND AND OBJECTIVES

This site on the Magellan Rise was chosen primarily because it promised to provide a complete biostratigraphic section of the Tertiary, and presumably much of the Cretaceous, owing to its elevation well above the present depth of calcium carbonate solution. A short survey by Stuart Smith (personal communication) aboard SIO's ship *Thomas Washington* had shown that the rise is capped by as much as 1000 meters of sediment, within which are two major and one lesser reflecting horizons. A further objective was to sample these horizons and determine their relationship to reflectors in the sediments of the surrounding deep basin. Other specific objectives were to seek further evidence from variations in the rate of sediment accumulation and from paleomagnetic data that this part of the Pacific plate has migrated northward from 20° to 25° south latitude since early Cretaceous time as has been suggested by previous paleomagnetic studies of seamounts (Francheteau et al., 1970) and cored samples from Site 166 (Sclater and Jarrard, 1971).

A broader objective was to acquire information about the history of sedimentation on the rise that might lead to an understanding of the nature of this and similar geomorphic features, such as Manihiki Plateau and Shatsky Rise. Was the Magellan Rise ever at sea level? Is it simply an extra large seamount, and, if so, why is its breadth/height ratio so different from other isolated seamounts? How does the formation of a large volcanic (?) feature like this fit into the currently popular concept of hot spots in the aesthenosphere as sources for the formation of linear oceanic island chains?

OPERATIONS

The site was approached on course 330° between two of the traverses of the *Thomas Washington* survey. A favorable section was observed on the seismic profiler record at about 2000 hrs, 23 Apr 71 (Figures 2a and 2b). The recorded section corresponds to a full second of reflection time with prominent reflectors as follows: sea floor, first subbottom reflection at 0.24, second at 0.60 (very strong), third at

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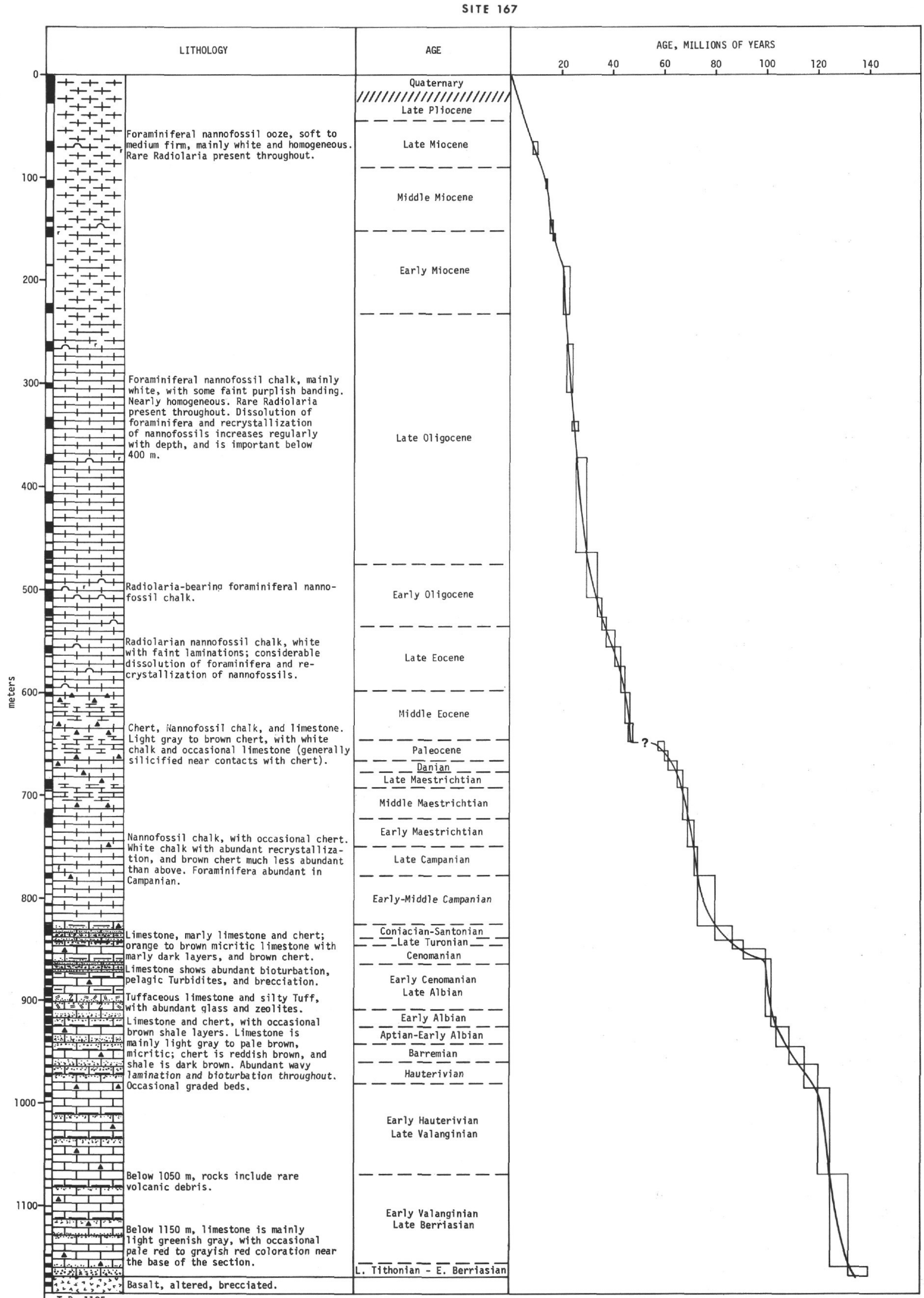

Figure 1. *Graphic log showing lithology, age, and rate of accumulation of sediments at Site 167.*

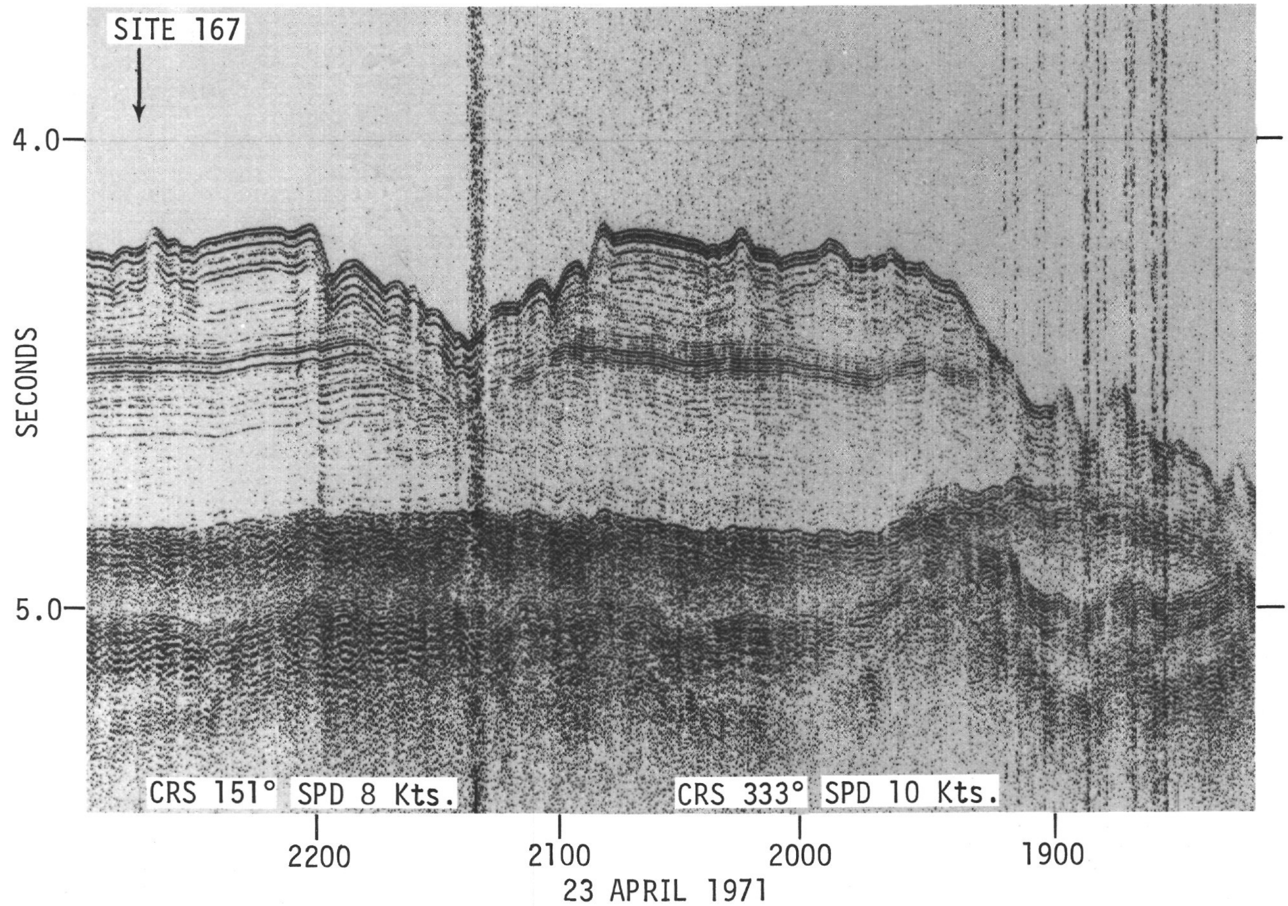

Figure 2a. *Seismic profile recorded by* Glomar Challenger *while approaching Site 167.*

0.79, and basement (?) at 1.00 sec. The ship's course was continued past the site for about one hour and reversed. The seismic record made during the reverse course was very nearly a duplicate of the original one, and the beacon was dropped underway as the ship passed over the selected spot (Figures 3, 4 and 5).

The hole was spot cored—one core every 36 meters—to a depth of 454 meters and continuously cored from there to total depth, 1185 meters. Recovery was good for most of the upper 600 meters, although the base of this zone was difficult to core because of firm chalks that could not be cored dry and would wash away if the pumps were used. The first cherts were encountered at 601 meters and hard cherty limestones at 827 meters. Throughout the zone below 600 meters recovery seldom exceeded 5 meters and was usually much less. Recovery was particularly poor in the upper cherts and in the cherty limestones in the region between 980 and 1140 meters, in spite of constant efforts on the part of the drilling crew to improve it. The problem of coring alternating hard and soft layers is still unsolved.

BIOSTRATIGRAPHIC SUMMARY

The section cored at Site 167 consists of 1185 meters of Tertiary and Cretaceous oozes, chalks, and limestones, with chert, overlying basalt. Except for hiatuses in the Paleogene, at the Cretaceous-Tertiary boundary, and in the upper Cretaceous, the sequence is essentially complete.

The upper 200 meters of section was spot cored at about 30 meter intervals and recovered portions of the Quaternary (Cores 1 and 2), upper Pliocene (Core 3), and upper (Core 4), middle (Cores 5 and 6), and lower Miocene (Cores 7, 8, and 9). The Neogene cores contain diverse and generally well preserved foraminifera (Douglas, this volume), Radiolaria, and nannoplankton. Significant numbers of reworked Miocene and Eocene radiolarians are present in Cores 2 and 3.

Between 223 meters and 545 meters a record thickness of Oligocene chalk was cored (Cores 10-24). Planktonic foraminifera are abundant and well preserved in the upper portion of the Oligocene, but below about Core 16 preservation progressively becomes worse. Radiolarians exhibit nearly an inverse relationship with foraminifera while nannoplankton remain abundant and generally well preserved. The Oligocene-Eocene boundary occurs within Core 25 based on Radiolaria and between Cores 24 and 25 based on nannofossils and foraminifera.

A thin Eocene section was cored between 541 meters and 648 meters, Cores 25 to 37. Recovery was generally limited to core catcher samples and calcareous microfossils are poorly represented. Radiolarians are common or abundant. Cores 25 to 29 are late Eocene and Cores 30 to

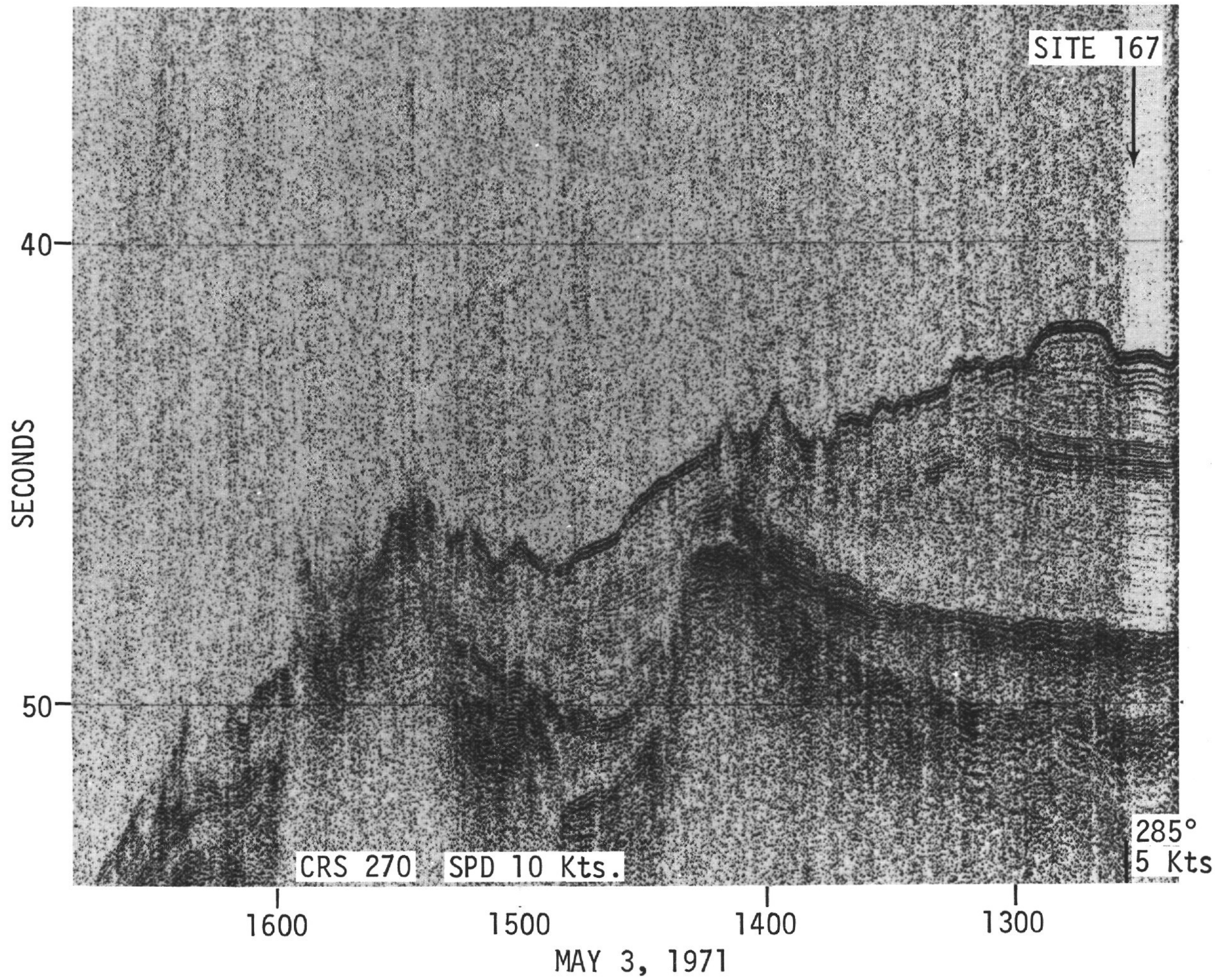

Figure 2b. *Seismic profile recorded by* Glomar Challenger *while leaving Site 167.*

37 are middle Eocene in age. The lowest Eocene sediment recovered belongs to the *Thyrosocyrtis triacantha* and *Nannotetrina fulgens* Zones, earliest middle Eocene. The lower Eocene is missing or highly condensed.

Paleocene foraminifera and nannofossils occur in Cores 38, 39, and 40. No Radiolaria are present. Core 38 and a small block of intact chalk in Core 39, Section 1, contain fossils of early late Paleocene age. The nannofossils in the remainder of Core 39 and in Core 40 are also early late Paleocene, but the foraminiferal assemblages are a mixture of Neogene, Paleocene, and rare Cretaceous species. The Neogene species are from downhole cavings. The presence of Cretaceous foraminifera in Core 39 suggests two possible stratigraphic interpretations: 1) the Cretaceous-Tertiary boundary was drilled within Core 39 (657 to 666 m), and the material recovered in Core 40 is redrilled cavings; or, 2) the Cretaceous species are reworked, and the Cretaceous-Tertiary boundary lies within Core 40 (666 to 676 m). Unfortunately, the poor recovery and mixed fossil assemblages prevent the determination of the exact stratigraphic relationship with either the overlying middle Eocene or the underlying Maestrichtian or the position of the Cretaceous-Tertiary boundary.

Cretaceous chalk and limestone and chert were cored from about 680 meters to 1165 meters, Cores 41 to 94. The Cretaceous-Tertiary boundary was drilled between about 676 meters to 685 meters, but was not recovered. A hiatus seems likely, because the oldest Tertiary sediments (Core 40) are late Danian, and the youngest Cretaceous sediments (Core 41) are early late Maestrichtian. Planktonic foraminifera and nannoplankton date Cores 41 to 48 as Maestrichtian, and Cores 49 to 57 as Campanian; no radiolarians are present. Below Core 55, planktonic foraminifera are absent or poorly preserved as rare silicified or calcified casts. Recrystallized benthonic foraminifera, similar to outer neritic or upper bathyal species in California, occur in the reddish marls of Cores 56 to 60. Nannoplankton date the upper part of Core 58 as probable Santonian, the lower part of Core 58 and Core 59 as Coniacian; benthonic foraminifera suggest the same interval is Coniacian or older, and a hiatus occurs between Cores 57 and 58. Core 60 and the upper part of Core 61 is Turonian,

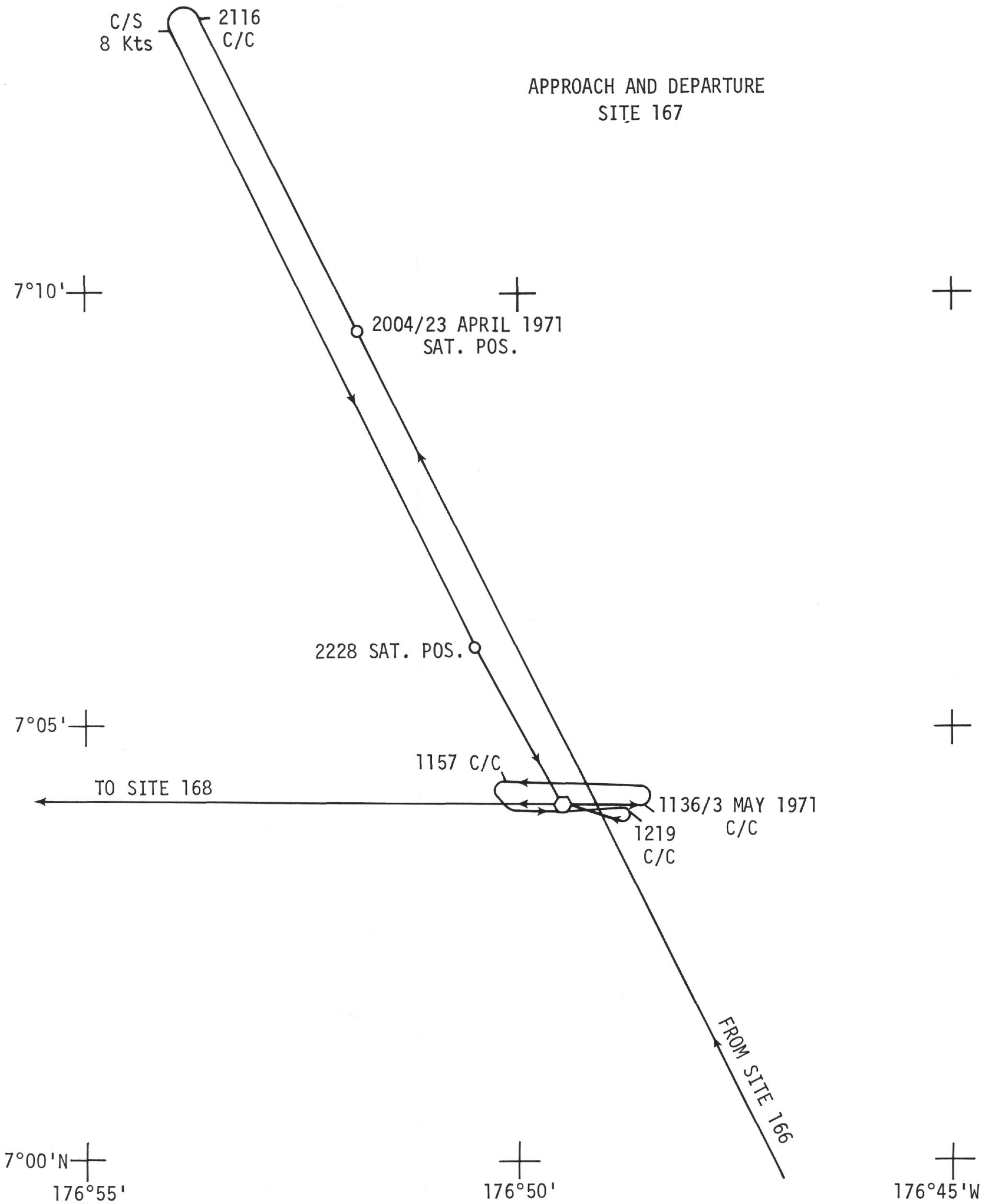

Figure 3. *Track of* Glomar Challenger *in the vicinity of Site 167.*

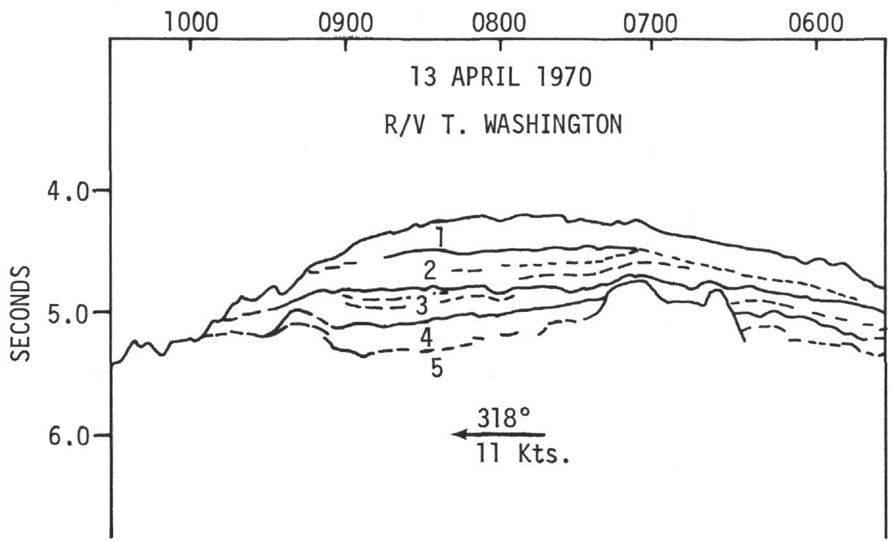

Figure 4a. *Tracing of seismic profile recorded by R/V* T. Washington *on Magellan Rise, showing major lithologic units. See Figure 5 for track.*

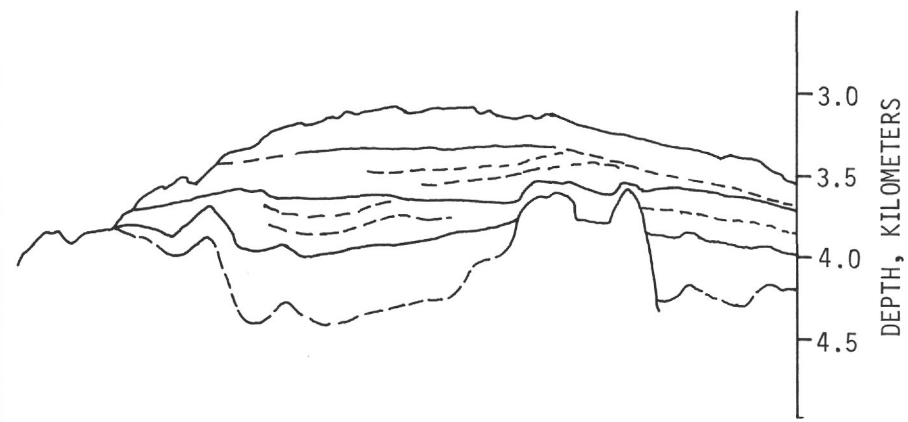

Figure 4b. *Cross section of Magellan Rise, with vertical scale below sea floor corrected for sound velocity in the various lithologic units.*

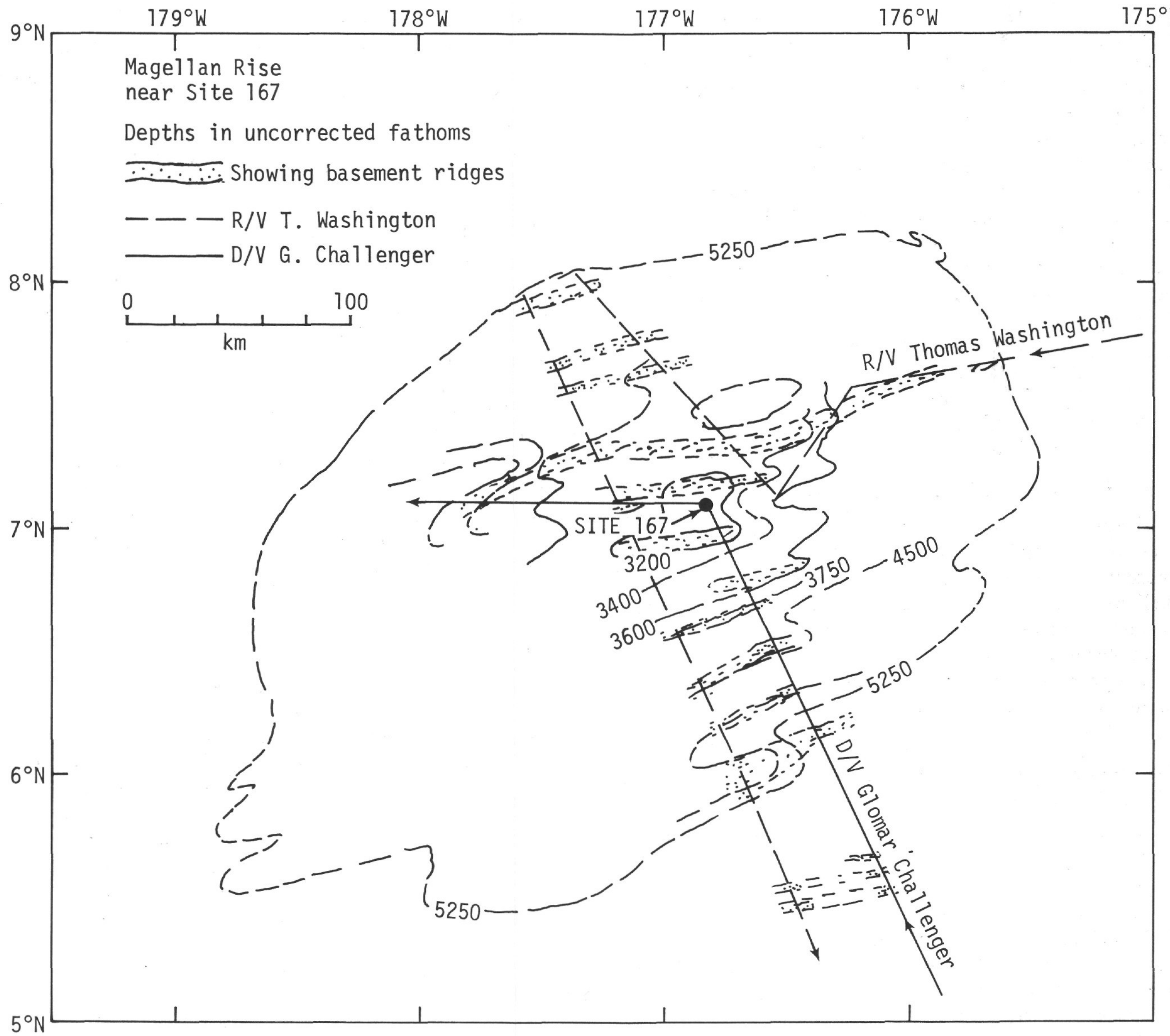

Figure 5. *Sketch map of Magellan Rise, showing bathymetric contours, tracks of* Glomar Challenger *and* T. Washington, *and inferred location of basement ridges near Site 167.*

and the lower part of the same core is Cenomanian. Silicified foraminifera and nannofossils in Core 61 indicate it is early Cenomanian, and the late Cenomanian is missing.

The biostratigraphy of the Lower Cretaceous to uppermost Jurassic interval at Site 167 is based on nannoplankton. The assemblages are strongly affected by diagenesis and only more robust species are preserved (see Roth, this volume). Radiolaria are present throughout this interval and include many taxa recognized as Cretaceous, but this part of the Cretaceous is unzoned at present (Moore, this volume). Radiolarians are best preserved in association with the cherts and are frequently calcified in the limestones without chert.

Subdivisions of the Lower Cretaceous section are as follows: Cores 62 to 68, Albian; Cores 69 to 70, Aptian to early Albian; Cores 71 to 72, Barremian; Cores 73 to 75, Hauterivian; Cores 75 to 84, late Valanginian to early Hauterivian; Cores 86 to 92, early Valanginian to late Berriasian; and Cores 93 to 94, early Berriasian to late Tithonian (Jurassic). For reasons that are difficult to explain, nannoconids are restricted to the early Berriasian and Tithonian interval and absent in younger cores. Thin sections of limestone samples from the interval between Cores 67 and 94 contain rare specimens of benthonic foraminifera (nodosariids), but no pelagic species were observed.

LITHOLOGIC SUMMARY

The sedimentary section of the Magellan Rise was sampled at this site by coring discontinuously in the upper 500 meters and continuously below that depth until basaltic rocks were encountered at 1168 meters.

As a whole, the sediments of this section are relatively homogeneous and consist mainly of biogenous calcium carbonate. Siliceous organisms are generally present, and chert, which was first encountered at 601 meters, is common in all the sections below that level. Volcanic detritus was sampled in the lower portion of the hole.

The most important differences in the nature of the sediments with increasing age and depth of burial are the consequence of diagenetic processes, namely recrystallization and silicification. Because the major lithologic changes are generally abrupt and well defined in the cores and because they correspond remarkably well to the principal reflectors observed on the seismic profile, it appeared convenient to divide the entire section into five lithological units:

1) calcareous ooze (0 to 220 m);
2) chalk (220 to 601 m);
3) chalk and chert (601 to 826 m);
4) limestone and chert (827 to 1168 m);
5) basaltic rocks (1168 to 1185 m, total depth).

Foraminiferal Nannofossil Ooze (Cores 1 to 9)

These sediments consist mainly of white calcareous nannofossils and foraminifera. Radiolaria are regularly present in small but variable amounts. Numerous well-crystallized calcite fragments (silt size), that are certainly fragments of large-sized planktonic foraminifera, were observed in several smear slides.

No primary structures were observed in the ooze, which is almost homogeneous and commonly badly disturbed by the drilling process.

Foraminiferal Nannofossil and Radiolarian Nannofossil Chalk (Cores 9 to 33)

The passage from ooze to chalk appears very gradational, with the highest chalk lumps occurring in the lower part of Core 9 (and possibly some in Core 8). Because this zone corresponds to a relatively sharp and well-defined reflector, and perhaps to an unconformity traceable on seismic profiles in the vicinity of the site, it is possible that the gradational aspect of the boundary between ooze and chalk is rather artificial and results mainly from drilling disturbances.

The chalk is generally firm, white, and almost homogeneous in the upper part. It shows faint laminations and purplish banding in the lower part. These slight changes of coloration result from the presence of fine-grained iron and manganese oxides and possibly pyrite.

The composition of the upper layers of chalk is somewhat similar to that of the oozes above, with abundant calcareous nannofossils and foraminifera and rare radiolarians. The foraminifera very commonly show traces of dissolution and the nannofossils are generally recrystallized. Micritic small grains of calcite, which are probably responsible for some of the cementation, are common to abundant in most smear slides. Below Core 19 (around 490 m) the proportion of radiolarians increases noticeably while that of the foraminifera decreases slowly at first and then sharply after Core 24 (530 m).

In the last core in this interval (Core 32) the radiolarian fragments show evidence of dissolution. This feature is probably related to proximity of these beds to chert, which has its highest occurrence in the next core below.

Nannofossil Chalk and Chert (Cores 33 to 56)

The first chert was encountered in Core 33. Recovery was rather poor in this interval and the largely dominant chert content of the samples is probably artificial and represents only the hardest lithological types present. The limestone associated with the chert is commonly intensely silicified.

The chert is particularly abundant in the upper portion of this interval. Below Core 44 (around 710 m) it is present in lesser proportions and persists down to basement. It is a massive, hard, glassy, chalcedonic chert with conchoidal fracturing. Its color (gray to pale brown) reflects generally the color of the sediments in which it lies, with a somewhat darker tone. Many pieces show remnants of bedding as well as limestone inclusions.

The chalk that predominates from Core 44 down to Core 56 (710 to about 820 m) has a composition slightly different from that of the overlying interval. Radiolarians are generally very rare and disappear completely below Core 38. Foraminifera are generally common and most of them are silicified; they decrease in abundance in the lower cores (52 to 56), which contain some slightly hematitic clay which gives them a pale brown color.

Limestone and Chert (Cores 57 to 94)

These rocks are well indurated and show very well preserved primary structures. They are generally light colored (white, light gray, pale brown, and pale green), the darker rocks generally being slightly enriched in clay and in volcanogenic minerals. Most of the section shows faint laminations that generally have a "wavy" aspect. This may be due partly to bottom-current circulation, but probably mainly to bioturbation and occasional slumping. Burrows are generally abundant and many show deformation by compaction. Turbidites occur regularly. Most of them consist of graded sequences, the base of which is composed of flattened, small, lithified mud pebbles that pass progressively upward to more or less homogeneous sediments. Burrows and "wavy" laminations at the top of sequences often mark the pelagic intervals. Other sequences show graded beds of silicified foraminifera and/or radiolarians. The thickness of the sequences varies from a few centimeters to about 20 cm. They consist exclusively of redepositied pelagic material and probably account for part of the filling of basement depressions that appear on the seismic profile.

In Cores 62 and 63 evidence for more massive displacements of sediment was found in the form of (a) a pebbly mudstone containing large clasts in a homogeneous matrix; (b) large-scale slumping; and (c) brecciated chert and brecciated limestone. The brecciated limestone shows large angular clasts that apparently have not been transported over long distances. The brecciated chert is cemented by well-crystallized sparry calcite and quartz (see Lancelot, this volume; see also frontispiece of this volume). This fragmentation obviously occurred when the chert was already hard. Furthermore, the absence of any sediment filling between the fragments suggests that the chert was probably broken when the sediments were already partially lithified. It is not clear whether part or all of this major sediment displacement could have resulted from some tectonic activity or merely by gravity sliding.

In the upper part of this interval the limestone is generally marly and owes its reddish brown color to the presence of hematite. Clay-rich, dark brown to black beds probably contain some manganese oxides. Smear slides from the limestones show mainly micritic grains of calcite, common to abundant recrystallized nannofossils, and some silt-size sparry calcite grains, commonly rhombic, that might come from the filling of radiolarians and/or foraminifera.

Cores 65, 66, and 67 sampled a dark green silty tuff zone several meters thick that contains abundant volcanic glass and zeolites. In the section below, the limestone is generally light gray to pale brown, and clay minerals are concentrated in thin shale layers, together with zeolites and iron (and Mn?) oxides.

Between Cores 78 and 91 (1010 m to 1140 m), recovery was very poor and chert appears again dominant. This is probably artificial and might indicate a zone of unsampled softer sediment in this interval. Tuff was also observed in the core catcher of Core 90, but owing to very poor recovery, the mixing of several lithologies and the small size of the fragments obtained, this material may, in fact, be only cavings from farther up the hole.

The last three cores recovered above the basement yielded mainly greenish limestone with some grayish red layers toward the bottom. These limestones contain volcanic detritus. They are very hard, but no evidence of any thermodiagenetic processes could be found in them. In fact, calcite is even less crystallized in these layers than in the upper portion of the limestone section. These observations suggest that the basaltic rocks immediately below are extrusive rather than intrusive.

Basaltic Rocks (Cores 94 and 95)

The contact between sediments and basalt was cored in Core 94. The basalt is highly altered and contains many small calcite (and zeolite?) specks, some calcite amygdules, and rare thin calcite veinlets. Some pieces show amygdules of drusy zeolites and plagioclase. The lower part of the section recovered is highly brecciated.

The size and irregularity of the amygdules and the thick rims of altered glass around them, along with the generally fine-grained texture of the basalt and the brecciation (flow breccia?), all support the conclusion that Hole 167 ended in extrusive rather than intrusive basalt. The rock itself is composed of plagioclase laths that are variolitic to felted in fabric and strongly altered (commonly to K-feldspars), less altered pyroxene, and opaques, within a formerly glassy mesostasis that now is chlorite and montmorillonite. Some parts of the cores have distinctive prismatic phenocrysts of now-altered plagioclase as much as 3.5 mm in length, suggesting that more than one flow unit may have been sampled.

Comments on the Lithification of Carbonate (Coplen and Schlanger, this volume)

This hole provides a very good opportunity to study the lithification of deep-sea carbonate rocks in situ. A complete section shows the passage from ooze to chalk and finally to limestone.

The ooze shows generally dominant unaltered nannofossils and foraminifera. The first step in the lithification appears to be the partial dissolution of the foraminifera and some recrystallization of the nannofossils. The chalk is characterized by a general recrystallization of the nannofossils (which are still discrete individuals), the dissolution of the foraminifera, which commonly are well preserved only where silicified, and the appearance of small (clay-size to silt-size) calcite grains, probably recrystallized from dissolved foraminifera and nannofossils. In the limestone, the dominant component is the recrystallized micritic calcite with only few foraminifera (mainly silicified); nannofossils are still common.

PHYSICAL PROPERTIES

Gealy (1971, p.1103) pointed out that for the nannofossil oozes of equatorial Pacific Sites 62, 63, and 64 (Leg 7) wet bulk density and porosity appear to correlate with sediment age as well as with depth of burial. Quaternary oozes at Site 167 have a density of 1.40 to 1.45, compared with a density of about 1.5 at each of the three Leg 7 sites. Middle Miocene sediments at Site 167 have an average density of 1.6 to 1.7, compared with 1.7 to 1.75 for the Leg 7 sites. The average density of late Oligocene sediments at Site 167 is 1.6 to 1.7, compared with 1.85 to 1.90 for the Leg 7 sites. Mid-Tertiary nannofossil oozes occur also at Site 171 (Leg 7) and at Sites 71, 74, and 75 (Leg 8) to the east. The density distributions of Sites 171, 74, and 75 are similar to that of Site 167, while Site 71 follows the density pattern of Sites 62, 63, and 64. Thus, if there is a correlation of density with age for nannofossil oozes, it is complicated. The density differences between the two groups of sites reflect differences in sediment porosities; the grain densities are the same.

Densities at Site 167 remain almost constant at 1.60 to 1.70 from 70 meters to over 600 meters depth below the sea floor. As is the case at Sites 62, 63, and 64, the change from nannofossil ooze to nannofossil chalk at 250 meters does not seem to be caused by a change in porosity. Density rises to about 1.9 as limestone becomes dominant deeper in the hole. The tuffs at about 900 meters are lower in density, about 1.6.

Wet-bulk densities from section weights are consistently higher than GRAPE densities at this site; the reason for this discrepancy is obscure.

Gamma counts are monotonously very low (below 100) in the oozes and chalks owing to extreme dilution by biogenic components; the gamma increases slightly in the limestones. Cores 58, 59, and 60 show extremely variable gamma records with highest peaks of 2300, 2275, and 1850 respectively in the three cores. The peaks seem to correspond with dark reddish brown zones of marly limestone; Core 59 probably has the highest brown zones. No x-ray mineralogy samples were taken from these cores; thus it is not known what minerals were responsible for the high gamma counts. Cores 65 and 69 also showed several high gamma peaks, with a highest count of 1750 near the bottom of Core 69.

CORRELATION BETWEEN STRATIGRAPHIC SECTION AND SEISMIC REFLECTION PROFILE

This site provided an excellent opportunity to measure interval velocities of the various layers by correlations between reflectors in the seismic record, lithologic changes in the stratigraphic section, and drilling breaks. The diagram in Figure 6 shows the most probable correlation.

The upper layer is 220 meters thick and consists mainly of nanno-foram ooze ranging in age from Quaternary through Miocene. The average speed of sound in this layer is 1.82 km/sec. A reflecting zone, which may commence as early as 0.20 sec below bottom, but whose most distinct arrivals are at 0.24 sec, corresponds to a depth near the base of this layer. The behavior of this reflector nearer the edges of the rise suggests that it may represent a minor unconformity near the Miocene-Oligocene boundary.

The layer between the reflector just described and a very prominent one at 0.60 sec below bottom consists of about 320 meters of Oligocene and 60 meters of Eocene nanno-foram ooze and soft chalks. The basal reflector probably corresponds to an abrupt onset of chert in sediments of middle Eocene age, and the drilling rate graph in Figure 6 clearly shows the decrease in penetration rate. The speed of sound in this layer is 2.11 km/sec.

The layer from 600 meters to 827 meters that corresponds to the seismic interval 0.60 to 0.79 sec is cherty chalk ranging in age from middle Eocene to Santonian-Coniacian. It contains some chert throughout, but chert is more concentrated in the upper half than in the lower. This distribution corresponds rather closely to the variation in printing density in the seismic record. Average speed of sound in this layer is 2.38 km/sec.

The deepest sedimentary layer, corresponding to the interval 0.79 to 1.00 sec in the seismic record, is principally limestone and includes numerous beds of chert. Its age ranges from late Cretaceous (Santonian-Coniacian) at the top to earliest Cretaceous or latest Jurassic at the base. Its thickness (343 m) and seismic travel time gives it an interval velocity of 3.26 km/sec, a value somewhat higher than the uncorrected velocities (3.11 km/sec average) determined from many measurements made with the Hamilton sound velocimeter on cored samples. Because the ratio of recovery to penetration was seldom higher than 1/3, we had suspected that the material available to measure was only the hardest, and perhaps appreciably higher than the average velocity for the whole layer. However, it appears that appropriate corrections for temperature and pressure will raise the laboratory measurements into relatively good agreement with the interval velocity given in Figure 6, so the recovered material may be a fair representation of the whole layer after all.

The contact between the limestones and the basalt did not produce a marked drilling break, because the deepest limestones are very hard, and the basalt is appreciably softer than most. Little difference was noted, for example, in cutting the two materials with the diamond saw. The sound velocity also is appreciably lower than that measured on the samples from the preceding sites – 3.86 km/sec at 167 vs. 4.45, 5.13, and 5.25 km/sec at Sites 164, 165, and 166 respectively. This raised some question about identifying the deepest reflector in the seismic profile with the limestone/basalt interface, but the measured velocities along with some admittedly crude density measurements made on the samples indicate a reflectivity coefficient of about 0.1, probably sufficient to produce the observed level of reflection.

The results at this site present a better than average opportunity to examine the correlations between seismic reflectors, lithology, and stratigraphy, because the depositional environment was relatively shallow and the layers are thicker than the corresponding layers in the deep basin. It appears, for example, that at this site we should be able to decide with relatively high confidence whether the prominent midsection reflector (at 0.60 sec below bottom) correlates with early/middle Eocene cherts or with the late Cretaceous/early Tertiary hiatus (?). Although core recovery between the uppermost cherts and the hiatus was extremely poor, the paleontologic evidence puts the hiatus 60 to 80 meters below the top of the cherts. This stratigraphic model, as indicated in Figure 6, strongly favors correlating the reflector with the cherts. This correlation results in quite reasonable interval velocities above and below the top of the cherts. Correlation of the reflector with a hiatus at 660 to 680 meters would result in an interval velocity above the cherts of 2.5 to 2.6 km/sec, and a velocity below the cherts of only 1.5 to 1.6 km/sec, quite unrealistic in view of the lithologies in the two layers. The foregoing assumes that the correlation of the 5.03 sec reflector with the top of the cherty limestone layer is valid, and both the lithologic and the drilling evidence strongly support that correlation.

If the sample recovery had been better in Cores 34 to 41, there would be little reason to question the correlations shown in Figure 6, even though the evidence at several other sites seems to indicate that the hiatus is more reflective than the cherts. Because recovery was so poor, however, it would be prudent to hold open the possibility that the hiatus is considerably closer to the top of the cherts and may be partly, or mainly, responsible for the reflector.

CONCLUSIONS

The sedimentary cover on Magellan Rise, which is nearly 1200 meters thick, consists almost entirely of biogenous calcium carbonate, ranging in age from earliest Cretaceous or latest Jurassic at the base to Quaternary at the top. The oldest sediments rest with depositional contact on altered and brecciated basalt.

The sedimentary column can be subdivided on the basis of degree of lithification into the following units.

1) Calcareous ooze (0-220 m), ranging in age from early Miocene to Quaternary.

2) Chalk (220-601 m), ranging in age from late Eocene to early Miocene.

3) a. Chalk and chert (601-710 m), ranging in age from Maestrichtian to middle Eocene.

b. Chalk with occasional chert (710-826 m), ranging in age from Coniacian to Maestrichtian.

4) Limestone and chert (826-1168 m), ranging in age from Tithonian or Berriasian to Coniacian.

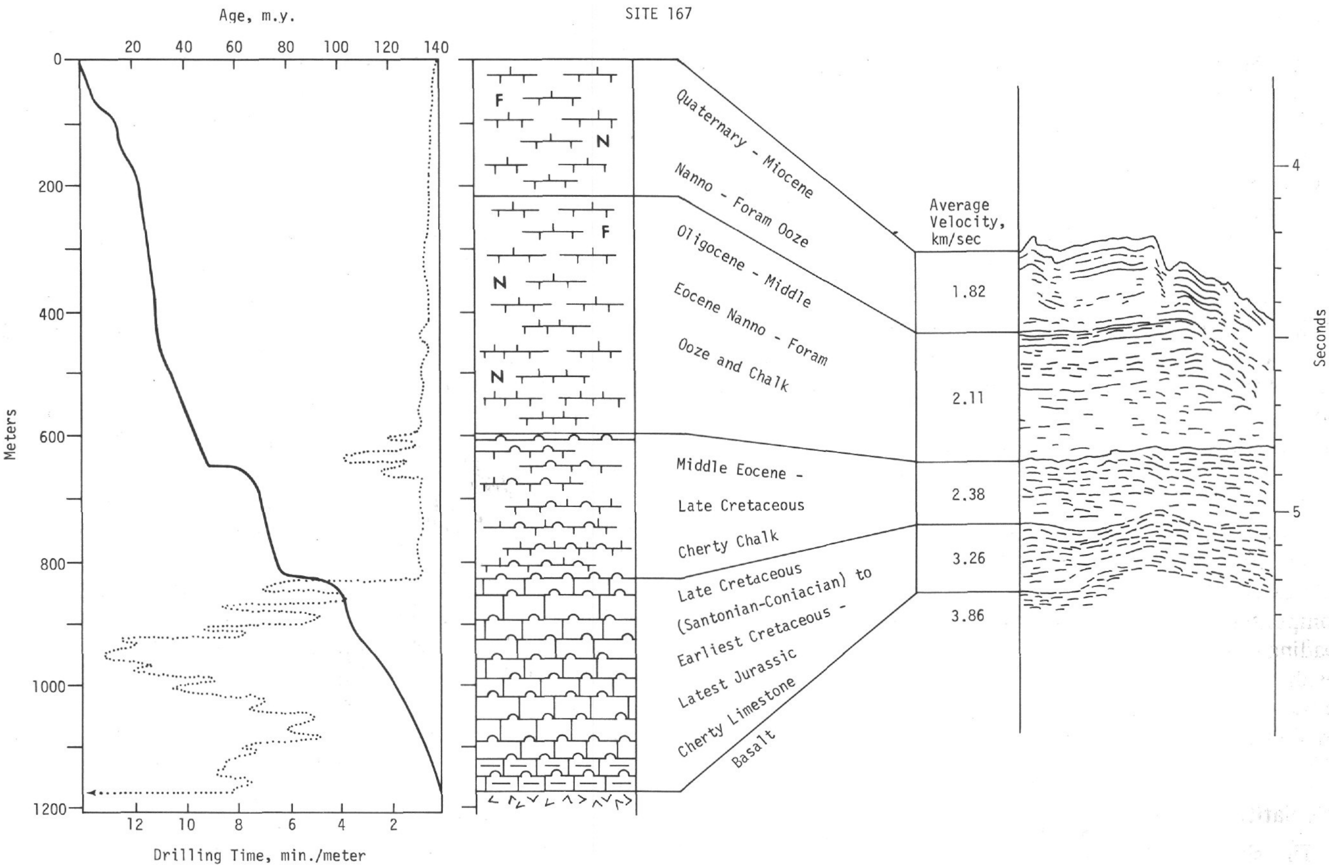

Figure 6. *Correlation of lithology, seismic stratigraphy, drilling rates, and sediment accumulation rates at Site 167.*

The lithologic units correspond very closely with acoustic units, separated by prominent reflectors in the profiler record (Figures 2a, 2b). The four sedimentary units are shown schematically in Figures 4a and 4b. Figure 4a shows the acoustic section, and Figure 4b shows the same section corrected for the velocity of sound in the various units. (See Figure 5 for the location of this section).

Several features in this diagram and in the other profiles merit attention.

Unconformities

Two angular unconformities are visible in the sedimentary section, corresponding to the boundaries between Units 1 and 2 and between 2 and 3. The younger of these discordances correlates with the change from ooze to chalk at a level of about 220 meters, close to the base of the Miocene. At Site 167, the cores give no evidence that any biostratigraphic zones are absent at this level, but the curve showing rate of sediment accumulation (Figure 1) shows a change in slope at about this same level, from fast (~25 m/m.y.) in the Oligocene to slower (~10 m/m.y.) in the Miocene. The profiler records (Figure 4a and Figure 2a, close to the major course change) show the angular relationship. The unconformity may record a change from sluggish bottom currents or less effective dissolution during the time of rapid accumulation in the Oligocene to more rapid currents or more dissolution in the late Tertiary. The profiles suggest that virtually all sediment has been eroded or dissolved, right down to basement, at the outer edge of the plateau. Much of this erosion or dissolution may well have taken place during quite recent times, while sediments continued to accumulate on the top of the plateau in shallower water, at about 10 m/m.y.

Another unconformity is evident near the position of the first cherts in the column (at a depth of 600 m at Site 167). On the R/V *Washington* profile (Figure 4a), it appears that an angular discordance occurs very close to the reflector, that is, near what probably are middle Eocene beds. The rate of accumulation curve (Figure 1), on the other hand, shows the greatest change in slope at a somewhat deeper level, near the base of the Tertiary at the boundary between Units 3a and 3b at about 680 meters, where beds of Danian age rest on beds of middle Maestrichtian age.

Basement Ridges

All profiles show that the basement surface has considerable relief. On Figure 4b, the corrected profile, the height of the prominent buried hills in the basement is about 700 meters above the adjacent basin floor. The sediments beneath Unit 3a all appear to thin markedly over or to buttress out entirely against the basement highs. In map view (Figure 5), the basement highs are shown in their proper locations along the reflection profiles and are interpreted as east-trending narrow ridges.

Paleobathymetry

At the present time the sea floor at Site 167 is above the compensation depth for calcium carbonate, and the evidence obtained from the presence of calcareous nannofossils at all levels in the stratigraphic section indicates that this has been so ever since the beginning of Cretaceous times.

No evidence came to light suggesting the presence of shallow water at any time on Magellan Rise; indeed, the sequence can be interpreted simply through a static model in which the water depth changes over the past 135 m.y. are due to the sediment accumulated on the rise, i.e., the water was initially about 4300 meters deep. If we allow for isostatic subsidence under the load of the sediments, the original depth would be about 3750 meters.

If, on the other hand, the plateau has subsided apace with typical sea floor produced at a rise crest, then the difference in original and final depth, after 135 m.y., should be about 3300 meters (Sclater, et al., 1971), giving a calculated initial depth of about 1000 meters (no isostatic compensation), or about 400 meters (allowing for isostatic loading). A depth of only 400 meters at the drill site would result in depths very close to or even above sea level for some of the nearby ridges on the rise. No evidence of resedimented shallow-water material was detected at Site 167.

Paleolatitude

The shape of the rate of accumulation curve (Figure 1) suggests that the site was in the equatorial zone of high productivity during late Oligocene times, about 25 to 30 m.y. ago. The northward shift has therefore been at an average rate of about 1 degree per 4 m.y. (2.5 cm/m.y.), a figure consistent with results from Site 166 and from sites farther east, drilled during Leg 8 (Tracey, Sutton et al., 1971), and Leg 9 (Hays et al., 1972).

The Cretaceous part of the curve is also qualitatively consistent with the notion of earlier northward motion of the Pacific plate, bringing Site 167 from southern latitudes up to a near-equatorial position by the end of Cretaceous times.

The enigmatic part of the curve is the early Tertiary part. If the site were near the equator 70 m.y. ago and 30 m.y. ago, where was it in between times? A simple answer is that it was near the equator, but that something happened to slow down the accumulation rate. The fact that the same kink in the rate curve, associated with abundant chert, is found at so many places in the Pacific suggests that more than local conditions are responsible. This whole question is taken up in more detail in the chapter on Regional Interpretations.

Nature of Basement Rocks

The extrusive basalt beneath the sedimentary rocks at Site 167 is more highly altered than the basalt at Sites 164, 165, or 166. It not only drilled very easily and cut quickly on the diamond saw, but it also transmits sound waves relatively slowly (3.86 km/sec). Since only about 17 meters of basalt were cored, it is possible that we sampled only an altered upper surface and that more normal rocks lie below.

Age of Basement

The paleontological evidence based on shipboard study of samples indicates an age for the oldest sediments of either early Cretaceous (Berriasian) or latest Jurassic (Tithonian); that is, about 135 m.y. This is as old as any material yet cored in the Pacific (at Sites 49 and 50, Leg 6, Heezen, Fischer et al., 1971, on the Shatsky Rise).

Whether any additional sediments lie buried beneath the basalts at this site is unknown. The highly altered nature of the basalt makes comparisons with ocean ridge basalts difficult, though the data presented by Bass et al. (this volume) on volcanic rocks suggests ocean island tholeiites at Site 167

If we accept the basement as ridge-crest basalt, about 135 m.y. old, and if we regard the basement at Site 167 as having been formed at the same spreading ridge as at Site 166, as is suggested by the parallelism in bathymetric trends at both sites (Chart, in pocket) and the coincidence of magnetic and bathymetric trends at Site 166, then we can estimate the average spreading rate between the two sites. The range in crustal age for Site 167 is from 130 to 140 m.y., and for Site 166, from 116 to 120 m.y., giving a range of half-spreading rates of from about 2 to 4 cm per year.

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APPENDIX A
Core Inventory – Site 167

Core	Depth Below Sea Floor (m) Top	Depth Below Sea Floor (m) Bottom	Total Depth[a] (m) Top	Total Depth[a] (m) Bottom	Cored (m)	Recovered (m)	Lithology	Age
1	0	9	3176	3185	9	8.5	Foraminiferal nannofossil ooze	Quaternary
2	9	18	3185	3194	9	8	Foraminiferal nannofossil ooze	Quaternary
3	18	28	3194	3204	10	9	Foraminiferal nannofossil ooze	Late Pliocene
4	66	75	3242	3251	9	9	Foraminiferal nannofossil ooze	Late Miocene
5	103	112	3279	3288	9	7	Foraminiferal nannofossil ooze	Middle Miocene
6	140	149	3316	3325	9	3	Foraminiferal nannofossil ooze	Middle Miocene
7	149	158	3325	3334	9	9	Foraminiferal nannofossil ooze	Early Miocene
8	186	195	3362	3371	9	1.5	Foraminiferal nannofossil ooze	Early Miocene
9	223	232	3399	3408	9	9	Foraminiferal nannofossil ooze	Early Miocene
10	260	269	3436	3445	9	9	Foraminiferal nannofossil chalk	Late Oligocene
11	297	306	3473	3482	9	9	Foraminiferal nannofossil chalk	Late Oligocene
12	334	343	3510	3519	9	9	Foraminiferal nannofossil chalk	Late Oligocene
13	370	379	3546	3555	9	7.5	Foraminiferal nannofossil chalk	Late Oligocene
14	407	416	3583	3592	9	8.5	Foraminiferal nannofossil chalk	Late Oligocene
15	435	444	3611	3620	9	9	Foraminiferal nannofossil chalk	Late Oligocene
16	454	463	3630	3639	9	2.5	Foraminiferal nannofossil chalk	Late Oligocene
17	463	472	3639	3648	9	7.5	Foraminiferal nannofossil chalk	Early Oligocene
18	472	481	3648	3657	9	3	Foraminiferal nannofossil chalk	Early Oligocene
19	481	491	3657	3667	10	3	Foraminiferal nannofossil chalk	Early Oligocene
20	491	500	3667	3676	9	3	Radiolarian-bearing foraminiferal nannofossil chalk	Early Oligocene
21	500	509	3676	3685	9	9	Radiolarian-bearing foraminiferal nannofossil chalk	Early Oligocene
22	509	519	3685	3695	10	2	Foraminiferal nannofossil chalk	Early Oligocene
23	519	528	3695	3704	9	6.5	Foraminiferal nannofossil chalk	Early Oligocene
24	528	537	3704	3713	9	1.5	Radiolarian nannofossil chalk	Early Oligocene
25	537	541	3713	3717	4	0.1 CC	Radiolarian nannofossil chalk	Late Eocene
26	541	546	3717	3722	5	0.3	Radiolarian nannofossil chalk	Late Eocene
27	546	555	3722	3731	9	0.1	Radiolarian nannofossil chalk	Late Eocene
28	555	564	3731	3740	9	6	Radiolarian nannofossil chalk	Late Eocene
29	564	574	3740	3750	10	CC	Radiolarian nannofossil chalk	Late Eocene
30	574	583	3750	3759	9	0.5	Radiolarian nannofossil chalk	Middle Eocene
31	583	592	3759	3768	9	CC	Radiolarian nannofossil chalk	Middle Eocene
32	592	601	3768	3777	9	4.5	Radiolarian nannofossil chalk	Middle Eocene
33	601	611	3777	3787	10	2	Chert, nannofossil chalk and limestone	Middle Eocene
34	611	620	3787	3796	9	CC	Chert, nannofossil chalk and limestone	Middle Eocene
35	620	629	3796	3805	9	CC	Chert, nannofossil chalk and limestone	Middle Eocene
36	629	639	3805	3815	10	CC	Chert, nannofossil chalk and limestone	Middle Eocene
37	639	648	3815	3824	9	CC	Chert, nannofossil chalk and limestone	Middle Eocene
38	648	657	3824	3833	9	0.5	Chert, nannofossil chalk and limestone	Paleocene
39	657	666	3833	3842	9	0.7	Chert, nannofossil chalk and limestone	Paleocene
40	666	676	3842	3852	10	1.5	Chert, nannofossil chalk and limestone	Paleocene
41	676	685	3852	3861	9	0.4	Chert, nannofossil chalk and limestone	Late Maastrichtian
42	685	694	3861	3870	9	7.5	Chert, nannofossil chalk and limestone	Middle Maastrichtian
43	694	703	3870	3879	9	1.7	Chert, nannofossil chalk and limestone	Middle Maastrichtian
44	703	713	3879	3889	10	0.4	Chert, nannofossil chalk and limestone	Middle Maastrichtian
45	713	722	3889	3898	9	9	Nannofossil chalk with occasional chert	Middle Maastrichtian
46	722	731	3898	3907	9	9	Nannofossil chalk with occasional chert	Early Maastrichtian
47	731	740	3907	3916	9	CC	Nannofossil chalk with occasional chert	Early Maastrichtian
48	740	750	3916	3926	10	0.3	Nannofossil chalk with occasional chert	Early Maastrichtian
49	750	759	3926	3935	9	1.5	Nannofossil chalk with occasional chert	Late Campanian
50	759	768	3935	3944	9	1	Nannofossil chalk with occasional chert	Late Campanian

APPENDIX A – *Continued*

Core	Depth Below Sea Floor (m) Top	Depth Below Sea Floor (m) Bottom	Total Depth[a] (m) Top	Total Depth[a] (m) Bottom	Cored (m)	Recovered (m)	Lithology	Age
51	768	777	3944	3953	9	CC	Nannofossil chalk with occasional chert	Late Campanian
52	777	786	3953	3962	9	3	Nannofossil chalk with occasional chert	Early Campanian
53	786	796	3962	3972	10	0.7	Nannofossil chalk with occasional chert	Early Campanian
54	796	805	3972	3981	9	0.4	Nannofossil chalk with occasional chert	Early Campanian
55	805	814	3981	3990	9	2	Nannofossil chalk with occasional chert	Early Campanian
56	814	823	3990	3999	9	1	Nannofossil chalk with occasional chert	Early Campanian
57	823	827	3999	4003	4	1	Limestone, marly limestone and chert	Early Campanian
58	827	832	4003	4008	5	5	Limestone, marly limestone and chert	Santonian to Coniacian
59	832	841	4008	4017	9	4	Limestone, marly limestone and chert	Santonian to Coniacian
60	841	851	4017	4027	10	2	Limestone, marly limestone and chert	Late Turonian
61	851	860	4027	4036	9	2	Limestone, marly limestone and chert	Cenomanian
62	860	870	4036	4046	10	5	Limestone, marly limestone and chert	Late Albian to Early Cenomanian
63	870	879	4046	4055	9	5.5	Limestone, marly limestone and chert	Late Albian to Early Cenomanian
64	879	888	4055	4064	9	6.7	Limestone, marly limestone and chert	Late Albian
65	888	898	4064	4074	10	6	Tuffaceous limestone and silty tuff	Late Albian
66	898	907	4074	4083	9	3.2	Tuffaceous limestone and silty tuff	Late Albian
67	907	916	4083	4092	9	5	Tuffaceous limestone, chert and occasional shale	Early Albian
68	916	925	4092	4101	9	6.2	Limestone and chert with thin brown shale layers	Early Albian
69	925	935	4101	4111	10	6	Limestone and chert with thin brown shale layers	Aptian
70	935	944	4111	4120	9	5.2	Limestone and chert with thin brown shale layers	Aptian
71	944	953	4120	4129	9	2.5	Limestone and chert with thin brown shale layers	Barremian
72	953	962	4129	4138	9	3	Limestone and chert with thin brown shale layers	Barremain
73	962	971	4138	4147	9	3	Limestone and chert with thin brown shale layers	Hauterivian
74	971	981	4147	4157	10	2	Limestone and chert with thin brown shale layers	Hauterivian
75	981	990	4157	4166	9	0.5	Limestone and chert with thin brown shale layers	Late Valanginian to Early Hauterivian
76	990	999	4166	4175	9	3	Limestone and chert with thin brown shale layers	Late Valanginian to Early Hauterivian
77	999	1008	4175	4184	9	0.7	Limestone and chert with thin brown shale layers	Late Valanginian to Early Hauterivian
78	1008	1018	4184	4194	10	0.6	Limestone and chert with thin brown shale layers	Late Valanginian to Early Hauterivian
79	1018	1027	4194	4203	9	0		
80	1027	1036	4203	4212	9	0		
81	1036	1045	4212	4221	9	0.1	Limestone and chert with thin brown shale layers	Late Valanginian to Early Hauterivian
82	1045	1055	4221	4231	10	0.1	Chert	Late Valanginian to Early Hauterivian
83	1055	1064	4231	4249	9	0.002		Late Valanginian to Early Hauterivian
84	1064	1073	4240	4249	9	CC	Limestone, chert and shale	Late Valanginian to Early Hauterivian
85	1073	1082	4249	4258	9	CC	Chert	Late Berriasian to Early Valanginian
86	1082	1101	4258	4277	19	CC	Chert	Late Berriasian to Early Valanginian
87	1101	1108	4277	4284	7	CC+.2	Limestone, chert and shale	Late Berriasian to Early Valanginian

APPENDIX A – *Continued*

Core	Depth Below Sea Floor (m) Top	Bottom	Total Depth[a] (m) Top	Bottom	Cored (m)	Recovered (m)	Lithology	Age
88	1108	1119	4284	4295	11	0.5	Limestone, chert and shale	Late Berriasian to Early Valanginian
89	1119	1129	4295	4305	10	CC	Limestone, chert and shale	Late Berriasian to Early Valanginian
90	1129	1138	4305	4314	9	CC	Limestone and silty tuff	Late Berriasian to Early Valanginian
91	1138	1148	4314	4324	10	0		
92	1148	1157	4324	4333	9	1.5	Limestone, chert and shale	Late Berriasian to Early Valanginian
93	1157	1166	4333	4342	9	2.5	Limestone, chert and shale	Late Berriasian to Early Valanginian
94	1166	1175	4342	4351	9	4	Limestone on basalt	Late Tithonian to Early Berriasian
95	1175	1185	4351	4361	10	3	Basalt	

[a]Measured from the derrick floor.

APPENDIX B
Physical Properties – Site 167

Core Section	Section Weight Wet Bulk Density (g/cc)	GRAPE: Wet Bulk Density Total Range (g/cc)	GRAPE: Wet Bulk Density Undisturbed (g/cc)	GRAPE: Assigned Grain Density (g/cc)	GRAPE: Porosity Total Range (%)	GRAPE: Porosity Undisturbed (%)	Syringe: Interval Sampled (cm)	Syringe: Wet Bulk Density (g/cc)	Syringe: Grain Density (g/cc)	Syringe: Porosity (%)	Natural Gamma Radiation: Total Count	Natural Gamma Radiation: Net	Sonic Velocity: Interval Sampled (cm)	Sonic Velocity: (km/sec)
1-1		1.07-1.15		2.71	92.5-97.2						1450	175		
1-2		1.30-1.34		2.71	81.2-83.6									
1-3	1.48	1.30-1.40		2.71	77.6-83.6									
1-4	1.48	1.35-1.40		2.71	77.6-80.6									
1-5	1.53	1.40-1.45	1.40-1.45	2.71	74.7-77.6	74.7-77.6								
1-6	1.48	1.38-1.44	1.40-1.44	2.71	75.3-78.8	77.6-78.8	87	1.59	2.47	61.1				
2-1		1.30-1.35		2.71	80.6-83.6						1300	25		
2-2	1.40	1.40		2.71	77.6								62	1.54
													117	1.55
2-3	1.48	1.40-1.45		2.71	74.7-77.6								100	1.52
2-4	1.56	1.40	1.40	2.71	77.6	77.6								
2-5	1.50	1.40-1.45	1.40-1.45	2.71	74.7-77.6	74.7-77.6								
2-6		1-40,1-43		2.71	75.9-77.6									
3-1		1.45-1.50	1.45-1.50	2.71	71.7-74.7	71.7-74.7	108	1.57	2.50	62.9	1300	25	93	1.53
3-2		1.40-1.50		2.71	71.7-77.6									
3-3		1.40-1.45		2.71	74.7-77.6								85	1.55
3-4		1.45-1.50		2.71	71.7-74.7								90	1.50
3-5		1.45	1.45	2.71	74.7	74.7							43	1.51
													93	1.55
3-6		1.42-1.48	1.45-1.48	2.71	72.9-76.5	72.9-74.7							35	1.53
													97	1.51
4-1		1.50-1.54		2.71	69.3-71.7						1300	50		
4-2		1.54-1.64		2.71	63.4-69.3								39	1.53
													118	1.55
4-3		1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8	39	1.57	2.15	51.6			43	1.54
													78	1.55
													137	1.55
4-4		1.60-1.70	1.60-1.70	2.71	59.9-65.8	59.9-65.8	60	1.67	2.29	62.9			42	1.56
													125	1.57
4-5		1.57-1.66	1.57-1.66	2.71	62.2-67.6	62.6-67.6	73	1.63	2.72	64.6				
4-6		1.57-1.63	1.57-1.63	2.71	64.0-67.6	64.0-67.6								
5-1		1.27-1.60		2.71	65.8-85.4						1325	25		
5-2		1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8	20	1.56	2.26					
5-3		1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8	21	1.71	2.76					
5-5		1.58-1.62	1.58-1.62	2.71	64.6-67.0	64.6-67.0	68	1.58	2.45				30	1.54
													85	1.56
6-2		1.40-1.45		2.71	74.7-77.6						1300	0		
6-3		1.40-1.65	1.60-1.65	2.71	62.8-77.6	62.8-65.8	80	1.72	2.68	58.3			91	1.55
													133	1.57
6-4		1.64-1.68	1.64-1.68	2.71	61.0-63.4	61.0-63.4	87	1.65	1.45	58.4			43	1.56

APPENDIX B – *Continued*

Core Section	Section Weight Wet Bulk Density (g/cc)	GRAPE: Wet Bulk Density Total Range (g/cc)	GRAPE: Wet Bulk Density Undisturbed (g/cc)	GRAPE: Assigned Grain Density (g/cc)	GRAPE: Porosity Total Range (%)	GRAPE: Porosity Undisturbed (%)	Syringe: Interval Sampled (cm)	Syringe: Wet Bulk Density (g/cc)	Syringe: Grain Density (g/cc)	Syringe: Porosity (%)	Natural Gamma Radiation: Total Count	Natural Gamma Radiation: Net	Sonic Velocity: Interval Sampled (cm)	Sonic Velocity (km/sec)
7-1		1.52-1.62		2.71	64.6-70.5						1325	25		
7-2		1.57-1.70	1.57-1.70	2.71	59.9-67.6	59.9-67.6							70	1.53
7-3		1.50-1.66	1.60-1.66	2.71	62.6-71.7	65.8-71.7								
7-4		1.55-1.67		2.71	61.6-68.8									
7-5		1.57-1.72	1.57-1.72	2.71	58.7-67.6	58.7-67.6	139	1.65	2.68	62.1			51	1.56
							139	1.62	2.46	58.3			84	1.60
													136	1.55
7-6		1.50-1.60		2.71	65.8-71.7									
8-1		1.50-1.60		2.71	65.8-71.7		20	1.60	2.43	59.1	1300	25	81	1.57
													132	1.57
9-1		1.56-1.70	1.62-1.70	2.71	59.9-68.2	59.9-64.6	74	1.79	2.67	53.2	1300	25		
							108	1.81	2.82	56.3				
9-2		1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8							49	1.57
													110	1.58
9-3		1.65-1.72	1.65-1.72	2.71	58.7-62.8	58.7-62.8	98	1.69	2.52	55.5			58	1.57
													137	1.51
9-4		1.65-1.70	1.65-1.70	2.71	59.9-62.8	59.9-62.8	74	1.70	2.55	55.7			43	1.60
													111	1.62
9-5		1.60-1.68	1.60-1.68	2.71	61.0-65.8	61.0-65.8	30	1.61	2.37	56.5			24	1.58
													82	1.59
													128	1.58
9-6		1.65-1.70	1.65-1.70	2.71	59.9-62.8	59.9-62.8								
10-1		1.60-1.69	1.60-1.69	2.71	60.4-65.8	60.4-65.8	114	1.75	2.63	54.9	1325	50		
10-2		1.58-1.65	1.58-1.65	2.71	62.8-67.0	62.8-67.0	129	1.67	2.50	56.1			15	1.58
													88	1.56
10-3	1.74	1.60-1.68	1.60-1.68	2.71	61.0-65.8	61.0-65.8							86	1.54
													128	1.58
10.4	1.70	1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8	44	1.56	2.24	56.1			32	1.59
													96	1.57
10-5	1.69	1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8							50	1.58
													107	1.56
10-6		1.60-1.65	1.60-1.65	2.71	62.8-65.8	62.8-65.8	16	1.60	2.34	56.3			54	1.57
													107	1.58
11-1		1.50-1.70	1.50-1.70	2.71	59.9-71.7	59.9-71.7					1300	25		
11-2	1.76	1.62-1.75	1.62-1.75	2.71	56.9-64.6	56.9-64.6							31	1.61
													90	1.62
													115	1.59
11-3	1.72	1.60-1.68	1.60-1.68	2.71	61.0-65.8	61.0-65.8	13	1.65	2.36	53.4			68	1.65
11-4	1.74	1.64-1.67	1.64-1.67	2.71	61.6-63.4	61.6-63.4							34	1.59
													94	1.61
11-5	1.72	1.62-1.66	1.62-1.66	2.71	62.2-64.6	62.2-64.6							32	1.62
													96	1.57
11-6		1.63-1.67	1.63-1.67	2.71	61.6-64.0	61.6-64.0							19	1.52
													81	1.55

12-1	1.72	1.60-1.77	1.60-1.77	2.71	55.7-65.8	55.7-65.8	60	1.66	2.41	54.4	1300	25	98	1.57
12-2	1.76	1.64-1.70	1.64-1.70	2.71	59.9-63.4	59.9-63.4							34	1.60
													99	1.58
12-3	1.76	1.63-1.68	1.63-1.68	2.71	61.0-64.0	61.0-64.0	60	1.75	2.61	54.2			24	1.61
													116	1.59
12-4	1.74	1.65-1.69	1.65-1.69	2.71	60.4-62.8	60.4-62.8							31	1.61
													73	1.65
12-5	1.70	1.64-1.69	1.64-1.69	2.71	60.4-63.4	60.4-63.4								
12-6	1.74	1.65-1.70	1.65-1.70	2.71	59.9-62.8	59.9-62.8								
13-1		1.53-1.68	1.53-1.68	2.71	61.0-69.9	61.0-69.9					1300	25	60	1.78
													110	1.73
13-2													28	1.70
													112	1.89
13-3		1.45-1.68	1.45-1.68	2.71	61.0-74.7	61.0-74.7							20	1.71
													110	1.71
13-4		1.57-1.68		2.71	61.0-67.6									
13-5	1.68	1.65-1.71	1.65-1.71	2.71	59.3-62.8	59.3-62.8	60	1.64	2.29	51.4			42	1.73
													96	1.72
14-1		1.63-1.73	1.63-1.73	2.71	58.1-64.0	58.1-64.0					1300	25	88	1.72
													108	1.66
14-2	1.72	1.62-1.64		2.71	63.4-64.6								35	1.65
													93	1.66
14-3	1.72	1.61-1.65		2.71	62.8-65.2								19	1.71
													110	1.71
													139	1.60
14-4	1.74	1.59-1.65		2.71	62.8-66.4		14	1.63	2.35	54.2			42	1.60
													84	1.60
14-5	1.68	1.62-1.64	1.62-1.64	2.71	63.4-64.6	63.4-64.6								
14-6		1.60-1.66	1.60-1.66	2.71	62.2-65.8	62.2-65.8								
15-1		1.47-1.60	1.47-1.60	2.71	65.8-73.5	65.8-73.5					1300	25	39	1.67
													101	1.65
15-2		1.45-1.53	1.45-1.53	2.71	69.9-74.7	69.9-74.7							38	1.67
													111	1.69
15-3		1.45-1.53	1.45-1.53	2.71	69.9-74.7	69.9-74.7							46	1.61
													106	1.68
15-4		1.45-1.50	1.45-1.50	2.71	71.7-74.7	71.7-74.7							37	1.68
													104	1.72
15-5		1.45-1.70	1.45-1.70	2.71	59.9-74.7	59.9-74.7							46	1.64
													139	1.65
15-6		1.55-1.65	1.55-1.65	2.71	62.8-68.8	62.8-68.8							87	1.66
													142	1.64
16-2		1.42-1.74		2.71	57.5-76.5						1325	75		
17-2		1.52-1.70		2.71	59.9-70.5						1300	50		
17-3		1.47-1.67		2.71	61.6-73.5									
17-4		1.50-1.72		2.71	58.7-71.7									
17-5		1.52-1.72		2.71	58.7-70.5									
18-1		1.50-1.64		2.71	63.4-71.7						1300	50		
18-2	1.66	1.57-1.71		2.71	59.3-67.6		102	1.54	2.16	54.2				
19-1		1.57-1.65		2.71	62.8-67.6						1325	75		
19-2		1.65-1.73		2.71	58.1-62.8									
20-1		1.55-1.64		2.71	63.4-68.8						1275	0		
20-2		1.65-1.70		2.71	59.9-62.8									

APPENDIX B – *Continued*

Core Section	Section Weight Wet Bulk Density (g/cc)	GRAPE: Wet Bulk Density Total Range (g/cc)	GRAPE: Wet Bulk Density Undisturbed (g/cc)	GRAPE: Assigned Grain Density (g/cc)	GRAPE: Porosity Total Range (%)	GRAPE: Porosity Undisturbed (%)	Syringe: Interval Sampled (cm)	Syringe: Wet Bulk Density (g/cc)	Syringe: Grain Density (g/cc)	Syringe: Porosity (%)	Natural Gamma Radiation: Total Count	Natural Gamma Radiation: Net	Sonic Velocity: Interval Sampled (cm)	Sonic Velocity (km/sec)
21-1		1.61-1.71		2.71	59.3-65.2		99	1.67	2.54	57.7	1300	0		
21-2		1.63-1.71		2.71	59.3-64.0									
21-3		1.63-1.71		2.71	59.3-64.0									
21-4		1.63-1.69		2.71	60.4-64.0									
21-5		1.60-1.68		2.71	61.0-65.8									
21-6		1.66-1.72		2.71	58.7-62.2									
22-1		1.64-1.70		2.71	59.9-63.4		79	1.56	2.15	50.2	1300	0		
23-1		1.50-1.55	1.50-1.55	2.71	68.8-71.7	68.8-71.7					1300	0		
23-2		1.50-1.55	1.50-1.55	2.71	68.8-71.7	68.8-71.7	14	1.45	1.85	48.6			32	1.80
													98	1.88
23-3		1.50-1.55	1.50-1.55	2.71	68.8-71.7	68.8-71.7							40	1.83
													106	1.86
23-4		1.52-1.67	1.52-1.67	2.71	61.6-70.5	61.6-70.5	98	1.75	2.83	59.9			30	1.74
													120	1.73
23-5		1.52-1.57	1.52-1.57	2.71	67.6-70.5	67.6-70.5							62	1.66
													100	1.79
23-CC														1.61-1.80
24-1	1.	1.45-1.50	1.45-1.50	2.71	71.7-74.7	71.7-74.7					1325	25	25	1.69
													58	1.72
													86	1.68
													135	1.75
28-1	1.68	1.63-1.68		2.65	59.6-62.7						1300	50		
28-2		1.64-1.71		2.65	57.8-62.1									
28-3		1.43-1.67		2.65	60.2-75.0									
28-4	1.74	1.74-1.81		2.65	51.6-55.9		136	1.66	2.18	45.5				
30-1		1.55-1.68	1.55-1.68	2.65	59.6-67.6	59.6-67.6					1300	50		
32-1		1.35-1.48		2.71	72.9-80.6						1275	0		
32-2		1.48-1.60		2.71	65.8-72.9									
32-3		1.55-1.65		2.71	62.8-68.8									
32-CC														1.95
33-1		1.50-1.70	1.50-1.70	2.71	59.9-71.7	59.9-71.7					1275	0	109	2.76,2.83
													141	4.85,5.20
39-1											1400	125		
40											1425	150		
42-1		1.60-2.00		2.71	42.1-65.8						1375	125		
42-2		1.65-1.72		2.71	58.7-62.8									
42-3		1.65-1.72		2.71	58.7-62.8									
42-4		1.75-1.95		2.71	45.0-56.9									
42-5		1.70-1.87		2.71	49.8-71.7									
42-CC														2.00
43-2		1.45-1.85		2.71	51.0-74.7						1500	250		
44											1375	100		

45-1		1.75-1.80		2.71	53.9-56.9						1375	100		
45-2		1.72-1.78		2.71	55.1-58.7									
45-3		1.80-1.85	1.80-1.85	2.71	51.0-53.9	51.0-53.9								
45-4		1.65-1.85		2.71	51.0-62.8									
45-5		1.70-1.80		2.71	53.9-59.9									
45-6		1.70-1.83		2.71	52.1-59.9									
45-CC														1.73
46-1		1.74-1.93		2.71	46.2-57.5						1375	125		
46-2		1.40-1.60		2.71	65.8-77.6									
46-3		1.40-1.60		2.71	65.8-77.6									
46-4		1.40-1.60		2.71	65.8-77.6									
46-5		1.40-1.50		2.71	71.7-77.6									
46-6		1.75-1.85		2.71	51.0-56.9									
46-CC														1.75
47-CC														1.82
48-CC														1.70,4.84
49-1		1.60-1.70	1.60-1.70	2.71	59.9-65.8	59.9-65.8					1500	250		
50-1		1.40-1.48	1.40-1.48	2.71	72.9-77.6	72.9-77.6					1375	125		
52-1		1.70-1.95		2.71	45.0-59.9						1425	150		
52-2		1.75-1.95		2.71	45.0-56.9									
53-1		1.70-1.85		2.71	51.0-59.9						1425	150		
54-1		1.50-1.70	1.60-1.70	2.71	59.9-71.7	59.9-65.8					1400	125		
54-CC														1.67
55-1		1.65-1.71		2.71	59.3-62.8						1375	100		
55-2		1.62-1.78		2.71	55.1-64.6									
55-CC														1.74
56-1		1.77-1.83		2.71	52.1-55.7						1500	225		
57											1575	225		
58-2		1.45-1.65	1.45-1.65	2.71	62.8-74.7	62.8-74.7					1700	450		
58-3		1.56-1.72	1.56-1.72	2.71	58.7-68.2	58.7-68.2								
58-4		1.62-1.76	1.62-1.76	2.71	56.3-64.6	56.3-64.6								
59-1		1.63-1.70	1.63-1.70	2.71	59.9-64.0	59.9-64.0					2350	1075		
59-2		1.52-1.65	1.52-1.65	2.71	62.8-70.5	62.8-70.5								
59-3		1.70-1.80	1.70-1.80	2.71	53.9-59.9	53.9-59.9								
60-1		1.50-1.55		2.71	68.8-71.7						2100	825		
60-2		1.50-1.70	1.60-1.70	2.71	59.9-71.7	59.9-65.8								
61-2		1.65-1.76	1.65-1.76	2.71	56.3-62.8	56.3-62.8					1425	150		
62-2		1.68-1.76	1.68-1.76	2.71	56.3-61.0	56.3-61.0					1575	275		
62-3		1.60-1.80	1.60-1.80	2.71	53.9-65.8	53.9-65.8								
62-4		1.75-1.88	1.75-1.88	2.71	49.2-56.9	49.2-56.9								
63-1		1.75-1.95	1.75-1.95	2.71	45.0-56.9	45.0-56.9					1650	250		
63-2		1.75-1.88	1.75-1.88	2.71	49.2-56.9	49.2-56.9								
63-3		1.87-1.95	1.87-1.95	2.71	45.0-49.8	45.0-49.8								
63-4		1.80-1.92	1.80-1.92	2.71	46.8-53.9	46.8-53.9								
64-1		1.75-1.85	1.75-1.85	2.71	51.0-56.9	51.0-56.9					1475	275		
64-2		1.80-1.90	1.80-1.90	2.71	48.0-53.9	48.0-53.9							133	3.70,4.06
64-3		1.85-1.98	1.85-1.98	2.71	43.2-51.0	43.2-51.0								
64-4		1.85-1.98	1.85-1.98	2.71	43.2-51.0	43.2-51.0								
64-5		1.85-1.97	1.85-1.97	2.71	43.8-51.0	43.8-51.0								

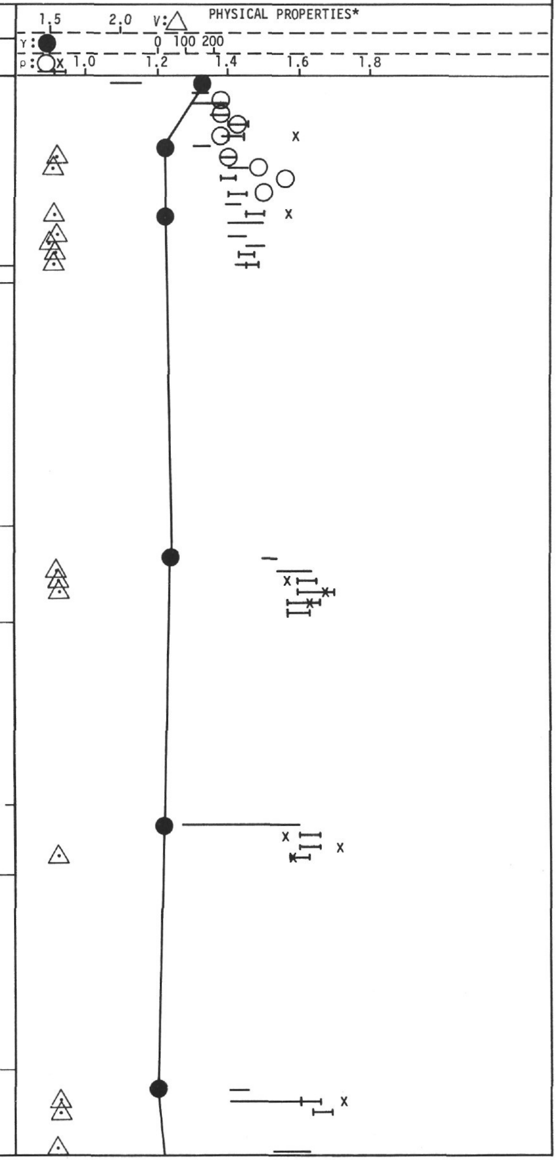
APPENDIX B – *Continued*

Core Section	Section Weight Wet Bulk Density (g/cc)	GRAPE: Wet Bulk Density Total Range (g/cc)	GRAPE: Wet Bulk Density Undisturbed (g/cc)	GRAPE: Assigned Grain Density (g/cc)	GRAPE: Porosity Total Range (%)	GRAPE: Porosity Undisturbed (%)	Syringe: Interval Sampled (cm)	Syringe: Wet Bulk Density (g/cc)	Syringe: Grain Density (g/cc)	Syringe: Porosity (%)	Natural Gamma Radiation: Total Count	Natural Gamma Radiation: Net	Sonic Velocity: Interval Sampled (cm)	Sonic Velocity (km/sec)
65-1		1.85-1.90	1.85-1.90	2.71	48.0-51.0	48.0-51.0					1625	25	130	3.26
65-2		1.82-1.93	1.82-1.93	2.71	46.2-52.7	46.2-52.7							91	2.79
65-3		1.80-1.93	1.80-1.93	2.71	46.2-53.9	46.2-53.9							60	2.67,2.69
65-4		1.80-1.87	1.80-1.87	2.71	49.8-53.9	49.8-53.9							95	3.14,3.2
66-1		1.53-1.70	1.53-1.70	2.71	59.9-69.9	59.9-69.9					1600	25	69	2.34
66-2		1.50-1.70	1.50-1.70	2.71	59.9-71.7	59.9-71.7								
67-1		1.50-1.75	1.50-1.75	2.71	56.9-71.7	56.9-71.7					1550	100		
67-2		1.65-1.83	1.65-1.83	2.71	52.1-62.8	52.1-62.8							103	2.14-2.65
67-3		1.65-1.83	1.65-1.83	2.71	52.1-62.8	52.1-62.8								
67-4		1.73-1.84	1.73-1.84	2.71	51.6-58.1	51.6-58.1								
68-2		1.83-1.92	1.83-1.92	2.71	46.8-52.1	46.8-52.1					1550	150		
68-3		1.85-1.95	1.85-1.95	2.71	45.0-51.0	45.0-51.0								
68-4		1.85-1.98	1.85-1.98	2.71	43.2-51.0	43.2-51.0								
68-5		1.88-1.99	1.88-1.99	2.71	42.7-49.2	42.7-49.2								
69-1		1.85-1.98	1.85-1.98	2.71	43.2-51.0	43.2-51.0					1525	125	42	3.41
69-2		1.80-2.00	1.80-2.00	2.71	42.1-53.9	42.1-53.9							49	2.58,2.90
69-3		1.88-1.97	1.88-1.97	2.71	43.8-49.2	43.8-49.2								
69-4		1.88-2.02	1.88-2.02	2.71	40.9-49.2	40.9-49.2							98	2.30
69-CC														2.95
70-1		1.85-2.00	1.85-2.00	2.71	42.1-51.0	42.1-51.0					1525	225		
70-2		1.75-196	1.75-1.96	2.71	44.4-56.9	44.4-56.9								
70-3		1.83-2.02	1.83-2.02	2.71	40.9-52.1	40.9-52.1								
70-4		1.88-1.98	1.88-1.98	2.71	43.2-49.2	43.2-49.2								
70-CC														3.33,3.46
71-1		1.80-1.97	1.80-1.97	2.71	43.8-53.9	43.8-53.9					1425	125		
71-2		1.87-1.98	1.87-1.98	2.71	43.2-49.8	43.2-49.8								
71-CC														3.48
72-1		1.85-1.98	1.85-1.98	2.71	43.2-51.01	43.2-51.0					1425	50	4	2.26
													95	3.42
72-2		1.83-2.00	1.83-2.00	2.71	42.1-52.1	42.1-52.1							116	3.64
72-CC														2.84,3.00
73-1		1.75-1.93	1.75-1.93	2.71	46.2-56.9	46.2-56.9					1475	150		
73-2		1.85-1.93	1.85-1.93	2.71	46.2-51.0	46.2-51.0							37	3.17,3.44
73-CC														3.22,3.22
74-1		1.85-1.95	1.85-1.95	2.71	45.0-51.0	45.0-51.0					1400	100		
74-2		1.95-2.10	1.95-2.10	2.71	36.1-45.0	36.1-45.0								
74-CC														3.83,4.16
75-1		1.70-1.90	1.70-1.90	2.71	48.0-59.9	48.0-59.9					1325	25		
76-1		1.72-1.83	1.72-1.83	2.71	52.1-58.7	52.1-58.7					1400	100	66	3.62
76-2		1.55-1.88	1.55-1.88	2.71	49.2-68.8	49.2-68.8							37	3.10
													96	2.98
76-CC														2.85

77-1		1.55-1.75	1.55-1.75	2.71	56.9-68.8	56.9-68.8					1375	50	82	2.75
													120	3.46
77-CC														3.02,3.30
78-1		1.75-1.85	1.75-1.85	2.71	51.0-56.9	51.0-56.9					1375	50		
78-CC														3.43
81-CC														3.44
88-1		1.65-2.05	1.65-2.05	2.71	39.1-62.6	39.1-62.2					1450	175		
92-1		1.70-1.90	1.70-1.90	2.71	48.0-59.9	48.0-59.9					1400	75		
93-1		1.85-1.93	1.85-1.93	2.71	46.2-51.0	46.2-51.0					1475	125		
93-2		1.80-2.17	1.80-2.17	2.71	32.0-53.9	32.0-53.9							63	3.24
94-1		1.80-2.23	1.80-2.23	2.71	28.4-53.9	28.4-53.9					1600	150		
94-2		1.90-2.15	1.90-2.15	2.71	33.1-48.0	33.2-48.0							76	3.89,4.11
													145	3.72
94-3		2.05-2.15	2.05-2.15										142	3.64,4.17
95-1		2.07-2.17	2.07-2.17								1800	150	66	3.92,3.77
95-2		2.05-2.17	2.05-2.17											

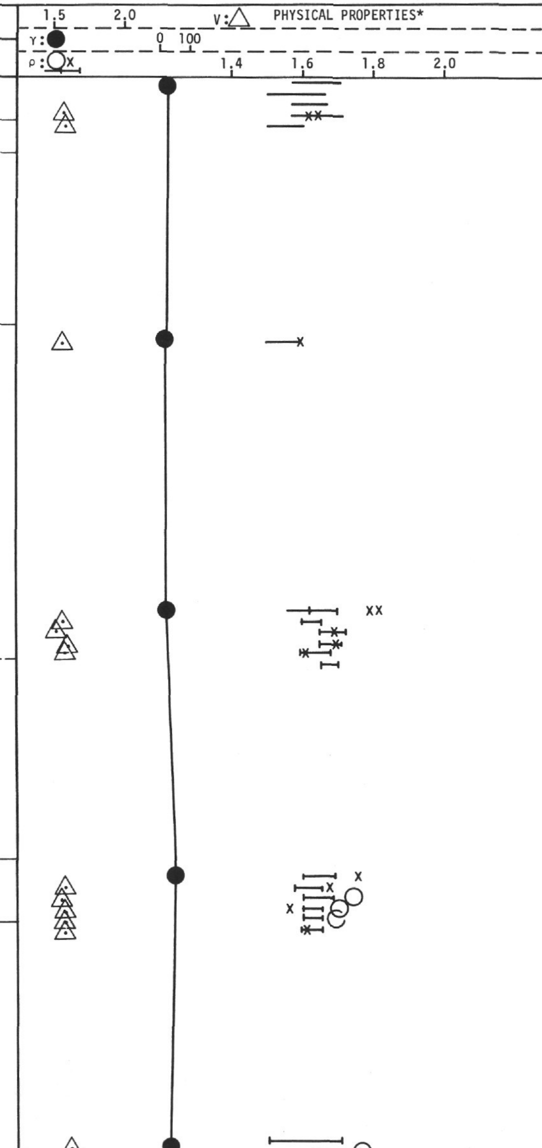
LEG XVII SITE 167 LAT. 07°04.1'N LONG. 176°49.5'W DEPTH 3176 m SHEET 1 OF 8

DEPTH	CORES	LITHOLOGY	AGE	BIOSTRATIGRAPHY: FORAMINIFERA	BIOSTRATIGRAPHY: NANNOFOSSILS	BIOSTRATIGRAPHY: RADIOLARIA
	1, 2, 3	FORAMINIFERAL NANNOFOSSIL OOZE, soft to moderately firm, mainly white and homogeneous; often badly disturbed. Rare radiolarians are present throughout.	QUATERNARY	N22/N23	Gephyrocapsa oceanica; Pseudoemiliania lacunosa	Quaternary
				N21	Cyclococcolithina macintyrei	P. prismatium
			LATE PLIO.			
50						
	4	Same as Cores 1-3 above.	LATE MIOCENE	N16	Discoaster bellus	Ommatartus antepenultimus
100	5	Same as Cores 1-3 above.	MIDDLE MIOCENE	N12	Discoaster exilis	Cannartus laticomus
150	6	Same as Cores 1-3 above slightly more chalky.		N9	Sphenolithus heteromorphus	Dorcadospyris alata



LEG XVII | SITE 167 | LAT. 07°04.1'N | LONG. 176°49.5'W | DEPTH 3176 m | SHEET 2 OF 8

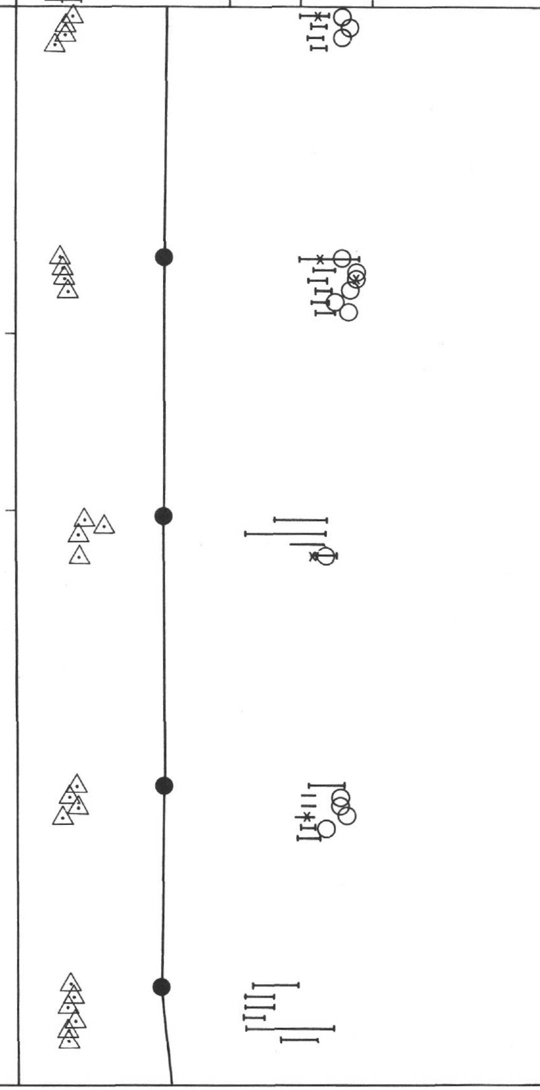
DEPTH	CORES	LITHOLOGY	AGE	FORAMINIFERA	NANNOFOSSILS	RADIOLARIA
150	7	Same as Cores 1-3 above slightly more chalky.	EARLY MIOCENE	N8	Sphenolithus heteromorphus	C. castata
	8	Same as Cores 6-7 above.	EARLY MIOCENE	N4	Triqutro-rhabdulus carinatus	Calocycletta virginis
200						
	9	Same as Cores 6-7 above. Lower part of the core is increasingly chalky.	EARLY MIOCENE			
250	10	FORAMINIFERAL NANNOFOSSIL CHALK, mainly white, almost homogeneous-rare radiolarians. Occasional ooze layers are probably artificial, due to drilling operation.	LATE OLIGOCENE	P22	Reticulo-fenestra abisecta	Lychnocanium bipes
300						

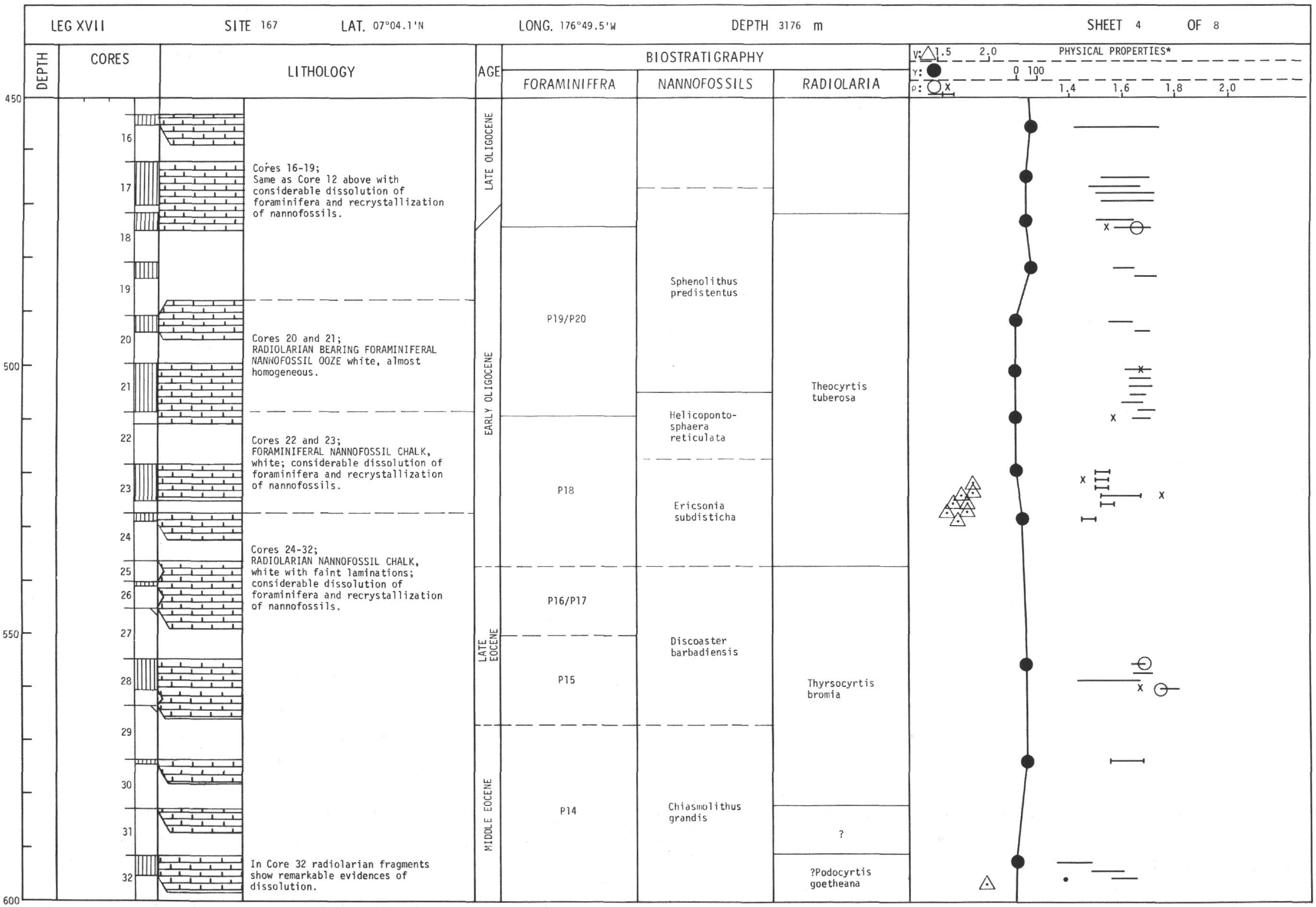


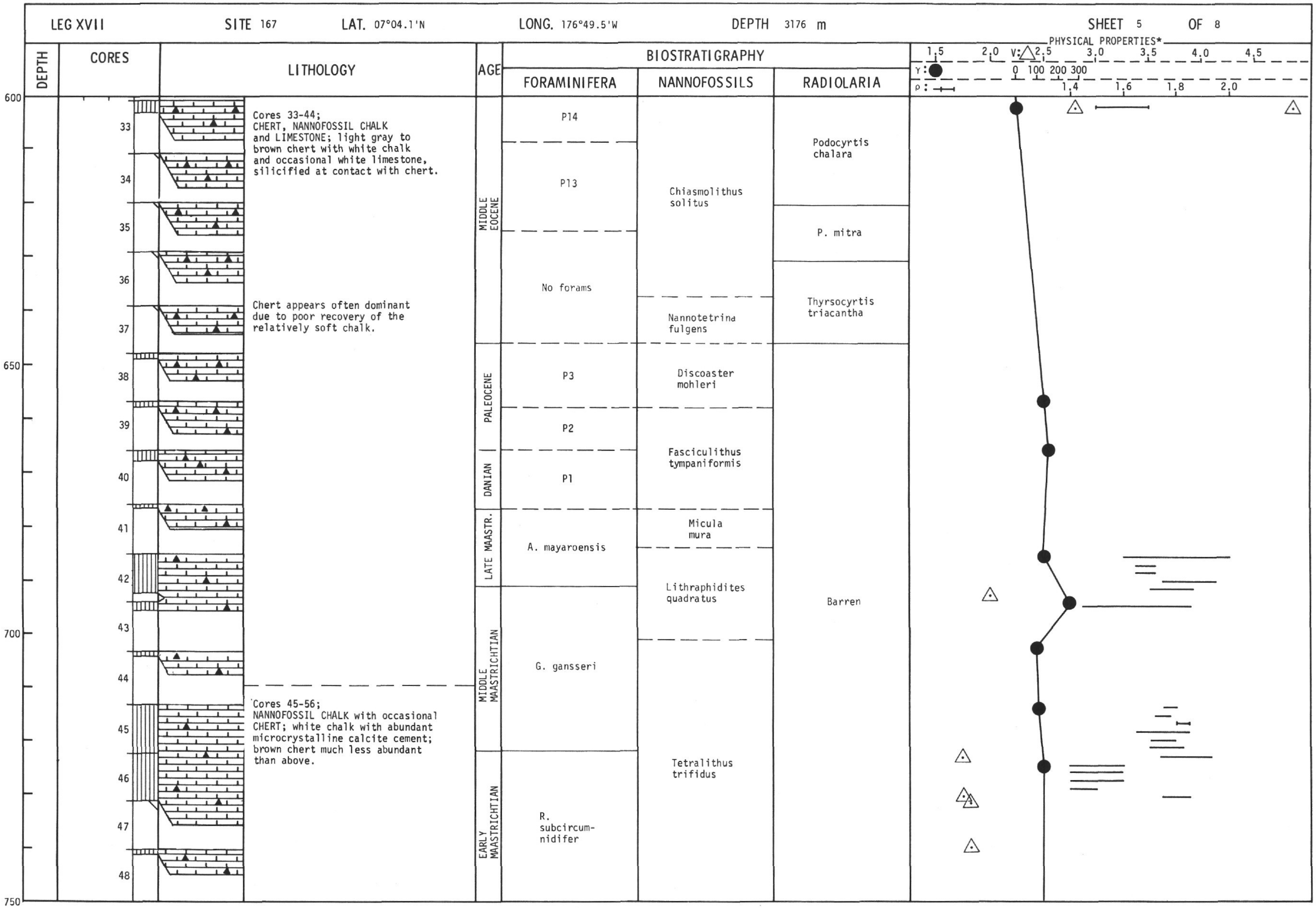
LEG XVII SITE 167 LAT. 07°04.1'N LONG. 176°49.5'W DEPTH 3176 m SHEET 3 OF 8

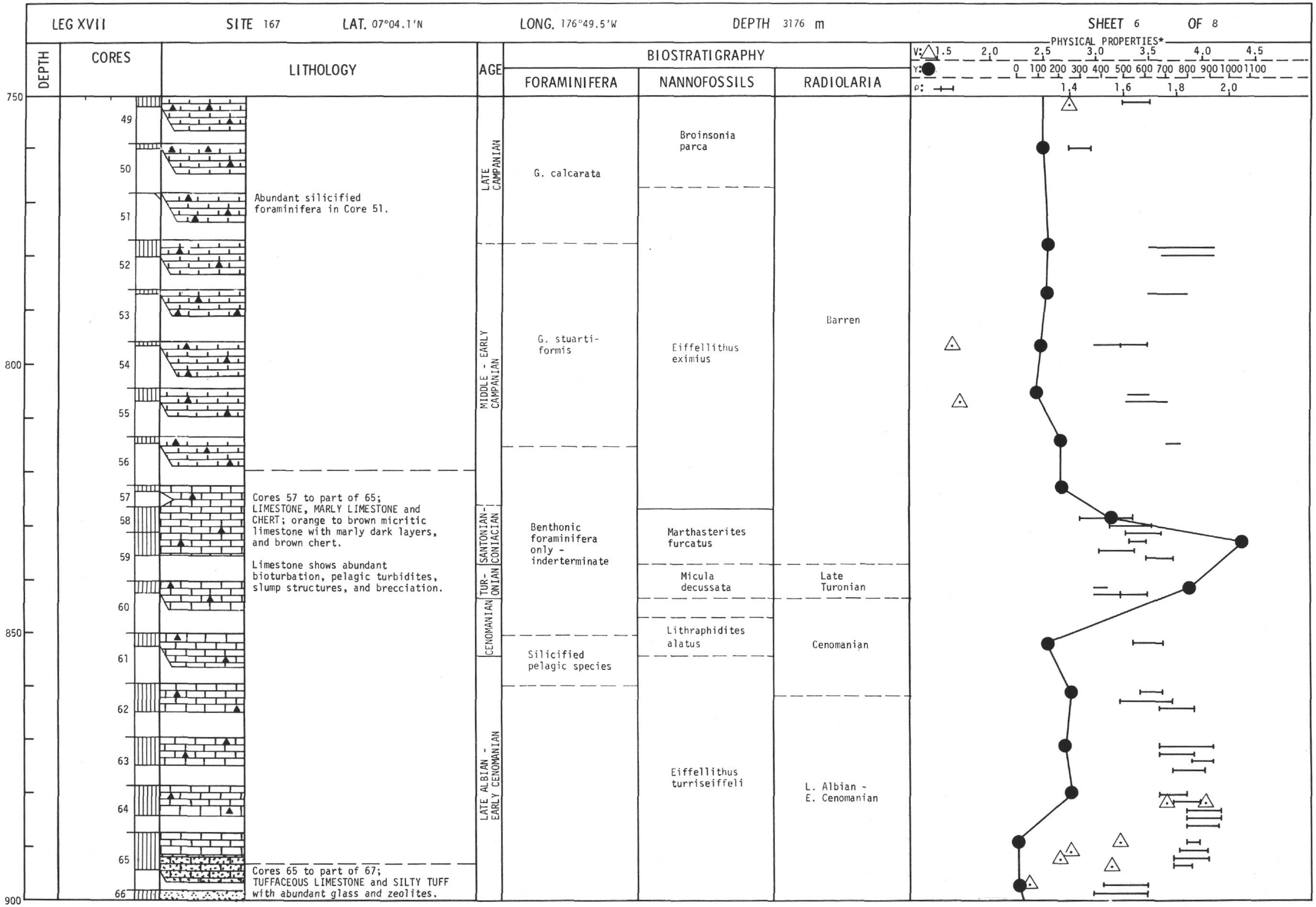
DEPTH	CORES	LITHOLOGY	AGE	FORAMINIFERA	NANNOFOSSILS	RADIOLARIA
300	11	Same as Core 10 above.	LATE OLIGOCENE	P21	Sphenolithus ciperoensis	Dorcadospyris papilio
	12	Same as Core 10 above with some evidence of dissolution of foraminifera and recrystallization of nannofossils.				
350	13	Same as Core 12 above.			Sphenolithus distentus	Theocyrtis annosa
400	14	Same as Core 12 above.				
450	15	Same as Core 12 above.				

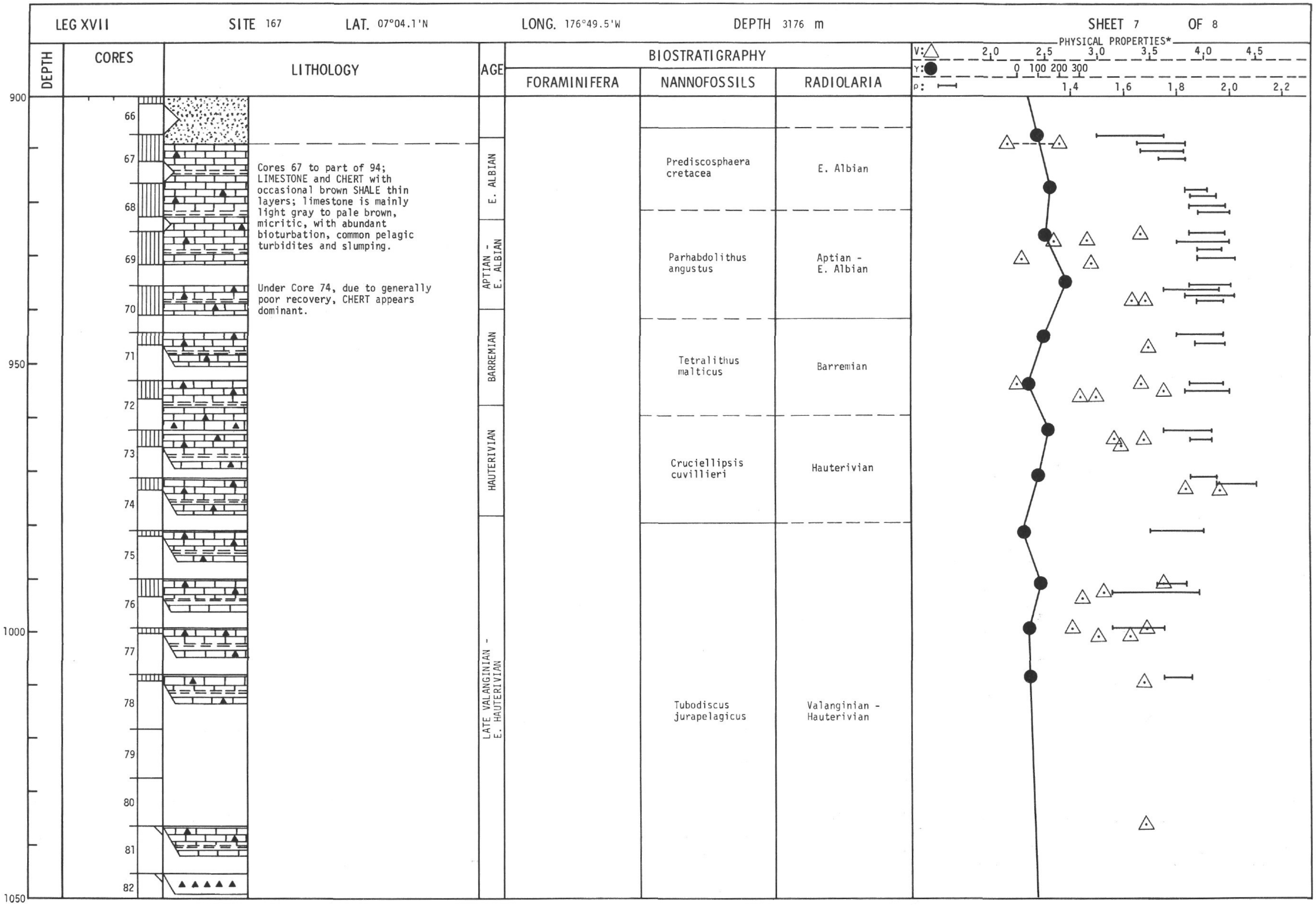
PHYSICAL PROPERTIES*
V: △ 1.5 2.0
γ: ● 0 100
ρ: ○ x 1.4 1.6 1.8

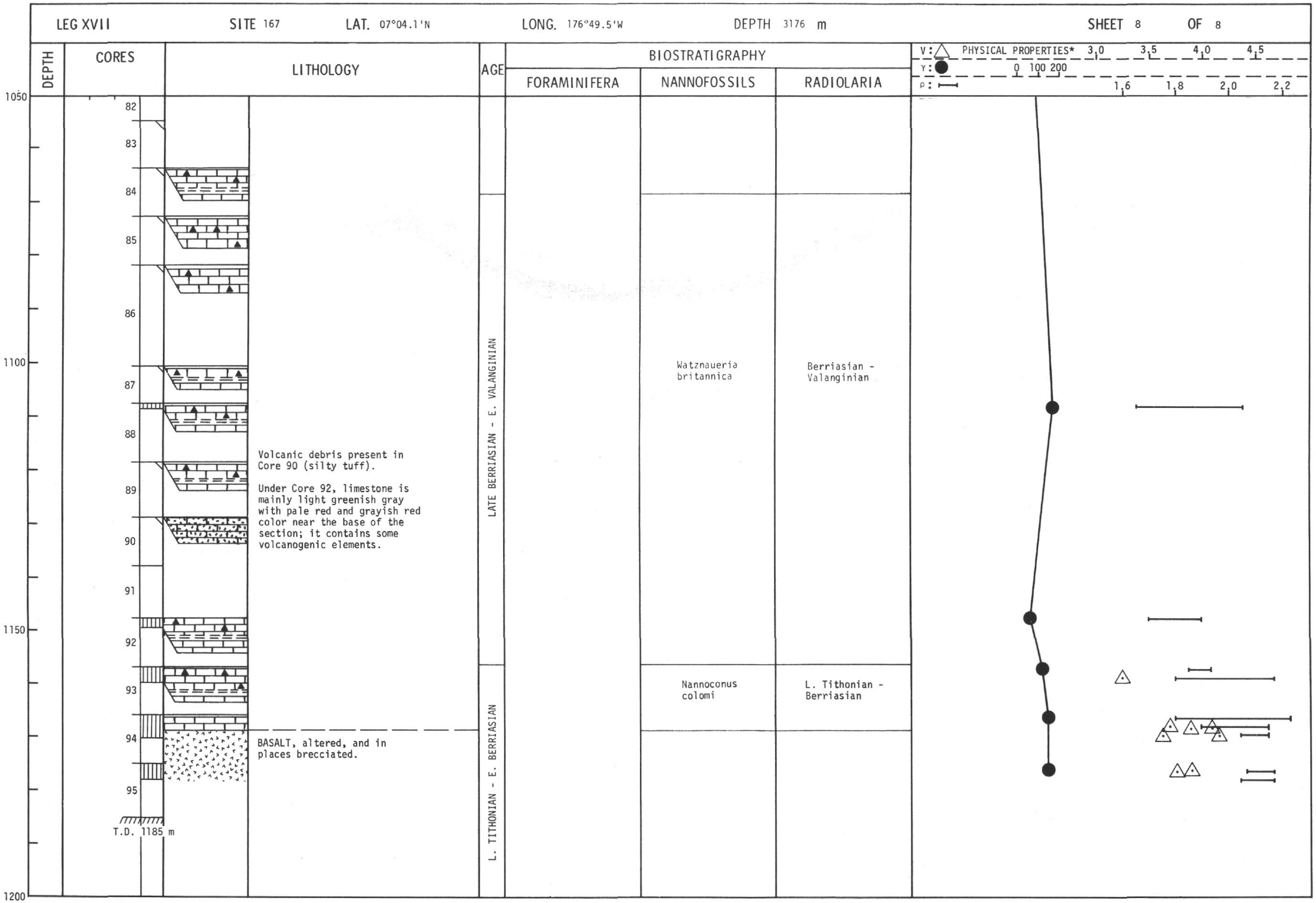



LEG XVII
SITE 167
LAT. 07°04.1'N
LONG. 176°49.5'W
DEPTH 3176 m
SHEET 4 OF 8
DEPTH
CORES
LITHOLOGY
AGE
BIOSTRATIGRAPHY
FORAMINIFFRA
NANNOFOSSILS
RADIOLARIA
PHYSICAL PROPERTIES*
V: 1.5 2.0
Y: 0 100
ρ: X 1.4 1.6 1.8 2.0
450
500
550
600
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
Cores 16-19; Same as Core 12 above with considerable dissolution of foraminifera and recrystallization of nannofossils.
Cores 20 and 21; RADIOLARIAN BEARING FORAMINIFERAL NANNOFOSSIL OOZE white, almost homogeneous.
Cores 22 and 23; FORAMINIFERAL NANNOFOSSIL CHALK, white; considerable dissolution of foraminifera and recrystallization of nannofossils.
Cores 24-32; RADIOLARIAN NANNOFOSSIL CHALK, white with faint laminations; considerable dissolution of foraminifera and recrystallization of nannofossils.
In Core 32 radiolarian fragments show remarkable evidences of dissolution.
LATE OLIGOCENE
EARLY OLIGOCENE
LATE EOCENE
MIDDLE EOCENE
P19/P20
P18
P16/P17
P15
P14
Sphenolithus predistentus
Helicoponto-sphaera reticulata
Ericsonia subdisticha
Discoaster barbadiensis
Chiasmolithus grandis
Theocyrtis tuberosa
Thyrsocyrtis bromia
?
?Podocyrtis goetheana

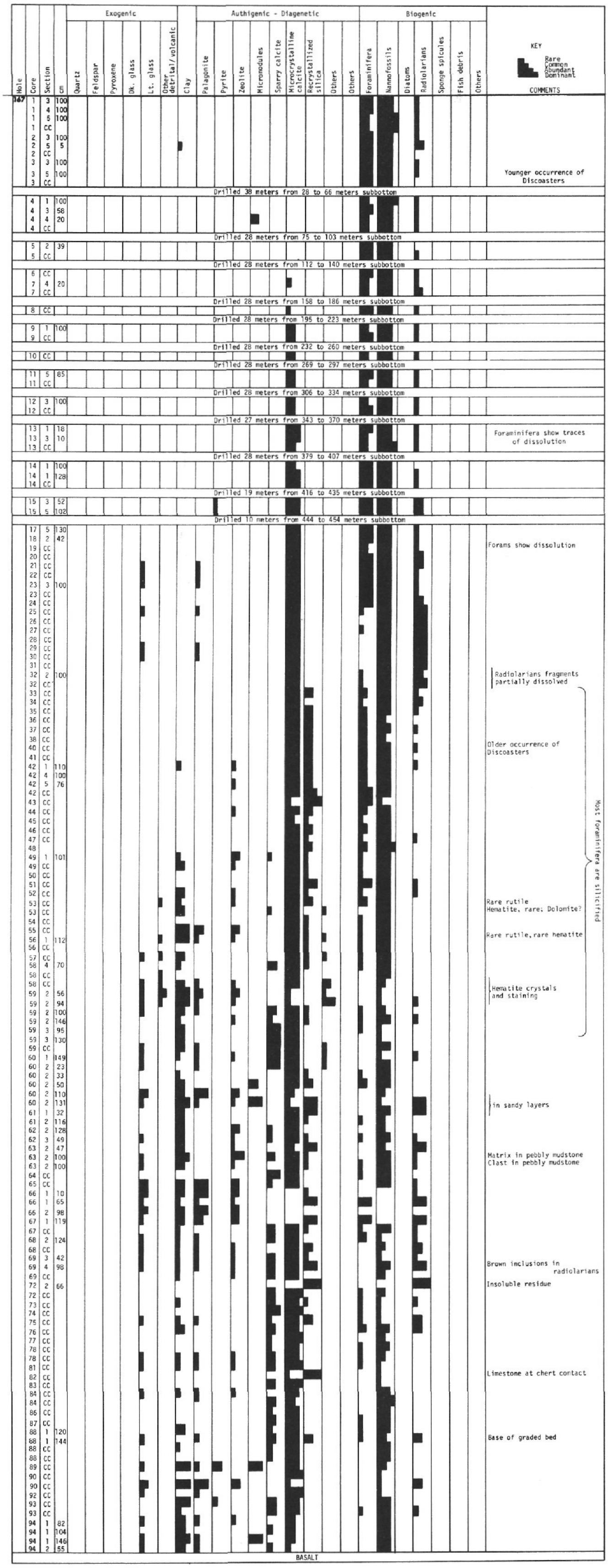

LEG XVII
SITE 167
LAT. 07°04.1'N
LONG. 176°49.5'W
DEPTH 3176 m
SHEET 5 OF 8
DEPTH
CORES
LITHOLOGY
AGE
BIOSTRATIGRAPHY
FORAMINIFERA
NANNOFOSSILS
RADIOLARIA
PHYSICAL PROPERTIES*
1.5 2.0 V: 2.5 3.0 3.5 4.0 4.5
γ:
0 100 200 300
ρ:
1.4 1.6 1.8 2.0
600
650
700
750
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
Cores 33-44;
CHERT, NANNOFOSSIL CHALK and LIMESTONE; light gray to brown chert with white chalk and occasional white limestone, silicified at contact with chert.
Chert appears often dominant due to poor recovery of the relatively soft chalk.
Cores 45-56;
NANNOFOSSIL CHALK with occasional CHERT; white chalk with abundant microcrystalline calcite cement; brown chert much less abundant than above.
MIDDLE EOCENE
PALEOCENE
DANIAN
LATE MAASTR.
MIDDLE MAASTRICHTIAN
EARLY MAASTRICHTIAN
P14
P13
No forams
P3
P2
P1
A. mayaroensis
G. gansseri
R. subcircum-nidifer
Chiasmolithus solitus
Nannotetrina fulgens
Discoaster mohleri
Fasciculithus tympaniformis
Micula mura
Lithraphidites quadratus
Tetralithus trifidus
Podocyrtis chalara
P. mitra
Thyrsocyrtis triacantha
Barren


LEG XVII SITE 167 LAT. 07°04.1'N LONG. 176°49.5'W DEPTH 3176 m SHEET 6 OF 8
DEPTH
CORES
LITHOLOGY
AGE
BIOSTRATIGRAPHY
FORAMINIFERA
NANNOFOSSILS
RADIOLARIA
PHYSICAL PROPERTIES*
V: 1.5 2.0 2.5 3.0 3.5 4.0 4.5
Y: 0 100 200 300 400 500 600 700 800 900 1000 1100
ρ: 1.4 1.6 1.8 2.0
750
800
850
900
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
Abundant silicified foraminifera in Core 51.
Cores 57 to part of 65; LIMESTONE, MARLY LIMESTONE and CHERT; orange to brown micritic limestone with marly dark layers, and brown chert.
Limestone shows abundant bioturbation, pelagic turbidites, slump structures, and brecciation.
Cores 65 to part of 67; TUFFACEOUS LIMESTONE and SILTY TUFF with abundant glass and zeolites.
LATE CAMPANIAN
MIDDLE - EARLY CAMPANIAN
SANTONIAN-CONIACIAN
TUR-ONIAN
CENOMANIAN
LATE ALBIAN - EARLY CENOMANIAN
G. calcarata
G. stuarti-formis
Benthonic foraminifera only - interderminate
Silicified pelagic species
Broinsonia parca
Eiffellithus eximius
Marthasterites furcatus
Micula decussata
Lithraphidites alatus
Eiffellithus turriseiffeli
Barren
Late Turonian
Cenomanian
L. Albian - E. Cenomanian


LEG XVII
SITE 167
LAT. 07°04.1'N
LONG. 176°49.5'W
DEPTH 3176 m
SHEET 7 OF 8
DEPTH
CORES
LITHOLOGY
AGE
BIOSTRATIGRAPHY
FORAMINIFERA
NANNOFOSSILS
RADIOLARIA
PHYSICAL PROPERTIES*
V:
2.0 2.5 3.0 3.5 4.0 4.5
γ:
0 100 200 300
ρ:
1.4 1.6 1.8 2.0 2.2
900
950
1000
1050
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
Cores 67 to part of 94; LIMESTONE and CHERT with occasional brown SHALE thin layers; limestone is mainly light gray to pale brown, micritic, with abundant bioturbation, common pelagic turbidites and slumping.
Under Core 74, due to generally poor recovery, CHERT appears dominant.
E. ALBIAN
APTIAN - E. ALBIAN
BARREMIAN
HAUTERIVIAN
LATE VALANGINIAN - E. HAUTERIVIAN
Prediscosphaera cretacea
E. Albian
Parhabdolithus angustus
Aptian - E. Albian
Tetralithus malticus
Barremian
Cruciellipsis cuvillieri
Hauterivian
Tubodiscus jurapelagicus
Valanginian - Hauterivian


LEG XVII
SITE 167
LAT. 07°04.1'N
LONG. 176°49.5'W
DEPTH 3176 m
SHEET 8 OF 8
DEPTH
CORES
LITHOLOGY
AGE
BIOSTRATIGRAPHY
FORAMINIFERA
NANNOFOSSILS
RADIOLARIA
V: △ PHYSICAL PROPERTIES* 3.0 3.5 4.0 4.5
Y: ● 0 100 200
ρ: ⊢ 1.6 1.8 2.0 2.2
1050
1100
1150
1200
82
83
84
85
86
87
88
89
90
91
92
93
94
95
T.D. 1185 m
Volcanic debris present in Core 90 (silty tuff).
Under Core 92, limestone is mainly light greenish gray with pale red and grayish red color near the base of the section; it contains some volcanogenic elements.
BASALT, altered, and in places brecciated.
LATE BERRIASIAN - E. VALANGINIAN
L. TITHONIAN - E. BERRIASIAN
Watznaueria britannica
Berriasian - Valanginian
Nannoconus colomi
L. Tithonian - Berriasian

SITE 167
SMEAR SLIDE SUMMARY



Site 167 Hole Core 1 Cored Interval: 0 to 9 m

AGE: QUATERNARY

ZONE: N22/N23; Gephyrocapsa oceanica; Pseudoemiliania lacunosa

SECTION	FOSSIL	ABUND.	PRES.	LITHOLOGY
1				NOT OPENED
2				NOT OPENED
3	n f r	A C F	G G M	
4	n f	A C	G G	
5	n f r	A A F	G G M	
6				
Core Catcher	f n r	C A F	G G M	

METERS: 0.5, 1.0

LITHOLOGIC DESCRIPTION

Sections 1 and 2 not opened, watery and disturbed.

Foraminiferal nannofossil ooze, orangish white (10YR 9/1), very soft. No structures apparent except in lower part where very rare mottles and "diapiric" beds of yellowish gray (10YR 7/1 to 5YR 7/2) ooze are present

Very rare dark specks near the top of the core are large foraminifera filled with clayey nannofossil ooze.

Rare radiolarians are present throughout.

Explanatory notes in Chapter 1

Site 167 Hole Core 2 Cored Interval: 9 to 18 m

AGE: QUATERNARY

ZONE: N22/N23; Pseudoemiliania lacunosa

SECTION	FOSSIL	ABUND.	PRES.	LITHOLOGY
1				NOT OPENED
2	n f	A A	G M	
3	n f	A A	G M	
4	n f	A A	G M	
5	n f	A A	G M	
6	n f	A A	G G	
Core Catcher	f n	A A	G G	

METERS: 0.5, 1.0

LITHOLOGIC DESCRIPTION

Section 1 not opened, very soft and disturbed.

Foraminiferal nannofossil ooze, orangish white (10YR 9/1), with occasional diffuse mottles of white (N9) and yellowish gray (5Y 8/1) ooze in Sections 4 and 5, otherwise homogeneous; soft throughout.

Yellowish gray mottles contain a slightly greater amount of radiolarians and sponge spicules.

Explanatory notes in Chapter 1

Site 167 Hole Core 3 Cored Interval: 18 to 28 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHO. SAMPLE
LATE PLIOCENE	N21 Cyclococcolithina macintyrei	n f r	A A F	G G M	1	0.5 1.0	
		n f	A A	G G	2		
		n f r	A A F	G G M	3		*
		n f	A A	G G	4		
		n f r	A C F	G M P	5		*
	Pterocranium prismaticum	f r	C F	G M	6		
		f n	C A	M G	Core Catcher		*

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil ooze, mainly orange white (10YR 9/1) with faint shade of pale orange gray (10YR 8/1) in the upper part; soft, almost homogeneous.

The top 25 cm contain abundant rust platelets from the drill string.

Rare radiolarians are present throughout.

Explanatory notes in Chapter 1

Site 167 Hole Core 4 Cored Interval: 66 to 75 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	LITHO. SAMPLE
LATE MIOCENE	N16 Discoaster bellus Ommatartus antepenultimus	n f r	A A C	M M M	1	0.5 1.0		*
		n f	A A	M M	2			
		n f r	A A C	M M M	3			*
		n f	A A	M M	4		VOID	*
		n f r	A A C	M M G	5		VOID	
		n f	A A	M M	6		VOID	
		f n r	A A C	M M M	Core Catcher			*

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil ooze, dominantly white (N10) in the upper half with occasional "diapiric" streaks of medium bluish gray (5B 5/1) to purplish white (5P 9/1); mainly purplish white (5P 9/1) in the lower half with streaks and specks of grayish purple (5P 6/1) and purplish black (5P 2/1). Some streaks of white (N9) and light purplish gray (5P 8/1) at the bottom.

Soft, generally homogeneous with rare slight mottling.

The variation in color shades may be due to the presence of opaque material (pyrite?) coating the interior of foraminifera tests.

Rare radiolarians present throughout.

Explanatory notes in Chapter 1

Site 167 Hole Core 5 Cored Interval: 103 to 112 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N12 Discoaster exilis Cannartus laticonus				1	0.5 1.0	NOT OPENED			Section 1 not opened.
		n f r	A A C	M M M	2				*	Foraminiferal nannofossil ooze, mainly purplish white (5P 9/1) with beds and zones of different shades of purplish gray (5P 6/1 to 7/1), bluish white (5B 9/1) and greenish white (5GY 9/1) with rare dusky purple (5P 3/2) to purplish black (5P 2/1) specks, streaks and diffuse mottles (in the lower part). Soft throughout. Limits between beds are sharp and horizontal. Rare radiolarians throughout.
		n f	A A	M M	3					
		n f r	A A C	M M M	4		VOID	?		
		n f	A A	M M	5			? ?		
		f n r	A A C	M M M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 6 Cored Interval: 140 to 149 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N9 Sphenolithus heteromorphus Dorcadospyris alata				1	0.5 1.0	NOT OPENED			Sections 1 and 2 not opened, very disturbed.
					2		NOT OPENED			
		n f r	A A C	G M M	3					Sect. 3; 0 to 150 cm, and Sect. 4; 19 to 110 cm; Foraminiferal nannofossil ooze, mainly white (N9) to greenish white (5G 9/1) with rare small dusky purple (5P 3/2) specks or mottles in the upper part. Moderately soft to moderately firm (in Section 4) Rare radiolarians throughout Top of the core is badly disturbed by drilling.
		n f	A A	G M	4		VOID / VOID			
					5		NOT OPENED			Not opened, very disturbed.
		n f r	A A C	G M M	6		VOID			Bottom of the core is badly disturbed.
		f n r	A A C	M M M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 7 Cored Interval: 149 to 158 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N9	n f	A A	M G	1	0.5, 1.0				Foraminiferal nannofossil ooze, mainly white (N9), soft to moderately firm and slightly chalky at the bottom. Generally disturbed by drilling. Rare radiolarians throughout.
		n f	A A	M G	2					
	N8 Spenolithus heteromorphus Dorcadospyris alata	f n	A A	G M	3			?		
					4				*	
		n f	A A	M G	5					
					6		NOT OPENED			Section 6 not opened, very disturbed.
	C. costata	f n	A A	G M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 8 Cored Interval: 186 to 195 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY MIOCENE	N4 Triquetrorhabdulus carinatus Calocycletta virginis	n	A	M	1	0.5, 1.0	VOID			Foraminiferal nannofossil ooze, white (N9), soft, strongly disturbed by drilling. Rare radiolarians.
		f r	A C	M P						
		f n r	A A C	M M P	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 9 Cored Interval: 223 to 232 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
EARLY MIOCENE	N4 Triquetrorhabdulus carinatus Calocycletta virginis	f	C	M	1	0.5 1.0	VOID	? ?	*
		f	C	M	2				
		f	C	M	3				
		f	C	M	4			?	
		f	C	G	5				
		f	C	G	6				
		f	C	G	Core Catcher				

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil ooze, mainly white (N9) to purplish white (5P 9/1) with occasional zones and beds of very light gray (N8), bluish white (5B 9/1) and light purplish gray (5P 8/1).

Moderately firm with some chalky lumps in Section 4.

Faint but distinct bedding in Sections 5 and 6.

Rare radiolarians present throughout.

Explanatory notes in Chapter 1

Site 167 Hole Core 10 Cored Interval: 260 to 269 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE OLIGOCENE	P22 Triquetrorhabdulus carinatus Lychnocanium bipes Reticulofenestra abisecta				1	0.5 1.0	VOID		
		n f	A C	M G	2				
		n f r	A C C	M G G	3				
		f	C	G	4				
		n f r	A C C	M G M	5				
		f	C	G	6				
		f n r	C A C	G M M	Core Catcher				*

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil ooze and chalk, mainly white (N9) to greenish and purplish white (5G and 5P 9/1).

Firm and stiff with chalky intervals in the lower half of the core.

Rare faint bedding near top of Section 2, otherwise devoid of primary structures.

Rare radiolarians present throughout.

Sect. 3, Sect. 4, Sect. 5 and Sect. 6; Alternations of lithologic symbols describe arbitrarily located alternations of ooze and chalk beds ranging in thickness from centimeters to tens of centimeters.

Explanatory notes in Chapter 1

Site 167 Hole Core 11 Cored Interval: 297 to 306 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	LITHO. SAMPLE
LATE OLIGOCENE	P22 Reticulofenestra abisecta Dorcadospyris papilio	n f r	A C C	G M G	1	
		f	C	M	2	
		n f r	A C C	G M M	3	
		f	C	M	4	
		n f r	A C C	G M M	5	*
		f	C	M	6	
		f n r	C A C	M M G	Core Catcher	*

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil chalk and ooze (most of the ooze is probably the result of softening of the chalk during coring operations).

Zones of different shades of white: white (N9), purplish white (5P 9/1 to 8/1) and greenish white (5G 9/1). Contacts between zones are either gradational or very sharp and well defined (as in Sect. 2 at 28 cm).

Occasional vague streaks and mottles in the lower part.

Rare radiolarians present throughout.

(Note: striations visible on the photographs are due to sawing).

Explanatory notes in Chapter 1

Site 167 Hole Core 12 Cored Interval: 334 to 343 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	LITHO. SAMPLE
LATE OLIGOCENE	P22 Sphenolithus ciperoensis Dorcadospyris papilio	n f r	A C C	G M P	1	
		f	C	M	2	
		n f r	A C C	G M M	3	*
		f	C	M	4	
		n f r	A C C	G M M	5	
		f	C	M	6	
		f n r	C A C	M G M	Core Catcher	*

LITHOLOGIC DESCRIPTION

Foraminiferal nannofossil chalk and ooze, mainly purplish white (5P 9/1) and greenish white (5G 9/1).

Pieces of chalk in ooze due to mixing during coring operation.

Distinct bedding and diffuse "diapiric" streaks in the upper part, otherwise rather homogeneous.

Rare radiolarians present throughout.

Explanatory notes in Chapter 1

Site 167 Hole Core 13 Cored Interval: 370 to 379 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21 Sphenolithus distentus Theocyrtis annosa	n f r	A C C	G M M	1	0.5 1.0			*	Foraminiferal nannofossil chalk, mainly greenish white (5G 9/1) with purplish white (5P 9/1) bedding, sharp and distinct except in Section 5. Pieces of chalk are in a matrix of ooze probably artificially produced during coring. Smear slides show noticeable recrystallization of the nannofossils and some dissolution of the foraminifera. Rare radiolarians are present throughout.
		f	C	M	2					
		n f r	A C C	G M M	3				*	
					4		NOT OPENED			
		n f r	A C C	G M P	5					
		n	A	G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 14 Cored Interval: 407 to 416 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21 Sphenolithus distentus Theocyrtis annosa	n f r	A A C	M M M	1	0.5 1.0	VOID		* *	Foraminiferal nannofossil chalk, greenish white (5G 9/1) and purplish white (5P 9/1) with distinct thin laminations of pale green (10G 6/2) and pale purple (5P 6/2). Pieces of chalk in softer ooze probably produced artificially by drilling. Smear slides show recrystallization of the nannofossils and some dissolution of the foraminifera. Rare radiolarians are present throughout.
		f	A	M	2			?		
		n f r	A A C	M G M	3			? ?		One piece of chalk in Section 3 shows evidence of post depositional faulting.
		f	A	G	4			? ?		
		n f r	A A C	M M M	5			? ?		
		f	A	G	6			? ?		
		f n r	A A C	G M M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 15 Cored Interval: 435 to 444 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21 Sphenolithus distentus Theocyrtis annosa	n f r	A A C	M M M	1	0.5 1.0				
		f	C	M	2					
		n f r	A C C	M M M	3				*	
		f	C	M	4					
		n f r	A C C	M M M	5				*	
		f	C	M	6					
		f n r	C A C	M M M	Core Catcher				*	

Foraminiferal nannofossil chalk, mainly white (N9) to purplish white (5P 9/1) and bluish white (5B 9/1).

Thin pale purple (5P 7/1) laminations, especially abundant in Sections 2, 3, 4, and 5; rare greenish gray (5G 5/1) thin laminae. The purplish tint seems to be due to the presence of fine grained pyrite.

Radiolarians are common throughout.

Nannofossils show recrystallization, foraminifera show traces of dissolution.

Explanatory notes in Chapter 1

Site 167 Hole Core 16 Cored Interval: 454 to 463 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21 Sphenolithus distentus Theocyrtis annosa				1	0.5 1.0	NOT OPENED			Sections 1 and 2 not opened, badly disturbed)
					2					
		f n r	F A F	R M P	Core Catcher				*	Foraminiferal nannofossil chalk white (N9)

Explanatory notes in Chapter 1

Site 167 Hole Core 17 Cored Interval: 463 to 472 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P21 / Sphenolithus predistentus / Theocyrtis tuberosa				1	0.5, 1.0	NOT OPENED			Sections 1, 2, and 4 not opened, very disturbed.
					2		NOT OPENED			
		n f	A C	M M	3					Foraminiferal nannofossil chalk, badly disturbed by drilling. Mainly white (N9) to greenish white (5G 9/1) Smear slides show dissolution of the foraminifera and recrystallization of the nannofossils. Rare radiolarians are present throughout.
					4		NOT OPENED			
		n	A	M	5				*	
	P19/20	f r f n r	C C C A C	M M M M M	Core Catcher					

Explanatory notes in Chapter 1

Site 167 Hole Core 18 Cored Interval: 472 to 481 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P19/20 / Sphenolithus predistentus / Theocyrtis tuberosa	n f	A C	M M	1	0.5, 1.0	VOID			Foraminiferal nannofossil chalk, mainly greenish white (5G 9/1), very light gray (N8) and very light bluish gray (5B 8/1). Fragments of chalk are found in a softer matrix probably produced by drilling operation. Smear slide shows abundant recrystallization of the nannofossils. Rare radiolarians are present.
		n f r	A C C	M M M	2				*	
		f n r	C A C	M M M	Core Catcher					

Site 167 Hole Core 19 Cored Interval: 481 to 491 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P19/20 / Sphenolithus predistentus / Theocyrtis tuberosa				1	0.5, 1.0	NOT OPENED			
		n f r	A C C	M M G	2					Foraminiferal nannofossil chalk, mainly bluish white (5B 9/1) homogenized by drilling (no apparent structures) Rather soft except in the core-catcher.
		f n r	C A A	M M M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 20 Cored Interval: 491 to 500 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P19/20 Sphenolithus predistentus Theocyrtis tuberosa				1	0.5 1.0	NOT OPENED			Sections 1, 3, 4, 5, and 6 not opened, very disturbed.
		n f r	A C A	M M M	2				*	Radiolarian-bearing foraminiferal nannofossil chalk, very light bluish gray (5B 8/1), homogenized by drilling operation.
					3		NOT OPENED			
					4					
					5					
					6					
		f n r	C A C	M M G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 21 Cored Interval: 500 to 509 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P19/20 Sphenolithus predistentus Theocyrtis tuberosa	n f	A C	G M	1	0.5 1.0	VOID			Radiolarian-bearing foraminiferal nannofossil chalk and ooze (occasional lumps of chalk in a plastic ooze that may be either an original ooze or artificially produced by drilling); mainly greenish white (5G 9/1) to bluish white (5B 9/1). Some vague "diapiric" streaks in the lower part (Section 6).
		n f	A C	G M	2					
		n f	A C	G M	3					
		n f	A C	G M	4					
		n f	A C	G M	5					
		n f	A C	G M	6					
	P18 Helicopontosphaera reticulata	f n	C A	M G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 22 Cored Interval: 509 to 519 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P18 *Helicopontosphaera reticulata* *Theocyrtis tuberosa*	n f r	A C C	G M M	1	0.5 1.0				<u>Foraminiferal nannofossil chalk</u>, mainly very light bluish gray (5B 8/1) with occasional small scale mottling of greenish white (5G 9/1) and light purplish gray (5P 7/1). Rare radiolarians present. (Fragments of chalk churned by drilling) (Section 2 not opened, badly disturbed by drilling).
					2		NOT OPENED			
		f n r	C A A	M G G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 23 Cored Interval: 519 to 528 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	P18 *Ericsonia subdisticha* *Theocyrtis tuberosa*				1	0.5 1.0				<u>Foraminiferal nannofossil chalk</u>, bluish white (5B 9/1) with vague mottles and specks of pale purple (5P 6/2). Smear slides show abundant recrystallization of the nannofossils. Rare radiolarians present.
		n f	A C	M M	2					
		f r	C C	M M	3				*	
		n f	A C	M M	4					
		f r	C C	M M	5					
		f n r	C A C	M M M	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 24 Cored Interval: 519 to 528 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY OLIGOCENE	N18 ? Ericsonia subdistincha Theocyrtis tuberosa	n f r	A F C	M M G	1	0.5 1.0				Radiolarian-bearing foraminiferal nannofossil chalk, greenish white (5G 9/1) to bluish white (5P 9/1) with laminae and slight mottling of pale purple (5P 6/2). Distinct purplish black (5P 2/1) speck (pyrite?) at 118 cm. Smear slides show abundant recrystallization.
		f n r	A A	M G	Core Catcher				*	

Site 167 Hole Core 25 Cored Interval: 537 to 541 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. EOCENE	P16-P17 I. T. bromia	f n r	F A A	M M G	Core Catcher				*	I. D. barbadiensis Radiolarian nannofossil chalk, white (N9) to bluish white (5B 9/1)

Site 167 Hole Core 26 Cored Interval: 541 to 546 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. EOCENE	P16-P17 I. T. bromia	f n r	R A A	P M G	Core Catcher				*	I. D. barbadiensis Radiolarian nannofossil chalk, bluish white (5B 9/1), with distinct purplish black laminations at top (5P 9/1), and vague greenish ones below. When fractured a few joint surfaces appear yellowish gray (5Y 8/1).

Site 167 Hole Core 27 Cored Interval: 546 to 555 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. EOCENE	P16-P17 I. T. bromia	f n r	C A C	M M M	Core Catcher				*	Radiolarian nannofossil chalk, strongly disturbed by drilling. I. D. barbadiensis

Explanatory notes in Chapter 1

Site 167 Hole Core 28 Cored Interval: 555 to 564 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE EOCENE	P15 Discoaster barbadiensis Thyrsocyrtis bromia	n f	A R	M P	1	0.5 1.0				Radiolarian nannofossil chalk and ooze. Rare pieces of greenish white (5G 9/1) chalk (at bottom of Sections 2 and 4) in a bluish white (5B 9/1) to greenish white (5G 9/1) paste probably produced by drilling operations. Smear slides in chalk show important recrystallization of the nannofossils and abundant small recrystallized calcite grains.
		f r	R C	P M	2					
					3		NOT OPENED			
		n f r	A R C	M P M	4					
		n f r	A R C	M P M	Core Catcher				*	

Site 167 Hole Core 29 Cored Interval: 564 to 574 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. EOCENE	P15 I. T. bromia	f n r	F A F	M M M	Core Catcher				*	Radiolarian nannofossil chalk - Smear slide shows abundant recrystallization I. D. barbadiensis

Explanatory notes in Chapter 1

Site 167 Hole Core 30 Cored Interval: 574 to 583 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE EOCENE	P14 Chiasmolithus grandis Theocyrtis bromia	n f r f n r	A R C R A A	M M M M M G	1	0.5 1.0	VOID			Radiolarian nannofossil chalk, bluish white (5B 9/1) with moderate very faint mottling. Smear slide shows recrystallization.
					Core Catcher				*	

Site 167 Hole Core 31 Cored Interval: 583 to 592 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
M. EOCENE	1	f n r	R A	P M	Core Catcher				*	Radiolarian nannofossil chalk - Smear slide shows recrystallization.

1.Ch. grandis

Site 167 Hole Core 32 Cored Interval: 592 to 601 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE EOCENE	P14 Chiasmolithus grandis Podocyrtis goetheana				1	0.5 1.0	NOT OPENED			(Section 1 not opened, very disturbed)
		n f	A F	M M	2				*	Nannofossil chalk, white (N10) Parts of ground up chalk Common radiolarian fragments slight degree of dissolution.
		f r	F A	M G	3					
		f n r	F A A	M M G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 33 Cored Interval: 601 to 611 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE EOCENE	P14 Chiasmolithus solitus Podocyrtis chalara	f r n	R C A	M M M	1	0.5 1.0				Chert and nannofossil chalk - Pieces of hard rock, mixed by drilling. Chert is gray (N7 to N4) with white streaks and blebs. Hard white rock at contact with chert is a highly silicified chalk. Radiolarian are absent from the chalk
					2		NOT OPENED			(Section 2 not opened, very disturbed)
		f n r	R A F	M M P	Core Catcher					

Site 167 Hole Core 34 Cored Interval: 611 to 620 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
M. EOCENE	P13 C.solitus P.chalara	f n r	R A F	M M P	Core Catcher				*	Nannofossil chalk and grey chert - common radiolarian fragments show slight degree of dissolution.

Site 167 Hole Core 35 Cored Interval: 620 to 629 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
M. EOCENE	P13 C.solitus P. mitra	f n r	R A F	M M P	Core Catcher				*	Chert and minor chalky limestone. Very light gray chert with slightly darker streaks and slickensides; and medium dark gray (N4) to slightly brownish chert, dense, glassy (flint-like) with irregular lenses of light chert and white (N9) chalky limestone.

Site 167 Hole Core 36 Cored Interval: 629 to 639 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
M. EOCENE	C.solitus 1	f n r	P R R	P P P	Core Catcher				*	Chert and limestone. Chert is medium dark gray (N4) to light gray (N7) with shades of brownish gray (5YR 4/1), dense (flint-like), conchoidally fractured with occasional white blebs and spots. Limestone is white (N9 to N10), hard, partly recrystallized and partly silicified.

Explanatory notes in Chapter 1
1.T. triacantha

Site 167 Hole Core 37 Cored Interval: 639 to 648 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
M. EOCENE	N. fulgens 1	n r	C R	M P	Core Catcher				*	**Chert** and **limestone**. Chert is mainly reddish brown (10YR 4/6 and lighter), dense, glassy, conchoidally fractured and some pieces show various shades of brown with lenses of yellowish gray (5Y 8/1). Some pieces show contact with silicified limestone. Limestone, white (N9 to N10) aphanitic.

Site 167 Hole Core 38 Cored Interval: 648 to 657 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PALEOCENE	P3 D. mohleri	f n r	F C B	M M	Core Catcher				*	**Chert** and **limestone**. Chert is moderate brown (5YR 4/4 and 3/4), grayish yellow (10YR 7/4) and moderate reddish brown (10YR 4/6); conchoidally fractured and glassy ("flint"-like). Limestone is white (N10), micritic.

Site 167 Hole Core 39 Cored Interval: 648 to 657 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PALEOCENE	P2 Fasciculithus tympaniformis	f n r	F C B	M P	1	0.5 1.0				**Limestone and chert.** Limestone is white (N9) to yellowish gray (5Y 8/1), micritic, partly broken in small fragments in the lower part of the section. Chert is light to moderate brown (5YR 5/6 to 5YR 4/4), glassy, broken in angular small fragments.
		f n r	F C B	M P	Core Catcher				*	

Site 167 Hole Core 40 Cored Interval: 666 to 676 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
PALEOCENE	P1 Fasciculithus tympaniformis				1	0.5 1.0	NOT OPENED			(Section 1 not opened, very disturbed by drilling).
		f n r	F C B	M P	Core Catcher				*	**Chert and limestone.** Chert fragments, mainly moderate brown (5YR 4/1) with lighter moderate orange pink (5YR 8/6) specks on some pieces, very angular, glassy to slightly dull. Limestone is white (N9 to N8) micritic, hard (partly silicified).

Explanatory notes in Chapter 1

Site 167 Hole Core 41 Cored Interval: 676 to 685 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
1	2 M. mura	f n r	F A R	P M P	Core Catcher				* *	**Chert, limestone and chalk (fragments)** - limestone is white (N9) to pale yellowish brown (10YR 6/2), slightly zeolitic, soft, micritic. Chert is moderate reddish brown (10R 4/6), glassy (sharp angular fragments). Chalk is greenish white (5G 9/1), soft, with abundant nannofossils. 1. MAESTRICHTIAN 2. ?A. mayaroensis

Site 167 Hole Core 42 Cored Interval: 685 to 694 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAESTRICHTIAN	Abathomphalus mayaroensis ?Lithraphidites quadratus	f	F	P	1	0.5 1.0			*	**Nannofossil Chalky limestone**, with occasional **chert**- mainly broken fragments, often homogenized by drilling operation.
		n	A	M			VOID			Limestone is mainly white (N9) to pale yellowish brown (10YR 6/2). White sections are chalky and relatively soft, brown fragments are very hard with occasional ashy layers (dark yellowish brown, 10YR 4/2). Chert, dark reddish brown (10R 3/2) is present as large pieces in Section 1, as small scattered angular fragments in the lower Sections.
		n f	A R	M P	2					
		n f	A C	M P	3		VOID			
		n f	C C	M P	4		VOID		*	
		n f	C F	M P	5				*	
		f n r	F C B	P G	Core Catcher					

Explanatory notes in Chapter 1

Site 167 Hole Core 43 Cored Interval: 694 to 703 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAESTRICHTIAN	Globotruncana gansseri ?Lithraphidites quadratus				1	0.5 1.0	NOT OPENED			(Section 1 not opened, very disturbed).
		n f	C F	M M	2					Chert fragments, angular (artificial graded bedding), mainly moderate reddish brown (10R 4/6), badly disturbed by drilling.
		f n r	F A B	M M	Core Catcher				*	

Site 167 Hole Core 44 Cored Interval: 703 to 713 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAESTRICHTIAN	Globotruncana gansseri Tetralithus trifidus	f	R	P	1	0.5 1.0				Nannofossil chalk and chert, with some limestone at the top. Chalk is yellowish gray (5Y 8/1), pinkish gray (5YR 8/1) and pale orange pink (5YR 8/2) at the bottom. Chert is moderate reddish brown (10R 4/6) to gray.
		f n r	R A B	P G	Core Catcher				*	Nannofossil chalk

Explanatory notes in Chapter 1

Site 167 Hole Core 45 Cored Interval: 713 to 722 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAESTRICHTIAN	Globotruncana gansseri Tetralithus trifidus				1	0.5 1.0	NOT OPENED			(Sections 1, 2, 4 and 5 not opened, very disturbed).
					2		NOT OPENED			
		n f	A R	G P	3					Nannofossil chalk, pinkish gray (5YR 8/1), (upper part very watery). Pieces of chalk in a paste of ground up chalk. One piece in Section 6 shows faint laminations.
					4		NOT OPENED			
					5		NOT OPENED			
		n f	A R	G P	6					Nannofossil chalk, as above.
		f n	R A	P G	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 46 Cored Interval: 722 to 731 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY MAESTRICHTIAN	Rugotruncana subcircumnodifer Tetralithus trifidus				1	0.5 1.0	NOT OPENED			(Sections 1 to 6 not opened, very watery and disturbed).
					2					
					3					
					4					
					5					
					6					
		f n r	R A B	P G	Core Catcher				*	Nannofossil chalk, pinkish gray (5YR 8/2 to 8/1) with occasional black spots (Mn-rich ?).

Explanatory notes in Chapter 1

Site 167 Hole Core 47 Cored Interval: 731 to 740 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
1	2 3	f n r	R A B	P G	Core Catcher				*	Nannofossil chalk, pinkish gray (5YR 8/1) with a few lighter and darker laminae and mottles; firm.

Explanatory notes in Chapter 1

1. E. MAESTRICHTIAN
2. R. subcircum- nodifer
3. T. trifidus

Site 167 Hole Core 48 Cored Interval: 740 to 750 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
1	2 3	f n r	R A B	P G	Core Catcher				*	Nannofossil chalk and chert. Chalk is pinkish gray (5YR 8/1), firm, with very faint irregular laminations. One piece of chert, dark reddish brown (10R 3/4), glassy, conchoidally fractured.

Explanatory notes in Chapter 1

1 E. MAESTRICHTIAN
2 R. subcircum- nodifer
3 T. trifidus

Site 167 Hole Core 49 Cored Interval: 750 to 759 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN	Globotruncana calcarata Broinsonia parca	n f	A R	M P	1	0.5 1.0			*	Nannofossil chalk, mainly grayish orange pink (5YR 7/2) and pinkish gray (5YR 8/1) with faint lenses, mottles and laminae ranging from pale brown (5YR 5/2) to pinkish white (5YR 9/1). The darker layers are slightly clayey and contain iron oxides. Some chert fragments in the core catcher.
		f n r	R A B	P M	Core Catcher				*	

Site 167 Hole Core 50 Cored Interval: 759 to 768 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN	Globotruncana calcarata Broinsonia parca	n f	A R	G P	1	0.5 1.0				Nannofossil chalk, pinkish gray (5YR 8/1) with occasional mottles of pinkish white (5YR 9/1), moderately firm.
		f n r	R A B	P G	Core Catcher				*	Some small chert fragments in core catcher.

Explanatory notes in Chapter 1

Site 167 Hole Core 51 Cored Interval: 768 to 777 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
1	2 3	f n r	F A B	M G	Core Catcher				*	Foraminiferal nannofossil chalk, pinkish white (5YR 9/1) to pinkish gray (5YR 8/1) with chips of brown (10R 4/6 to 5YR 4/4) chert, ground up by drilling.

Explanatory notes in Chapter 1

1. L. CAMPANIAN
2. G. calcarata
3. E. eximius

Site 167 Hole Core 52 Cored Interval: 777 to 786 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	Globotruncana stuartiformis Eiffellithus eximius	f	R	P	1	0.5 1.0				Nannofossil chalk, mainly pinkish gray (5YR 8/1) with a few angular chips of red brown chert, ground up by drilling (chalk is very soft).
					2		NOT OPENED			(Section 2 not opened, very disturbed).
		f n r	R A B	P G	Core Catcher				* *	Some pale brown (5YR 6/2) slightly clayey zones in core catcher.

Site 167 Hole Core 53 Cored Interval: 786 to 796 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	Globotruncana stuartiformis Eiffellithus eximius	n f	A R	G P	1	0.5 1.0	VOID			Nannofossil chalk, mainly pinkish gray (5YR 8/1) with some lighter (5YR 9/1) and darker (2.5YR 4/2) zones showing fine "wavy" laminations, and chert fragments, dusky red (7.5R 3/4). One large fragment at 89-92 cm with pinkish white (5YR 9/1) zone at the top. Some darker zones in chalk show rare to common hematite in slightly clayey and zeolitic sediment.
		f n r	R A B	P G	Core Catcher				* *	

Explanatory notes in Chapter 1

Site 167 Hole Core 54 Cored Interval: 796 to 805 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	Globotruncana stuartiformis Eiffellithus eximius	f n	R A	P G	1	0.5 1.0	VOID			Nannofossil chalk, pinkish gray (5YR 8/1) with slightly darker and lighter shades; firm, with no apparent structure.
		f n r	R A B	P G	Core Catcher				*	Rare fragments of reddish brown chert in the core catcher.

Site 167 Hole Core 55 Cored Interval: 805 to 814 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	Globotruncana stuartiformis Eiffellithus eximius	n	A	G	1	0.5 1.0	VOID			Nannofossil chalk, pinkish gray (5YR 8/1) and slightly lighter; firm; very faint mottling. Most of the core is ground up by drilling.
		f	R	P	2					
		f n r	R A B	P G	Core Catcher				*	Some chert fragments are present in the core catcher.

Site 167 Hole Core 56 Cored Interval: 814 to 823 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	G. stuartiformis Eiffellithus eximius	n f	A R	G P	1	0.5 1.0	VOID		*	Nannofossil chalk, pinkish gray (5YR 8/1) with pinkish white (5YR 9/1) intervals and some thin (1 mm) layers of grayish brown (5YR 3/2) slightly clayey and hematitic chalk.
		f n r	R A B	P G	Core Catcher				*	Some chert chips in the upper part (probably cavings) and in the core catcher.

Explanatory notes in Chapter 1

Site 167 Hole Core 57 Cored Interval: 823 to 827 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CAMPANIAN	? Eiffellithus eximius	f n	R A	P M	1	0.5, 1.0	VOID			Nannofossil limestone, mainly grayish orange pink (5YR 7/2), soft, very fine grained, micritic. Moderate to strong mottling (bioturbation) with abundant small (2 to 3 mm) burrows. Some dark intervals (moderate brown, 5YR 3/4) show the same structures. A 0.6 cm thick layer of sand-size carbonate grains is present at 126 cm.
		f n	R A	P M	Core Catcher				*	

Site 167 Hole Core 58 Cored Interval: 827 to 832 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CONIACIAN-SANTONIAN	E. eximius	n	C	P	1	0.5, 1.0				Marly limestone, mainly dark reddish brown (10R 3/4) to pale reddish brown (10R 5/4), occasional layers show a medium greenish gray (5G 5/1) color. Small scale moderate to intense mottling and burrowing produces some lighter intervals (very pale orange, 10YR 8/2).
	Marthasterites furcatus				2					Hematite is common in the darker intervals.
		n	C	P	3					Sections 3 and 4 contain some turbidites made of redeposited pelagic material; bases of sequences are made of small (1 mm) clases (mud flakes flattened by compaction) and upper parts of sequences are homogeneous (without bioturbation).
		n	C	P	4				*	
		f n r	R C B	P P	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 59 Cored Interval: 832 to 841 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CONIACIAN-SANTONIAN	Marthasterites furcatus	n	C	P	1	0.5, 1.0				Marly limestone, mainly light brown (7.5YR 6/4 and 7/4) and dark reddish brown (10R 3/4 to 4/4), grading to olive gray (5Y 6/1 to 3/2) near the bottom. Mottling and burrowing are moderate to intense throughout. The rock is relatively soft.
		n	C	P	2				* * * *	Mottles are mainly grayish orange pink (5YR 7/2) and occasional graded layers show the same color. Some zones, grayish brown (5YR 3/2) burrowed with brownish black (5YR 2/1) seem Mn-rich and have a waxy aspect.
		n	C	P	3				* *	Two pieces of chert, dusky brown (5YR 2/2) are present in Section 3, separated by a graded calcareous bed. Several graded beds are observed in the same Section.
		f n r	R C B	P P	Core Catcher				*	

Site 167 Hole Core 60 Cored Interval: 841 to 851 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE TURONIAN	Micula decussata				1	0.5, 1.0	VOID			Marly limestone showing various shades of grayish to reddish brown (10R 3/4, 4/2, 5/6, 5/7) greenish gray (5G 6/1) and grayish brown (5YR 2/1, 2/2, 3/2, 5/4, 8/3).
		n	A	P	2		VOID		* * * *	In Section 2 are a chert fragment, grayish brown (5YR 3/2) and, near the base, a tuffaceous limestone, olive gray (5Y 5/2), very pale orange (10YR 8/2) and pale brown (5YR 5/2), laminated. Occasional laminations and burrowing, and rare graded beds are present throughout.
		f n r	R A R	P P P	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 61 Cored Interval: 851 to 860 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
CENOMANIAN	Lithaphridites alatus				1	0.5, 1.0	VOID			
		r n	A C	P P					*	Sect. 1 and Sect. 2 Marly limestone, mainly yellowish brown (10YR 6/2) with various shades of yellowish and orangish brown (5Y 8/1, 5YR 8/3 and 2/2, 10YR 8/2 and 4/2). Abundant "wavy" laminations, lenses, burrows and mottles. Graded bed, rich in recrystallized radiolaria (chalcedony) near the top of the core. Chert, dusky brown (5YR 2/2) is present in Section 2. A small irregular lens at 82 cm may be incipient chert.
		n r	C A	P P	2				*	
		f n r	 C R	 P P	Core Catcher					

Site 167 Hole Core 62 Cored Interval: 860 to 870 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN TO EARLY CENOMANIAN	Eiffellithus turriseiffeli				1	0.5, 1.0	NOT OPENED			(Section 1 not opened).
					2					Marly limestone and chert. Limestone shows various shades of yellowish, orangish and grayish brown (10YR 5/1, 5/3, 4/2, 6/2, 8/3) with some lighter mottles, burrows and laminae. In is micritic and slightly zeolitic (possibly slightly dolomitic).
		n r	C A	P P					*	
		r	R	P	3				*	Chert is dusky brown (5YR 2/2), glassy, in beds or nodules 2 to 5 cm thick.
		n	C	P						
		n	C	P	4					
		n r	F C	P P	Core Catcher				*	

Explanatory notes in Chapter 1

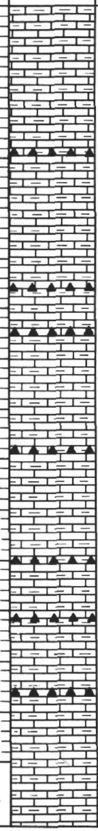
Site 167 Hole Core 63 Cored Interval: 870 to 879 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli				1	0.5, 1.0	VOID			Sect. 1; 30 to 150 cm and Sect. 2; 0 to 51 cm; Limestone and chert. Limestone is pale yellowish brown (10YR6/2), hard micritic, with some laminations, bioturbation and turbidites (complete sequence in Sect. 1 at 71 to 78 cm). Chert is dusky brown (5YR2/2) to dark reddish brown (10R3/4), massive. In Sect. 1 at 60 to 67 cm chert is brecciated in angular fragments cemented by large sparry calcite crystals and well crystallized quartz.
					2				* **	Sect. 2; 51 to 81 cm; Brecciated limestone in marly matrix, at base of graded bed. Breccia shows little displacements of the clasts. Sect. 2; 81 to 150 cm and Sect. 3; 0 to 116 cm; Pebbly marly mudstone. Matrix is dark yellowish brown (10YR4/2), zeolitic. Clasts are pale orange (10YR8/2) rounded fragments of coarser grained limestone (size 1 mm to 3 cm) with rare chert fragments.
					3					Sect. 3; 116 to 150 cm and Sect. 4; 0 to 150 cm; Marly limestone, with shale laminae and minor chert. Lower part shows grading to homogeneous limestone. Upper part is mainly light gray (N7) to grayish orange pink (5YR7/2) with grayish brown shale laminae and several graded beds - lower part is light gray (N7) to pinkish gray (5YR8/1) and pale yellowish brown (10YR6/2) with some laminations.
					4					
		n r	F R	P P	Core Catcher					

Explanatory notes in Chapter 1

Site 167 Hole Core 64 Cored Interval: 879 to 888 m

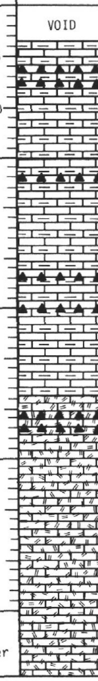
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffelithus turriseiffeli				1	0.5, 1.0				Sect. 1; 0 to 150 cm; Limestone, marly limestone and chert. Limestone is very pale orange (10YR8/2) to light gray (N7). Marly zones are darker (grayish brown, 5YR3/2 to 4/4) with wavy laminations. One small layer of soft calcareous claystone is present at 81 to 85 cm. Chert is dusky brown (5YR2/2).
					2					Sect. 2; 0 to 150 cm; Same as dominant lithology in Sect. 1 above, with possible turbidites - vertical very thin veinlets are probably the result of dewatering in the early stages of compaction.
					3					Sect. 3; 0 to 150 cm; Same as dominant lithology in Sect. 1 above with slumping. Thin horizontal quartz or chalcedony veinlet at 124 cm.
					4					Sect. 4; 0 to 150 cm; Same as dominant lithology in Sect. 1 above with well defined slumping (microfaulting, micro-shearing, and dipping).
					5					Sect. 5; 0 to 150 cm; Same as dominant lithology in Sect. 1 above with slumping structures in most of the section.
		r n	A F	P P	Core Catcher				*	



Explanatory notes in Chapter 1

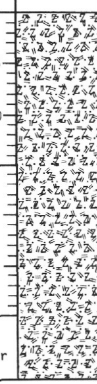
Site 167 Hole Core 65 Cored Interval: 888 to 898 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffelithus turriseiffeli				1	0.5, 1.0	VOID			Sect. 1; 35 to 150 cm; Limestone and chert. Limestone is mainly very pale orange (10YR8/2) to pale yellowish brown (10YR6/2), micritic, slightly marly, with abundant burrows. Chert is moderate brown (5YR3/4) to dark reddish brown (10R3/4).
					2					Sect. 2; 0 to 150 cm; Same as in Sect. 1 above, with slumping structures (30° dip and microshearing).
					3					Sect. 3; 0 to 88 cm; Same as in Sect. 1 above with occasional large burrows and slumping. Sect. 3; 88 to 150 cm; Tuffaceous limestone and chert. Limestone is as in Sect. 1 above with abundant volcanic ash producing a greenish color (dark to light greenish gray, 5G4/1 to 7/1) with some lenses of dark and dusky blue green (5BG3/2). Occasional intervals of waxy appearance, reddish gray (10R5/1). Numberous burrows and wavy laminations. Chert is as in Sect. 1 above.
					4				*	
		n r	F B	P	Core Catcher					



Site 167 Hole Core 66 Cored Interval: 898 to 907 m

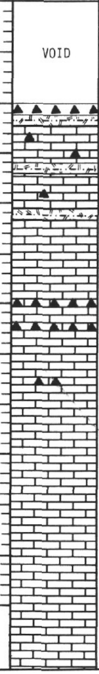
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffelithus turriseiffeli				1	0.5, 1.0			*, *	Sect. 1; 0 to 150 cm; Tuff (volcanic siltstone with abundant zeolites and glass), mainly dark greenish gray (5G4/1), grayish green (5G5/2) and dusky blue green (5BG3/2). Occasional reddish gray (5R5/1) laminae and a few light colored calcareous laminae, thin regular laminations throughout.
					2				*	Sect. 2; 0 to 150 cm; Same as in Sect. 1 above.
		n r	C B	P	Core Catcher					



Explanatory notes in Chapter 1

Site 167 Hole Core 67 Cored Interval: 907 to 916 m

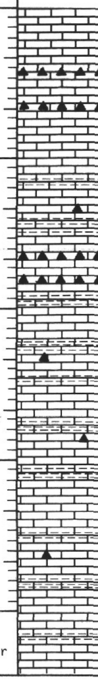
AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli				1	0.5 1.0	VOID		*	Sect. 1; 100 to 150 cm; <u>Limestone</u>, <u>chert</u> and <u>Tuff</u>. Limestone is light gray (N7) to white (N9), micritic, with burrows and wavy laminations. Chert is mainly brownish gray (5YR4/1) with lighter shades. Tuff is greenish gray (5G5/1) and grayish brown (5YR3/2), in fine grained (silt and clay size) lenses and beds. Some beds contain coarse chalcedony-replaced radiolarians mixed with glass and zeolites.
					2					Sect. 2; 0 to 150 cm; Same as dominant lithology of Sect. 1; with very small lens-shaped chert nodules.
		n r	C A	P M	3					Sect. 3; 0 to 150 cm; <u>Limestone</u> and <u>chert</u> similar to those of Sect. 1. Chert is common at top of Section and becomes rare in lower part.
EARLY ALBIAN	Prediscosphaera cretacea	r	A	M	4					Sect. 4; 0 to 150 cm; <u>Limestone</u> similar to that of Sect. 1, possible slump structures.
		n r	C R	P P	Core Catcher				*	



Explanatory notes in Chapter 1

Site 167 Hole Core 68 Cored Interval: 916 to 925 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY ALBIAN	Prediscosphaera cretacea				1	0.5 1.0				Sect. 1; not opened.
					2				*	Sect. 2; 0 to 150 cm; <u>Limestone</u> and <u>chert</u>. Limestone is pinkish gray (5YR8/1), light gray (N7 to N8) and occasionally grayish orange pink (5YR7/2), fine grained, micritic. Some marly laminae are darker (grayish brown, 5YR3/2). Abundant wavy laminations and moderate burrowing. Chert is moderate brown (5YR4/4) and slightly more reddish.
					3					Sect. 3; 0 to 150 cm; Same as dominant lithology of Sect. 1 with occasional thin brown <u>shale</u> layers.
					4					Sect. 4; 0 to 150 cm; Same as in Sect. 3; with evidence of slumping. Chert is very rare.
					5					Sect. 5; 0 to 150 cm; Same as in Sect. 4. (Shale symbols in lithology column are arbitrarily located.)
		n r	C R	P P	Core Catcher				*	



Explanatory notes in Chapter 1

Site 167 Hole Core 69 Cored Interval: 925 to 935 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN - E. ALBIAN	Parhabdolithus angustus	n	C	P	1	0.5				Sect. 1; 0 to 150 cm; Limestone with occasional chert and shale. Limestone is mainly light gray to white (N7 to N9) with pinkish gray (5YR8/1) and pale brown (5YR7/3) zones. It is micritic with common recrystallized radiolarians and foraminifera. Chert is moderate brown (5YR4/4) with reddish or lighter shades. Shale layers are pale brown (5YR5/2) and in places darker and sandy with silicified radiolarians and foraminifera. Evidence of slumping in the limestone and shale.
		r	C	P	1	1.0				
		n	F	P	2					Sect. 2; 0 to 150 cm; Same as in Sect. 1.
		r	C	M	3				*	Sect. 3; 0 to 150 cm; Same as dominant lithology of Sect. 1, with lesser amount of chert.
		n	C	P	4					Sect. 4; 0 to 150 cm; Same as in Sect. 3, with very rare chert.
		r	C	P	4				*	(Shale symbols in lithology column are arbitrarily located.)
		n	C	P	Core Catcher				*	
		r	R	P	Core Catcher					

Explanatory notes in Chapter 1

Site 167 Hole Core 70 Cored Interval: 935 to 944 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN - E. ALBIAN	Parhabdolithus angustus				1	0.5	VOID			Sect. 1; 70 to 150 cm; Limestone, shale and chert. Limestone is orangish gray (10YR7/1) and light gray (N7 to N8). Some coarse grained beds contain calcite and/or silica replaced radiolarians and foraminifera. Shale is waxy, calcareous, mianly dark yellowish brown (10YR4/2 to 3/2). Chert is moderate brown (5YR4/4) to more reddish, massive, glassy and fractures conchoidally.
		r	C	P	1	1.0				
		n	C	P	1					
		r	A	M	2					Sect. 2; 0 to 150 cm; Same as in Sect. 1.
		n	C	P	2					
		n	C	P	3					Sect. 3; 0 to 150 cm; Same as in Sect. 1.
		r	C	P	4					Sect. 4; 0 to 150 cm; Same as in Sect. 1.
		n	C	P	4					
		r	C	M	4					(Shale symbols in lithology column are arbitrarily located.)
		n	C	P	Core Catcher				*	
		r	R	P	Core Catcher					

Site 167 Hole Core 71 Cored Interval: 944 to 953 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN	Tetralithus malticus	n	C	P	1		VOID			Sect. 1; 25 to 150 cm; Limestone with occasional shale and chert. Limestone is light brownish gray (2.5Y6/2) to very light gray (N8), micritic, fine grained, often homogeneous with minor bioturbation. Shale is dark yellowish brown (10YR4/2) with a waxy aspect and common wavy laminations. Chert is grayish to pale red (10R4/2 to 6/2), glassy, it fractures conchoidally.
		n	C	P	1	0.5				
		r	R	P	1	1.0				
		n	C	P	2					Sect. 2; 0 to 130 cm; Same as in Sect. 1.
					2		VOID			(Shale symbols in lithology column are arbitrarily located.)
		r	R	P	Core Catcher				*	Core Catcher; Same as in Sect. 1.

Explanatory notes in Chapter 1

Site 167 Hole Core 72 Cored Interval: 953 to 962 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN	Tetralithus malticus	n r	C C	P M	1 2	0.5 1.0				Sect. 1; 0 to 150 cm; Limestone with occasional shale and chert - Limestone is mainly light brownish gray (2.5Y6/2) to very light gray (N8), with abundant wavy laminations and occasional burrows. Some coarse grained beds contain calcite or chalcedony replaced radiolarians and foraminifera. Shale is grayish to dark yellowish brown (5YR3/2 to 10YR4/2) calcareous with wavy laminations. Chert is pale brown (5YR5/2), to reddish brown (10R5/4), conchoidally fractured, and contains common limestone lensoid inclusions. At Sect. 1; 79.5 cm = fragment of Aptychus. Sect. 2; 0 to 150 cm; Same as Sect. 1 dominant lithology. (Shale symbols in lithology column are arbitrarily located.)
		n r	C A	P P	Core Catcher					

Site 167 Hole Core 73 Cored Interval: 962 to 971 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
HAUTERIVIAN	Cruciellipsis cuvillieri	r	C	P	1	0.5 1.0				Sect. 1; 0 to 150 cm; Limestone, with occasional shale and chert. Limestone is mainly light gray (N7 to N8) to grayish orange pink (5YR7/2), micritic, with clayey brown laminae. Shale is moderate brown (5YR3/4) calcareous, soft, waxy, with some cross laminations. Chert is grayish red (10R4/2) with lighter and darker (brown) shades; it fractures conchoidally and contains limestone inclusions. Sect. 2; 0 to 150 cm; Same as in Sect. 1. (Shale symbols in lithology column are arbitrarily located.)
		r n	C C	M P	2					
		n r	C A	P P	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 74 Cored Interval: 971 to 981 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
HAUTERIVIAN	Cruciellipsis cuvillieri	n	C	P	1	0.5 1.0	VOID			Sect. 1; 100 to 150 cm; Limestone and chert, with occasional shale. Limestone is light gray (N7 to N8) to light brownish gray (5YR7/1), micritic, with occasional sandy layers (calcite and chalcedony replaced radiolarians and foraminifera), burrows and clayey brown laminae with wavy laminations. Chert is pale red (10R6/2), glassy; it fractures conchoidally. Shale is mainly moderate brown (5YR3/4). Sect. 2; 0 to 150 cm; Same as in Sect. 1. (Shale symbols in lithology column are arbitrarily located.)
		r	C	M	2					
		r n	R C	P P	Core Catcher				*	

Site 167 Hole Core 75 Cored Interval: 981 to 990 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
HAUTERIVIAN	Cruciellipsis cuvillieri	n r	F C	P P	1	0.5 1.0	VOID			Sect. 1; 100 to 150 cm; Limestone and chert. Limestone is mainly light gray (N7 to N8), micritic, with wavy laminations. Chert is pale red (10R6/2) and glassy.
L. VALANG.-E. HAUTER.	T. jura-pelagicus	n r	C R	P P	Core Catcher				*	

Explanatory notes in Chapter 1

Site 167 Hole Core 76 Cored Interval: 990 to 999 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE VALANGINIAN-EARLY HAUTERIVIAN	Tubodiscus jurapelagicus	n	C	P	1	0.5, 1.0	VOID			Sect. 1; 20 to 150 cm; Limestone and chert - Limestone is mainly light gray (N7 to N8) to light brownish gray (5YR7/1), micritic, fine grained, with wavy laminations and some microstylolites (less than 1 mm amphitude). Several sandy zones contain recrystallized radiolarians and foraminifera. Chert is grayish red (10R4/2) with white lenses of silicified limestone.
		r	R	P						
		r	A	M	2					Sect. 2; 0 to 150 cm; Same as Sect. 1.
		n	C	P						
		n	C	P	Core Catcher				*	
		r	B						*	

Site 167 Hole Core 77 Cored Interval: 999 to 1008 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. VALANGINIAN-E. HAUTERIVIAN	Tubodiscus jurapelagicus				1	0.5, 1.0	VOID			Limestone with occasional shale and chert. Limestone is light brownish gray (10YR7/1) to very light gray (N8), micritic, with darker wavy laminations and occasional sandy zones, containing recrystallized radiolarians and foraminifera, that have a greenish gray (5GY7/1) color and abundant burrows, some of them chertified. Shale is grayish brown (5YR3/2), waxy, calcareous. Chert is pale red (10R6/2) or slightly darker.
		n	C	P	Core Catcher				*	
		r	R	P						

Site 167 Hole Core 78 Cored Interval: 1008 to 1018 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. VALANGINIAN-E. HAUTERIVIAN	Tubodiscus jurapelagicus				1	0.5, 1.0	VOID			Limestone and chert. Limestone is very light gray (N8) to light brownish gray (10YR7/1), almost homogeneous (very faint parallel laminations). Stylolites present at 145 cm. Chert is pale red (10R6/2) with white lenses and occasional bedding.
		n	C	P	Core Catcher			*		
		r	R	P						

Explanatory notes in Chapter 1

CORES 79 & 80 NO RECOVERY

Site 167 Hole Core 81 Cored Interval: 1036 to 1045 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. VALANG.-E. HAUTERIV.	T. jura-pelagicus	n	C	P	Core Catcher				*	Chert and limestone. Chert is pale red (10R6/2), fractures conchoidally, and shows some bedding. Limestone is very light gray (N8) micritic, almost homogeneous.
		r	B							

Site 167 Hole Core 82 Cored Interval: 1045 to 1055 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. VALANG.-E. HAUTER.	T. jurape-lagicus	n	C	P	Core Catcher				*	Chert, mainly pale red (10R6/2) to grayish red (10R4/2) and light olive gray (5Y6/1), with irregular lenses of yellowish gray (5Y8/2) silicified limestone.
		r	R	P						

CORE 83 NO RECOVERY

Site 167 Hole Core 84 Cored Interval: 1064 to 1073 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
L. VALANG.-E. HAUTERIV.	T. jura-pelagicus	n	C	P	Core Catcher				*	Limestone and chert in cavings from upper part of the hole (containing abundant chert chips and quaternary foraminifera). Limestone is greenish white (5G9/1) to dark greenish gray (5G4/1), laminated. Chert is very light gray (N8) and reddish gray (10R6/1).
		r	R	M					*	

Site 167 Hole Core 85 Cored Interval: 1073 to 1082 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
?		n	B		Core Catcher					Chert, variegated, pale red (10R6/2) and yellowish gray (5Y7/1), hard, dense, glassy; it fractures conchoidally.
		r	B							

Site 167 Hole Core 86 Cored Interval: 1082 to 1101 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANG.-BERRIAS.	W. britan-nica	n	C	P	Core Catcher					Chert.
		r	A	P						

Explanatory notes in Chapter 1

Site 167 Hole Core 87 Cored Interval: 1101 to 1108 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANG.-BERRIAS.	W. britannica	n r	C A	P P	Core Catcher				*	Limestone, greenish white (5G9/1), micritic, with some rare sand size green grains (chlorite?) and a few clayey laminae. A small piece of dark greenish gray (5G4/1) calcareous shale is also present.

Site 167 Hole Core 88 Cored Interval: 1108 to 1119 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY VALANGINIAN-BERRIASIAN	Watznaueria britannica				1	0.5 1.0	VOID			Limestone and chert. Limestone is mainly greenish white (5G9/1) to greenish gray (5G5/1) with rare clay minerals and glass shards observed in the smear slides. The lower part shows light gray (N7) to light brownish gray (5YR6/1) graded beds. Chert is varigated, reddish gray (10R7/1) and very light gray (N8), glassy; it fractures conchoidally.
		n r	C A	P M	Core Catcher				* *	

Site 167 Hole Core 89 Cored Interval: 1119 to 1129 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANG.-BERRIASIAN	W. britannica	n r	C C	P P	Core Catcher				*	Limestone and shale. Limestone is mainly very light gray (N8) with some grayish purple (5RP4/2) and greenish gray (5G6/1) laminae, micritic. Shale is firm, laminated, dusky yellowish brown (10YR4/2) with some micronodules and some zeolites and clay.

Site 167 Hole Core 90 Cored Interval: 1129 to 1138 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANG.-BERRIAS.	W. britannica	n r	C B	P	Core Catcher				*	Very small fragments of chert, zeolitic and glass-rich siltstone (dark greenish gray, 5G4/1), zeolitic nannofossil marl, yellowish brown (10YR5/4), and very soft white (N9) nannofossil chalk.

Explanatory notes in Chapter 1 CORE 91 NO RECOVERY

Site 167 Hole Core 92 Cored Interval: 1148 to 1157 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANGINIAN-BERRIASIAN	Watznaueria britannica	r n	R C	P P	1	0.5 1.0	VOID			Limestone and chert. Limestone is mainly light greenish gray (5G8/1) and darker (5G4/1), micritic, slightly clayey in laminated beds, with rare dark reddish laminae. Chert is varigated, light brownish gray (5YR6/1) to white (N9), light bluish gray (5B7/1) and reddish gray (10R5/1).
		n r	C R	P P	Core Catcher				*	

Site 167 Hole Core 93 Cored Interval: 1157 to 1166 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
E. VALANGINIAN-BERRIASIAN	W. britannica	n r	C B	P	1	0.5 1.0	VOID			Sect. 1; 50 to 150 cm; Limestone and chert - Limestone is light greenish gray (5G8/1) to dark greenish gray (5G4/1), with some pale and grayish red (5R7/1); it is micritic, slightly clayey and Tuffaceous, with occasional sandy beds containing recrystallized radiolarians and foraminiferal. Abundant wavy laminations throughout. Chert is varigated, pale red (5R6/2), pale yellowish brown (10YR6/2), white (N10) and pale red purple (5RP7/2), glassy and hard. Sect. 2; 0 to 150 cm; Same as in Sect. 1; at 55 to 57 cm in a bed with chevron-like structures (zoophycus?). Some slump structure at base of section (47° dip).
LATE TITHONIAN-BERRIASIAN	Nannoconus colomi	r n	C C	M P	2					
		n r	C R	P P	Core Catcher				* *	

Explanatory notes in Chapter 1

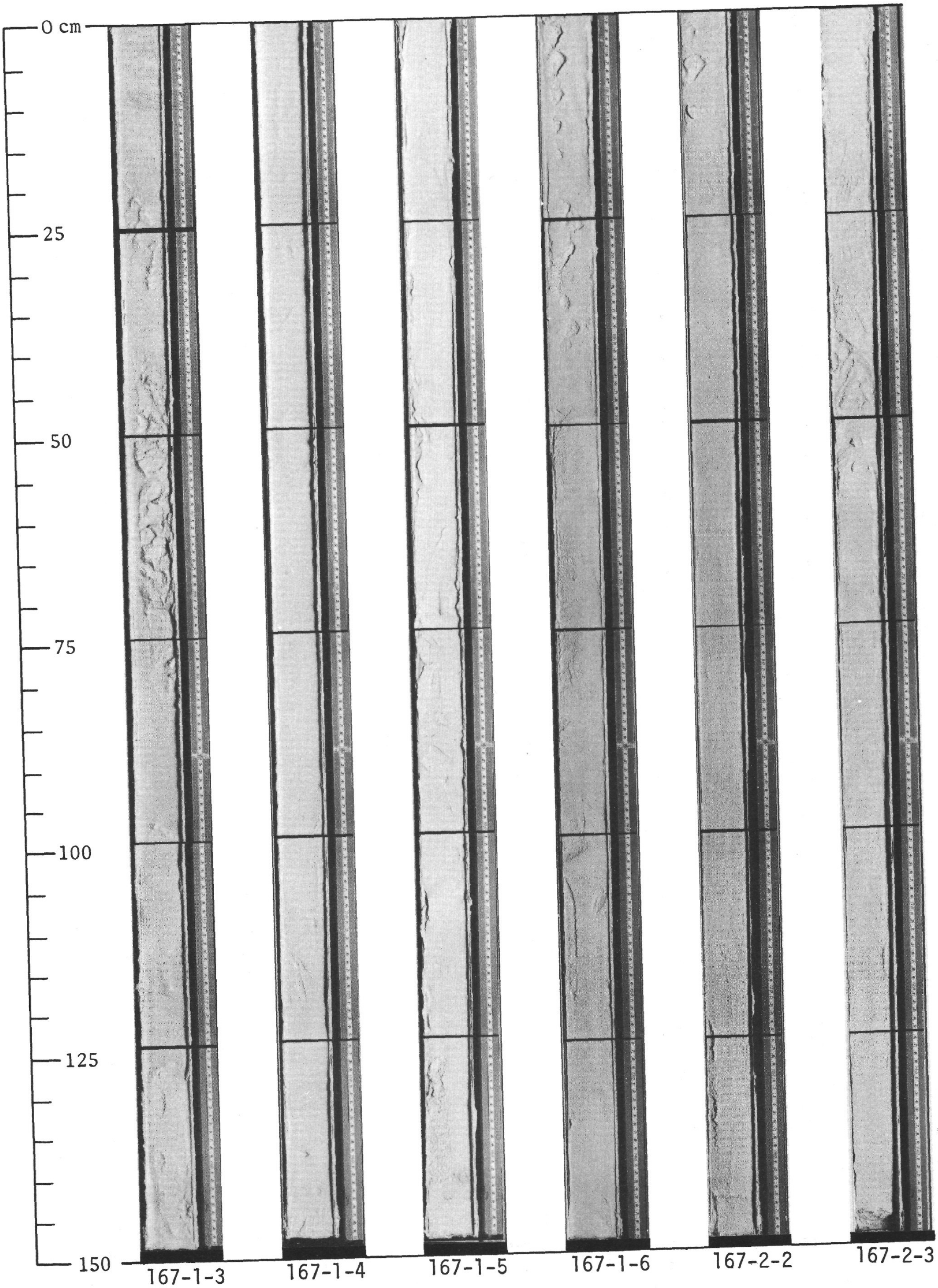
Site 167 Hole Core 94 Cored Interval: 1166 to 1175 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE TITHONIAN-BERRIASIAN	Nannoconus colomi	r n r n	C C C C	M P M P	1 2 3 Core Catcher	0.5 1.0	VOID		* * *	Sect. 1; 55 to 150 cm; Limestone and chert. Limestone is mainly pale reddish gray (5R7/1) grading downward to dusky red (5R3/4) and grayish red (5R4/3) with green Tuffaceous beds, pale bluish green (5BG7/2) to dusky blue green (5BG3/2). Recrystallization appears less intense than in overlying sediments. Burrows and wavy laminations are abundant. Chert is lenticular, dark reddish brown (10R3/4). Sect. 2; 0 to 58 cm; Same as in Sect. 1. One aptychus present at 40 cm. Sect. 2; 58 to 150 cm; Basalt, medium dark gray (N4) when dry, grayish black (N2) when wet; altered, speckled with white calcite and zeolites; irregular amygdules of calcite (?) and zeolites; some thin calcite veinlets sub-horizontal and subvertical; irregular rounded nodular aggregates of feldspars and zeolites at around 130 cm. Sect. 3; 0 to 150 cm; Same as Sect. 2; 50 to 150 cm, purplish breccia vein (3 cm wide) cut through the basalt from 12 to 31 cm.

Site 167 Hole Core 95 Cored Interval: 1175 to 1185 m

AGE	ZONE	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
?					1 2 Core Catcher	0.5 1.0				Sect. 1; 0 to 150 cm; Basalt, gray (N3 to N5 when dry, N2 when wet), altered, aphanitic, with small (2mm to occasionally 12 mm) amygdules of calcite and thin calcite veinlets. Sect. 2; 0 to 150 cm; Same as in Sect. 1; lower part is highly brecciated (altered coarse hyaloclastites?, flow breccia?).

Explanatory notes in Chapter 1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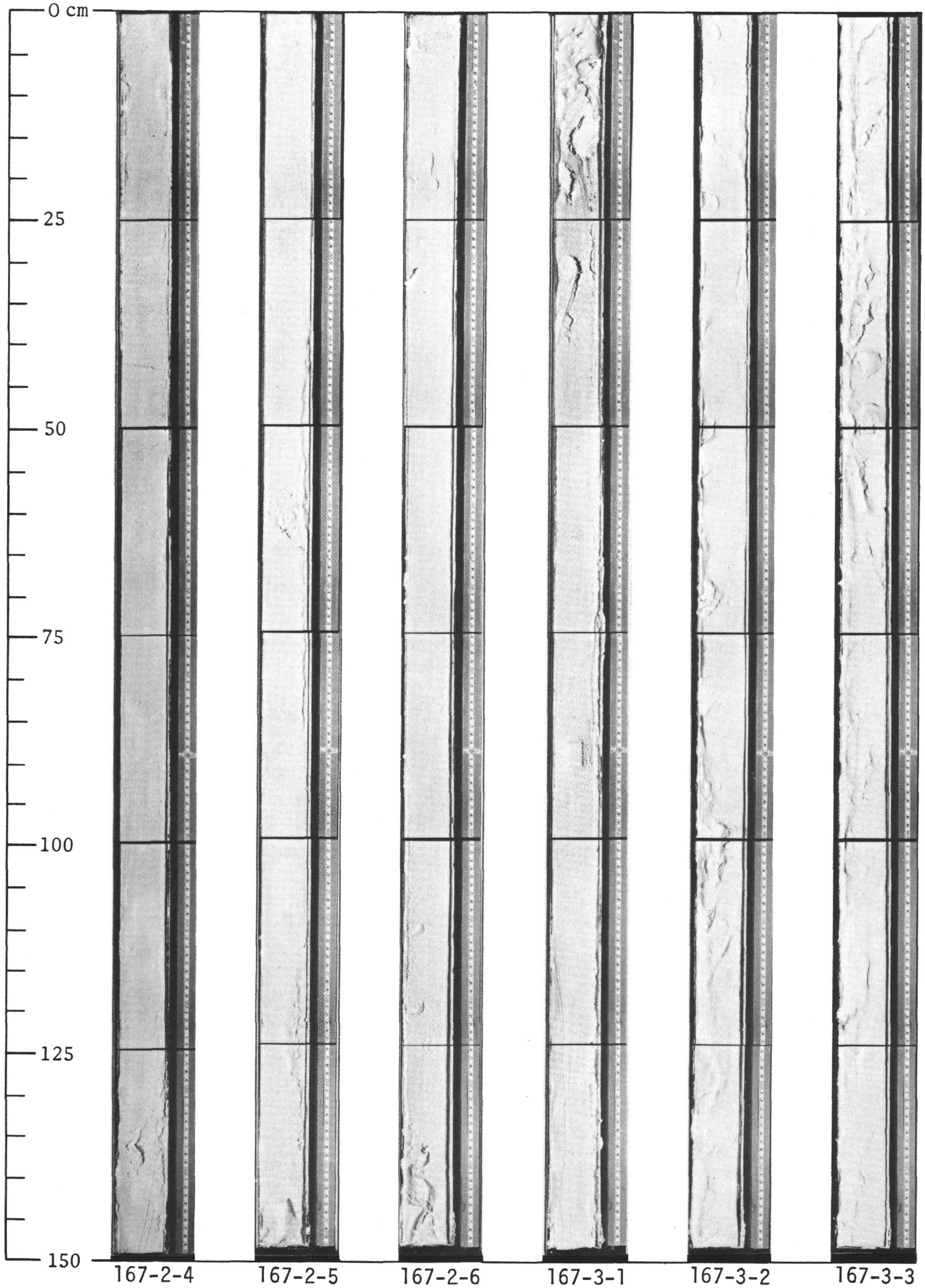
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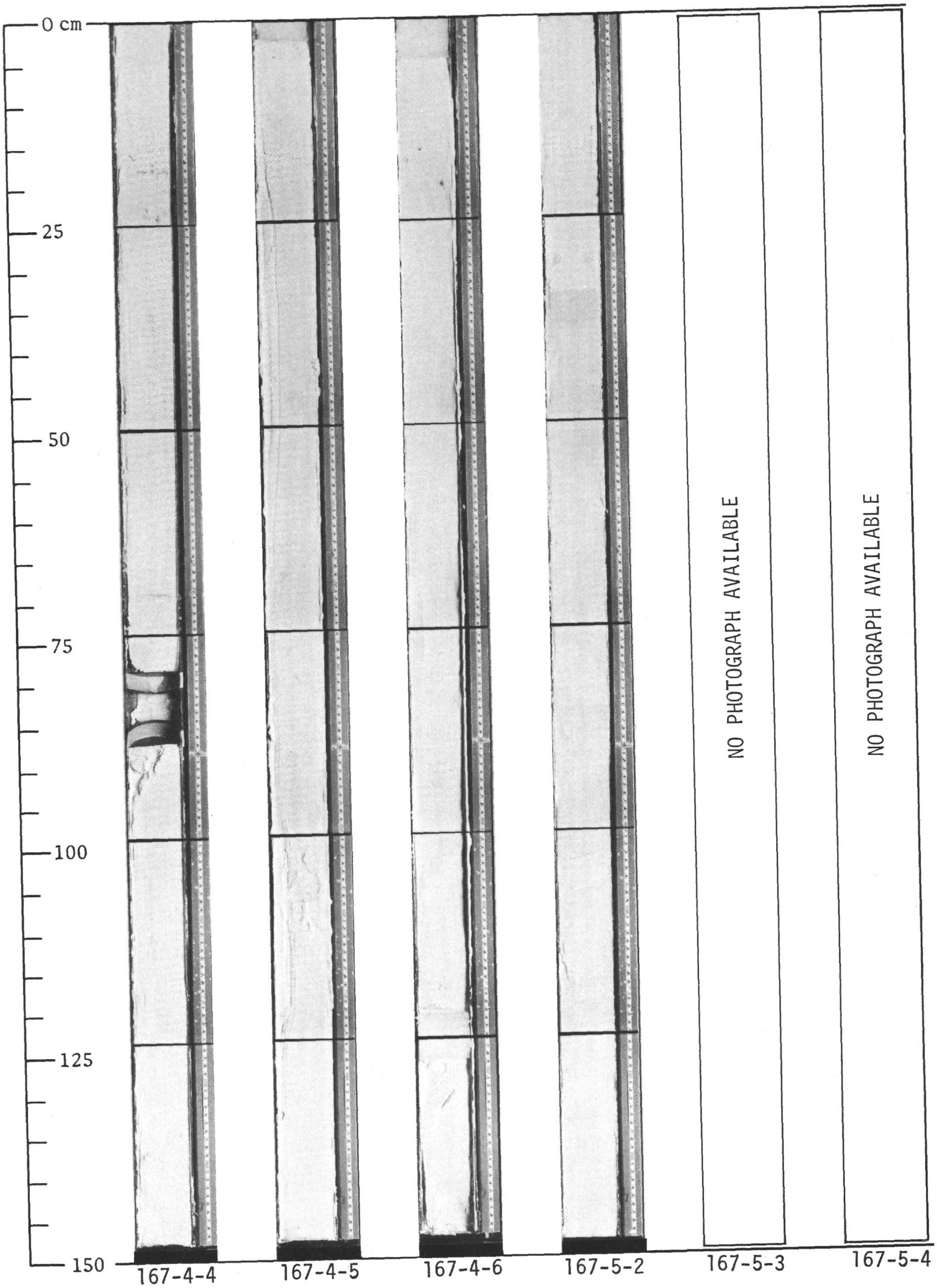
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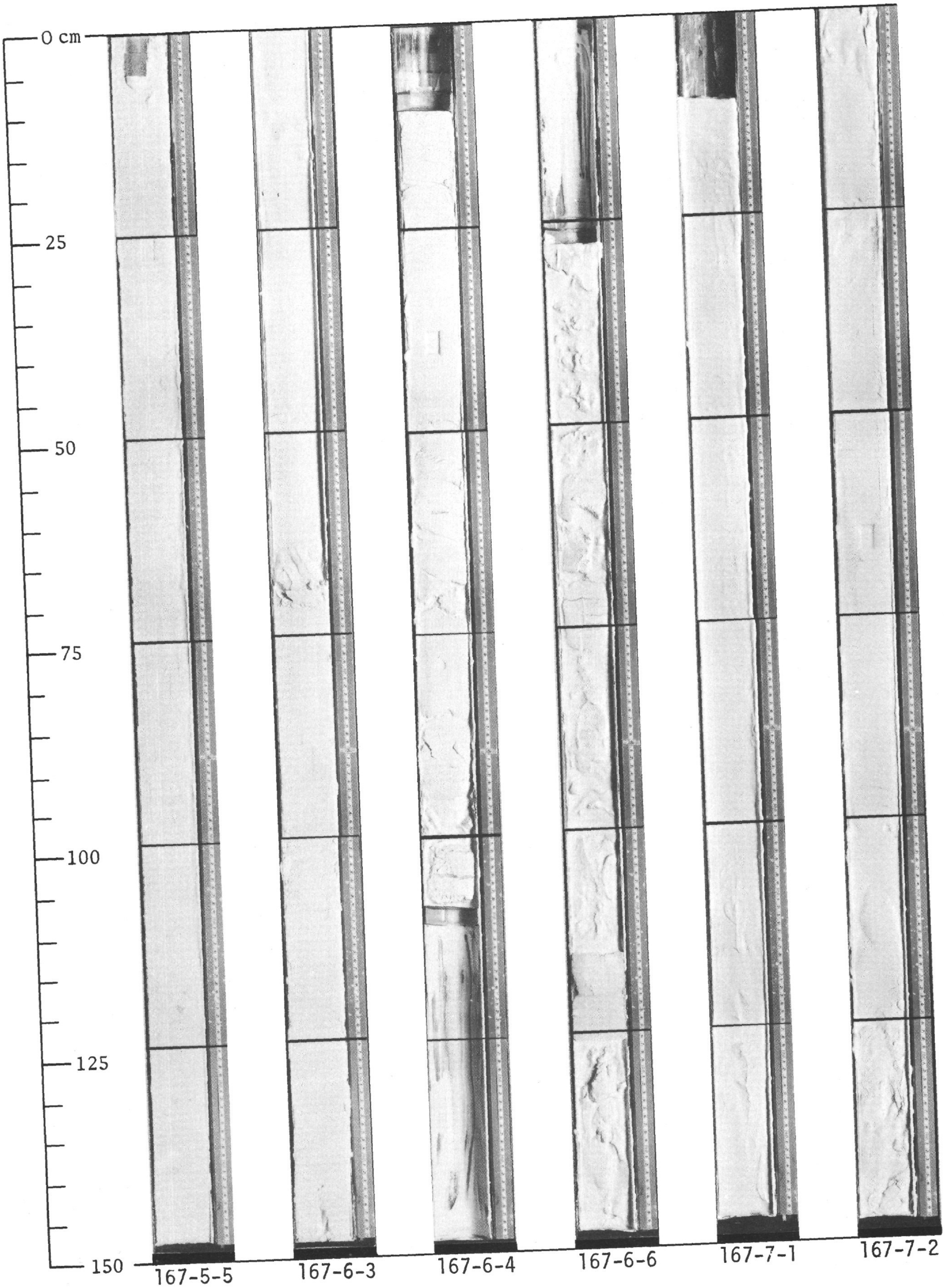
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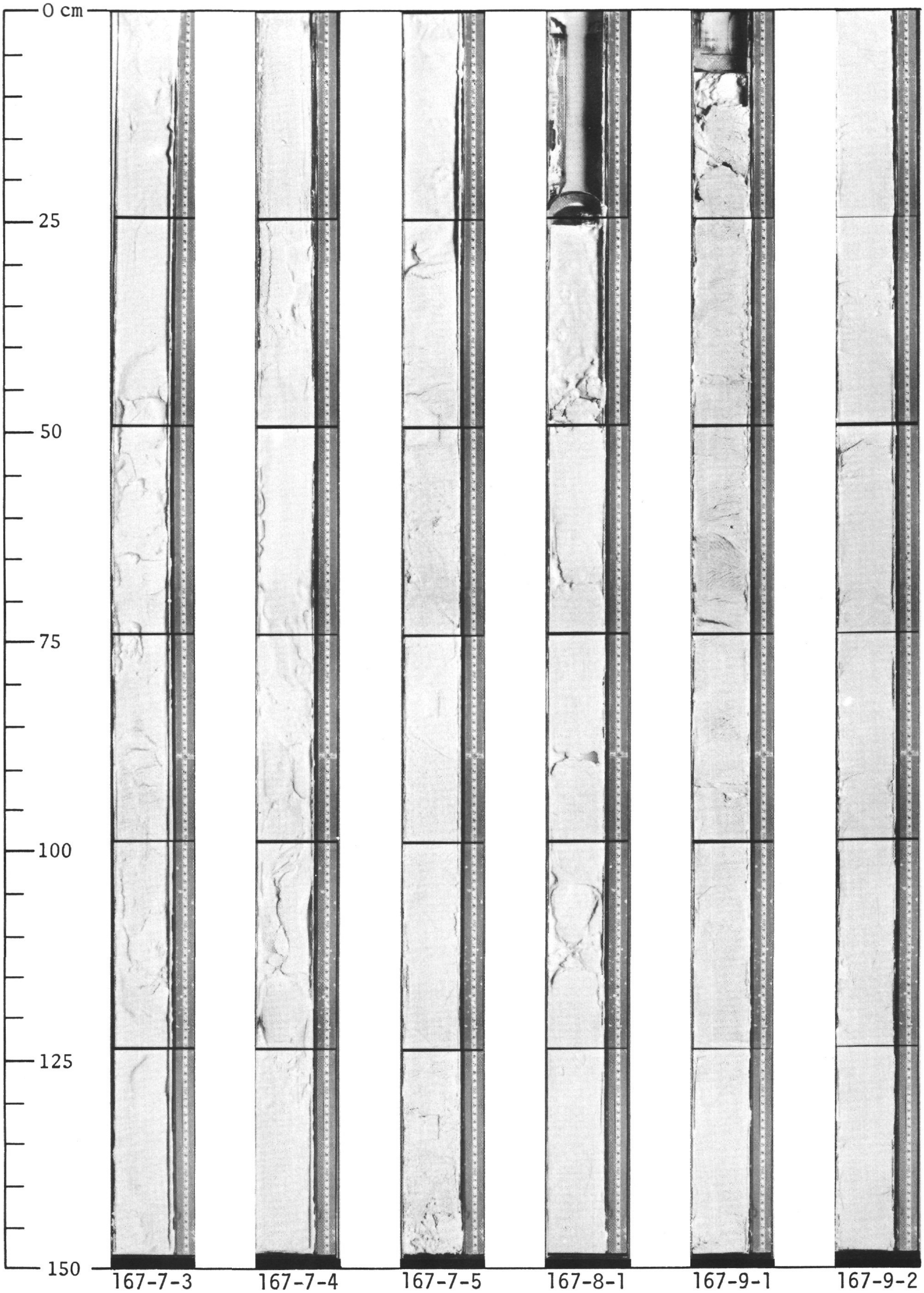
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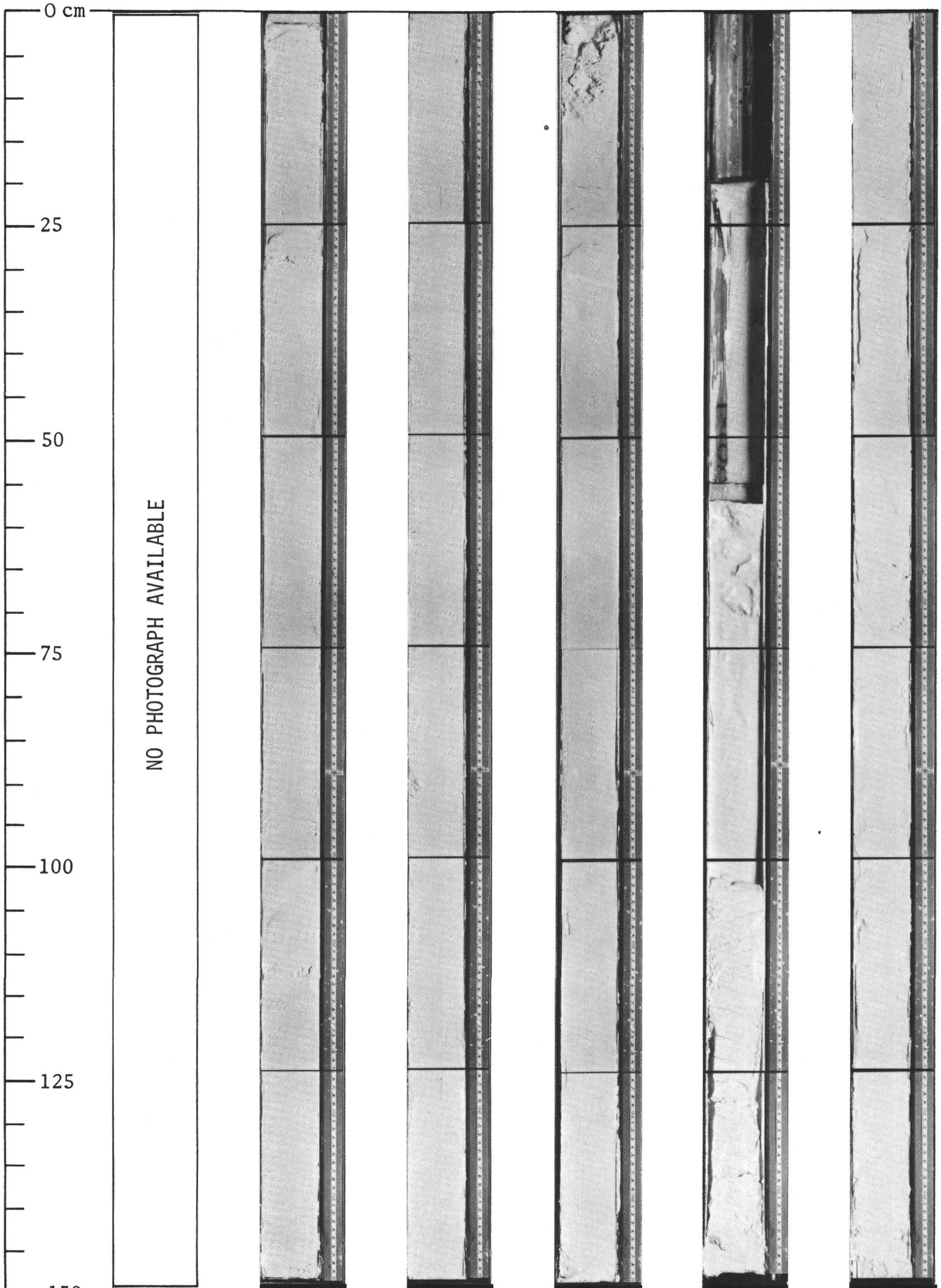

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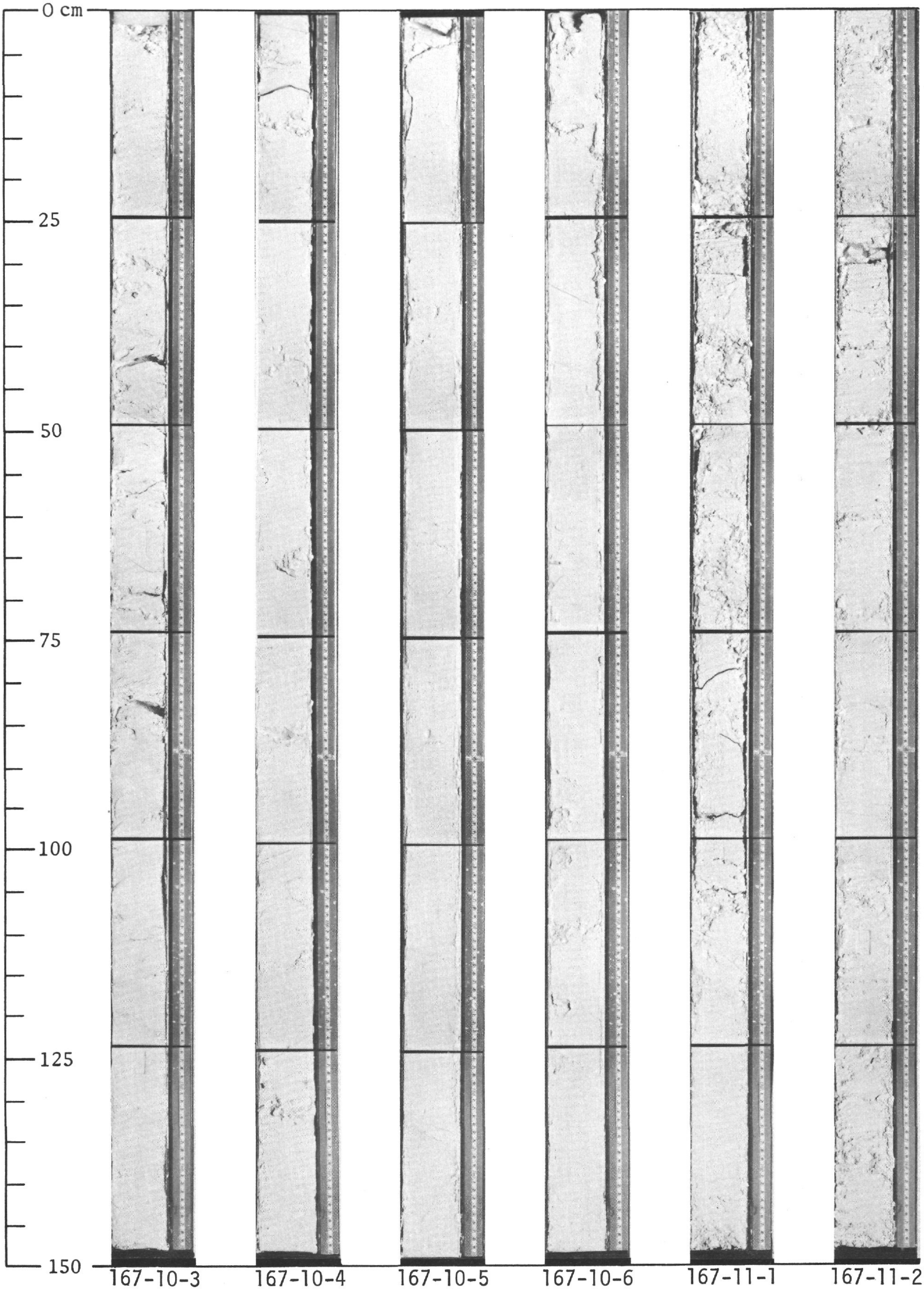
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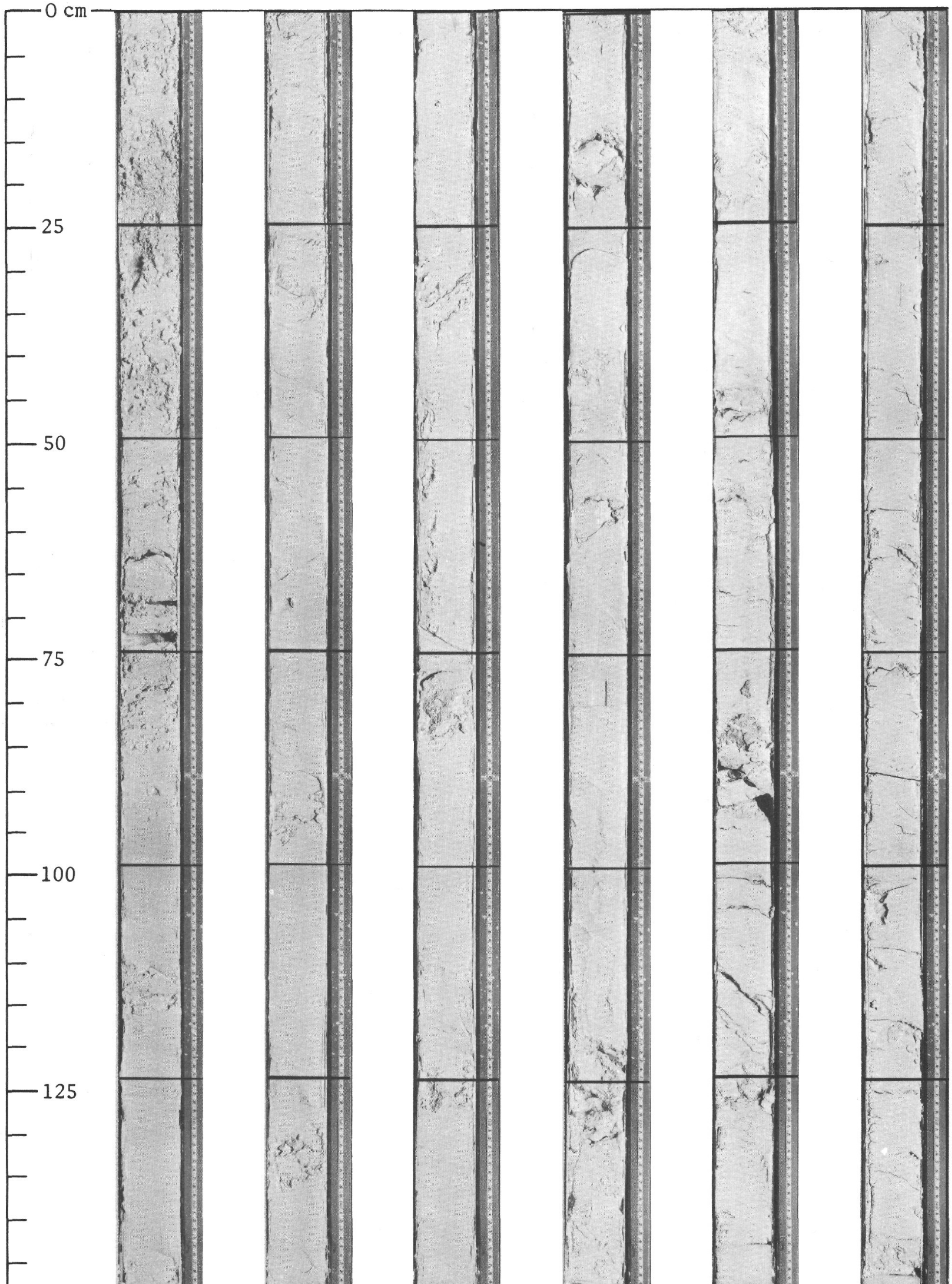
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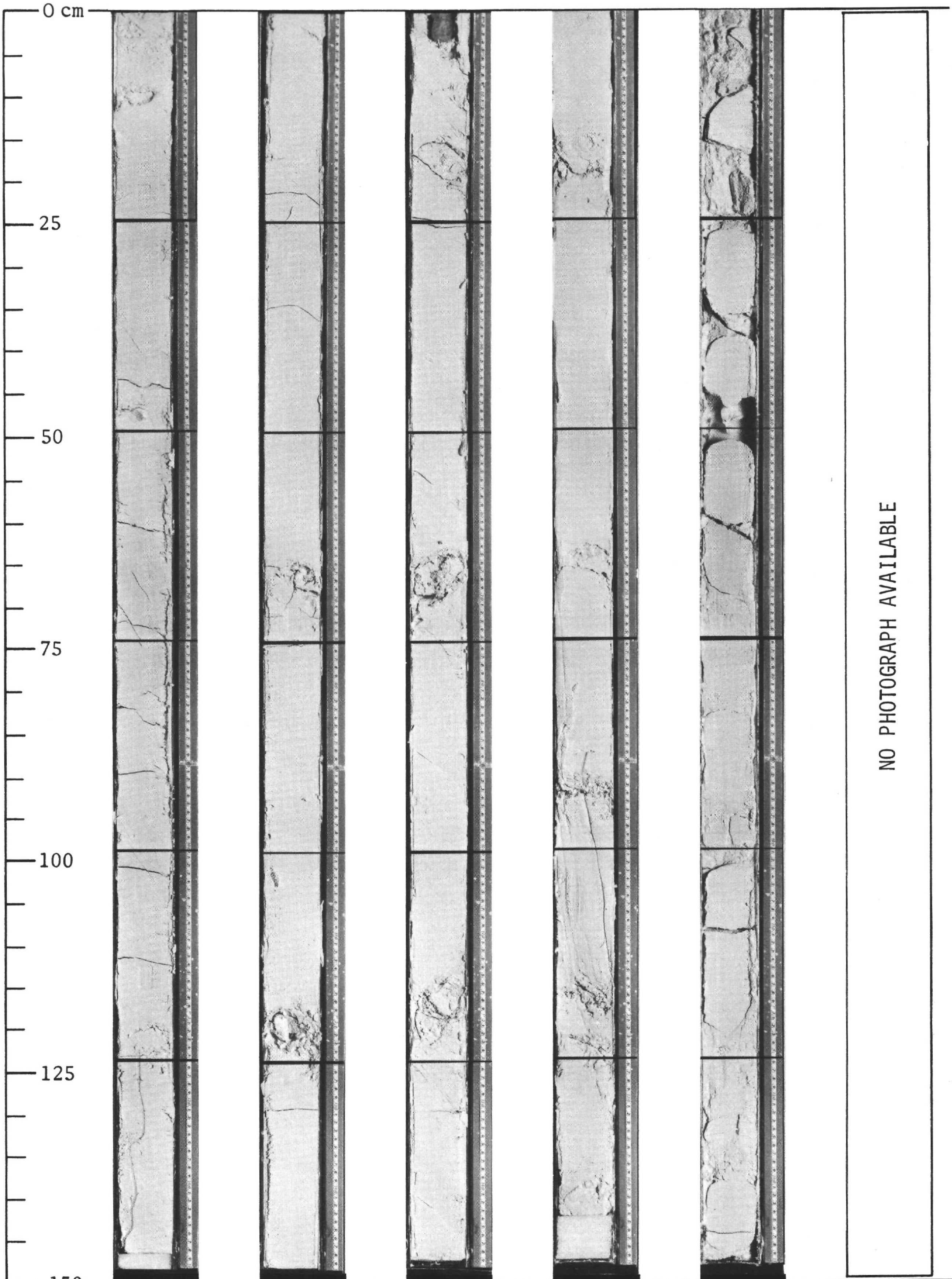

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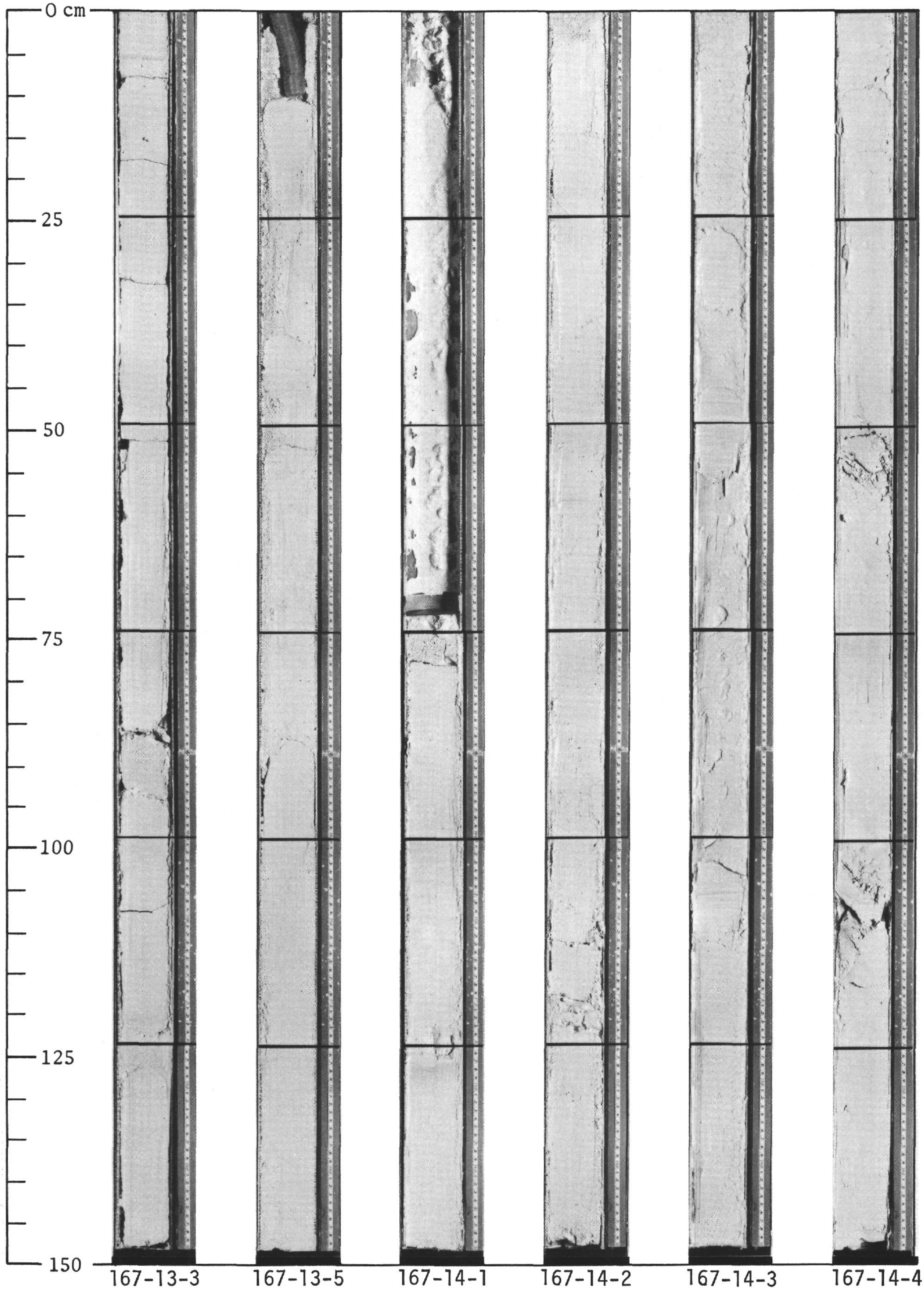
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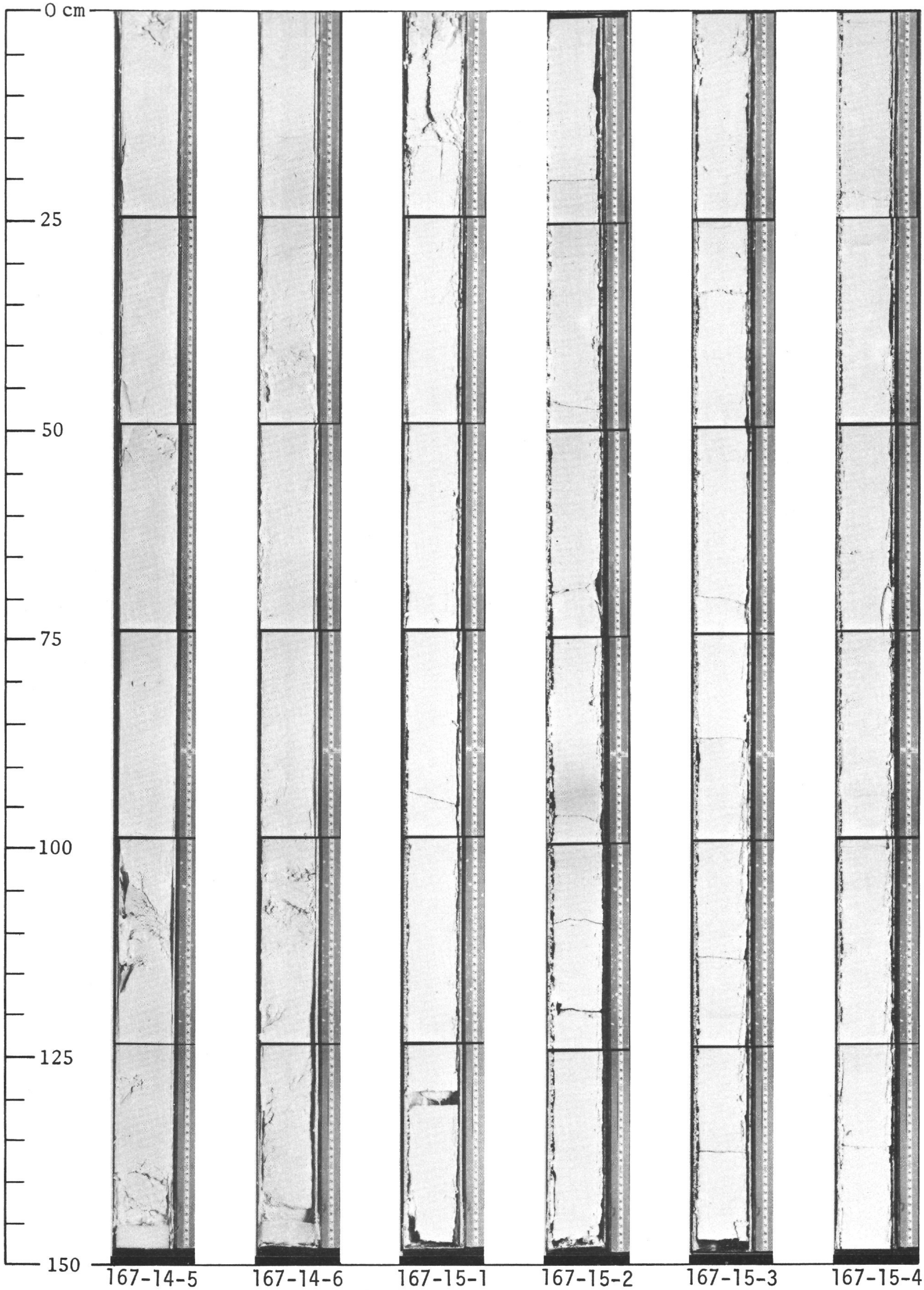
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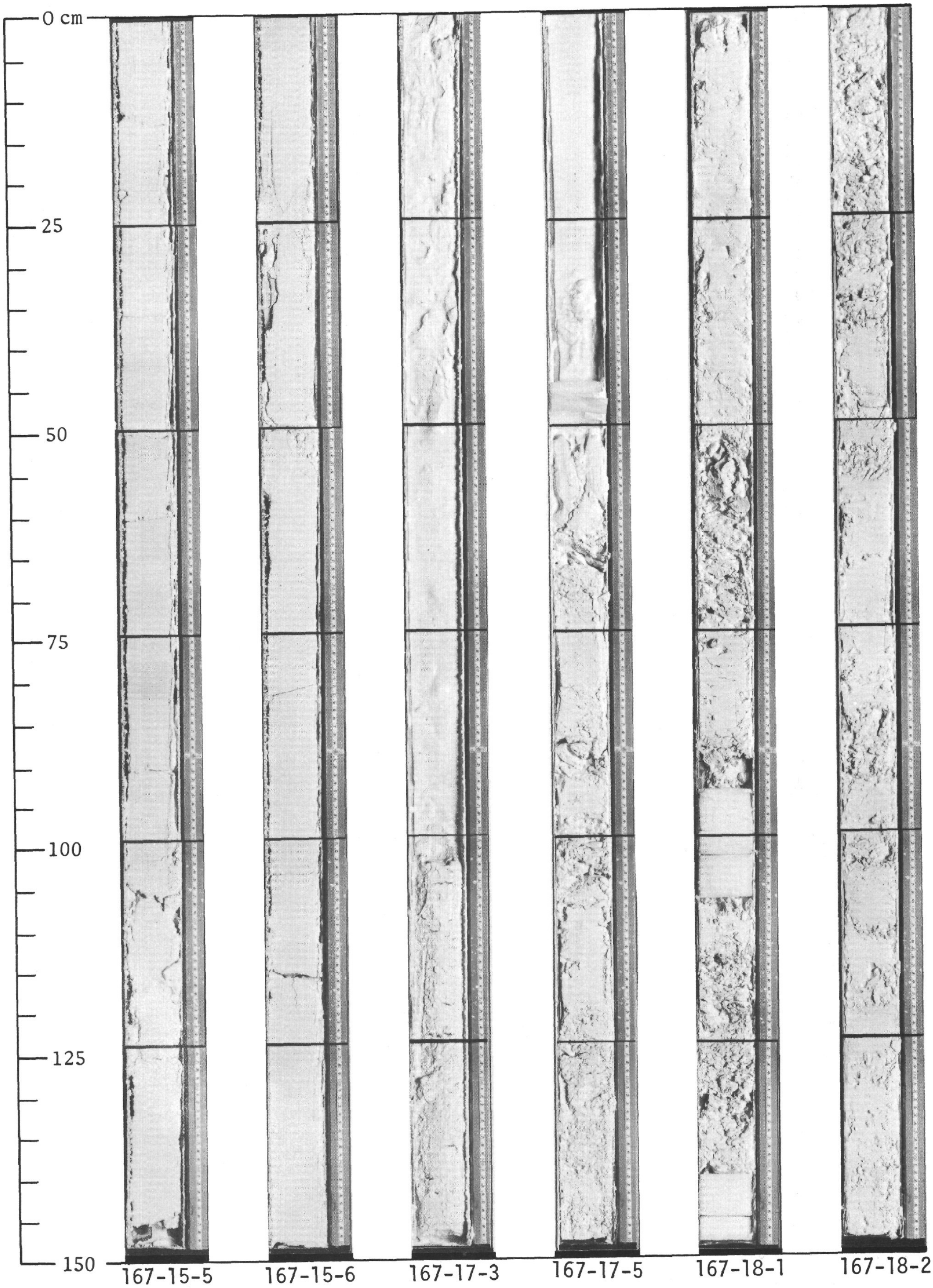
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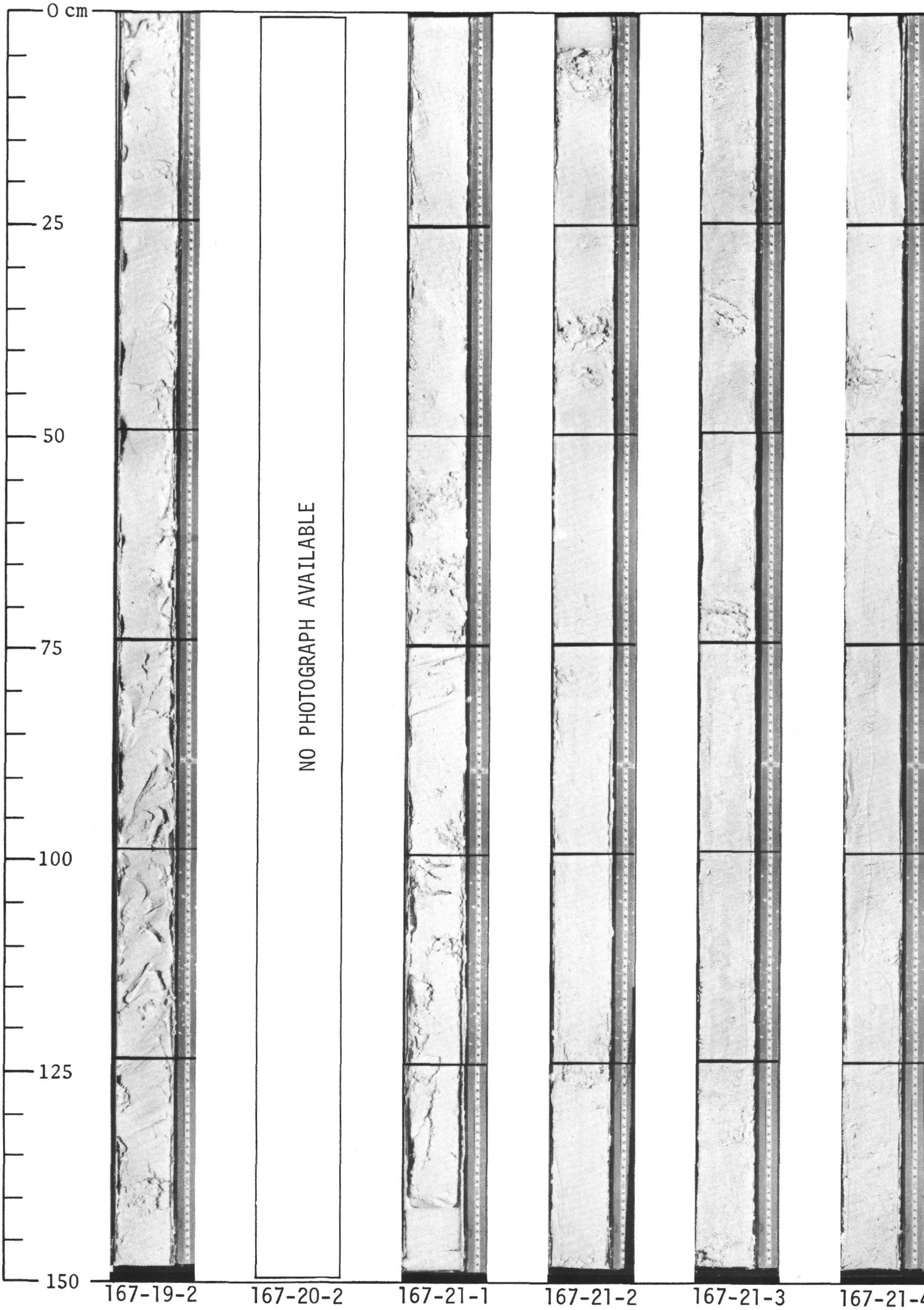
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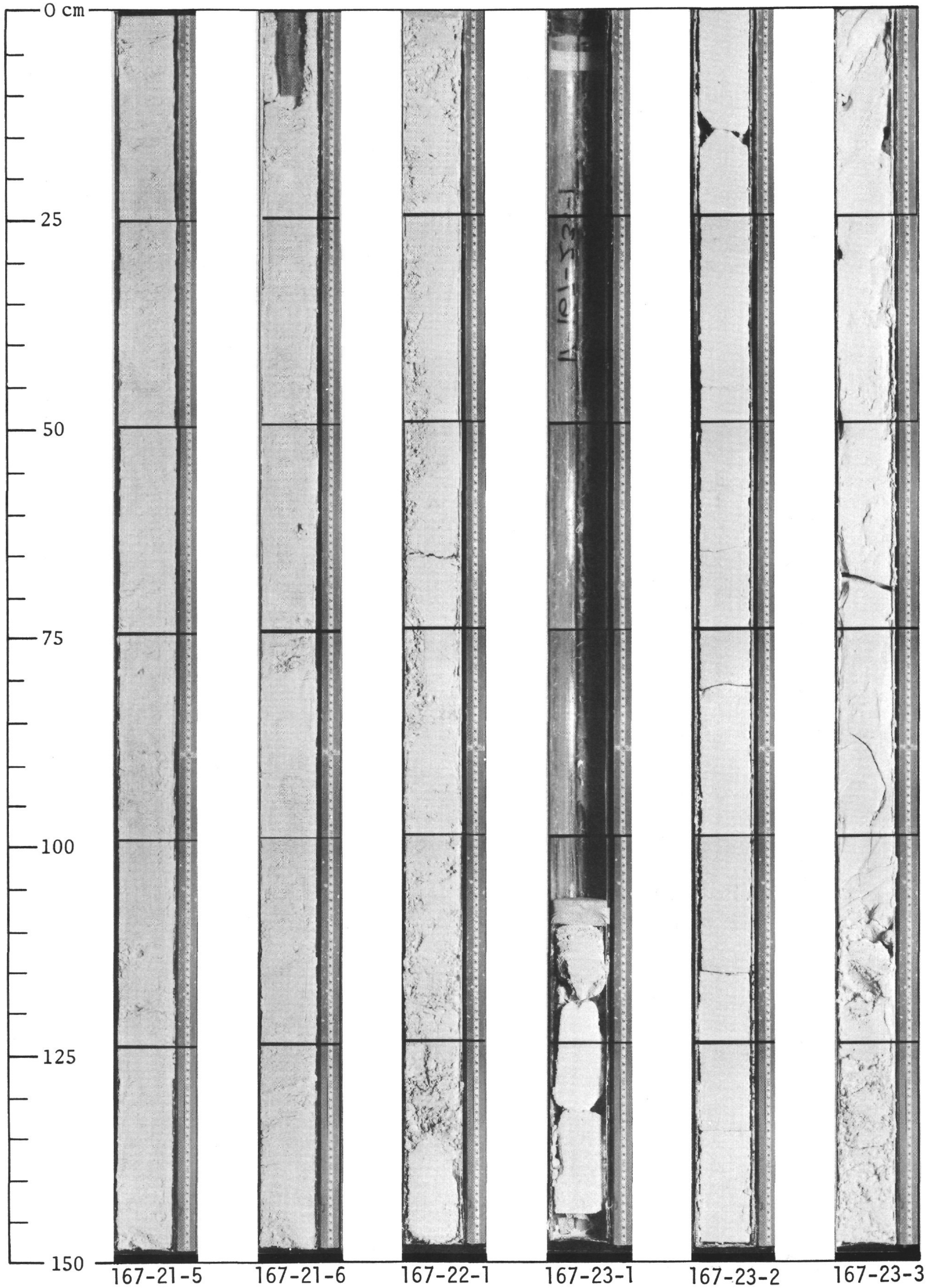
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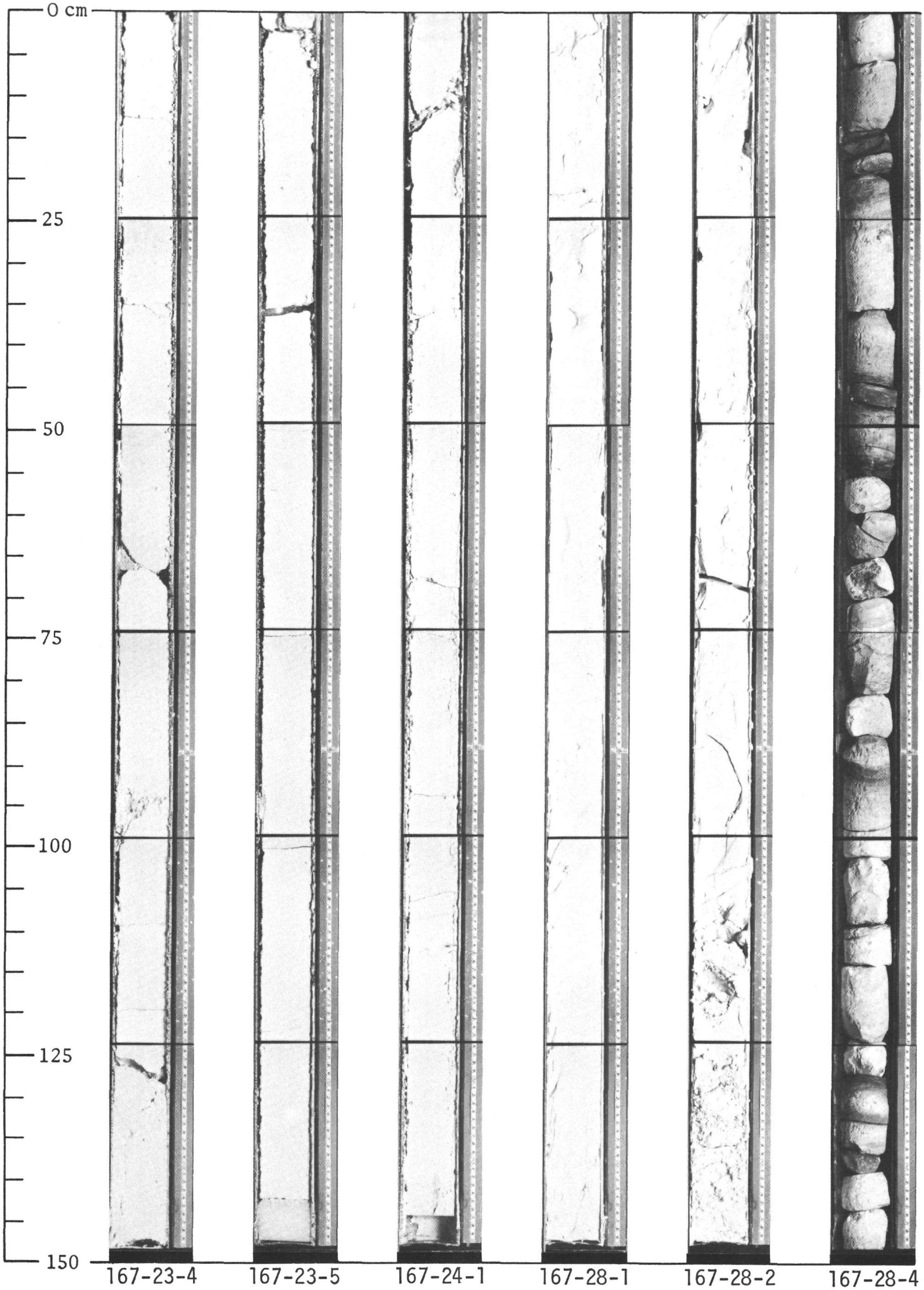

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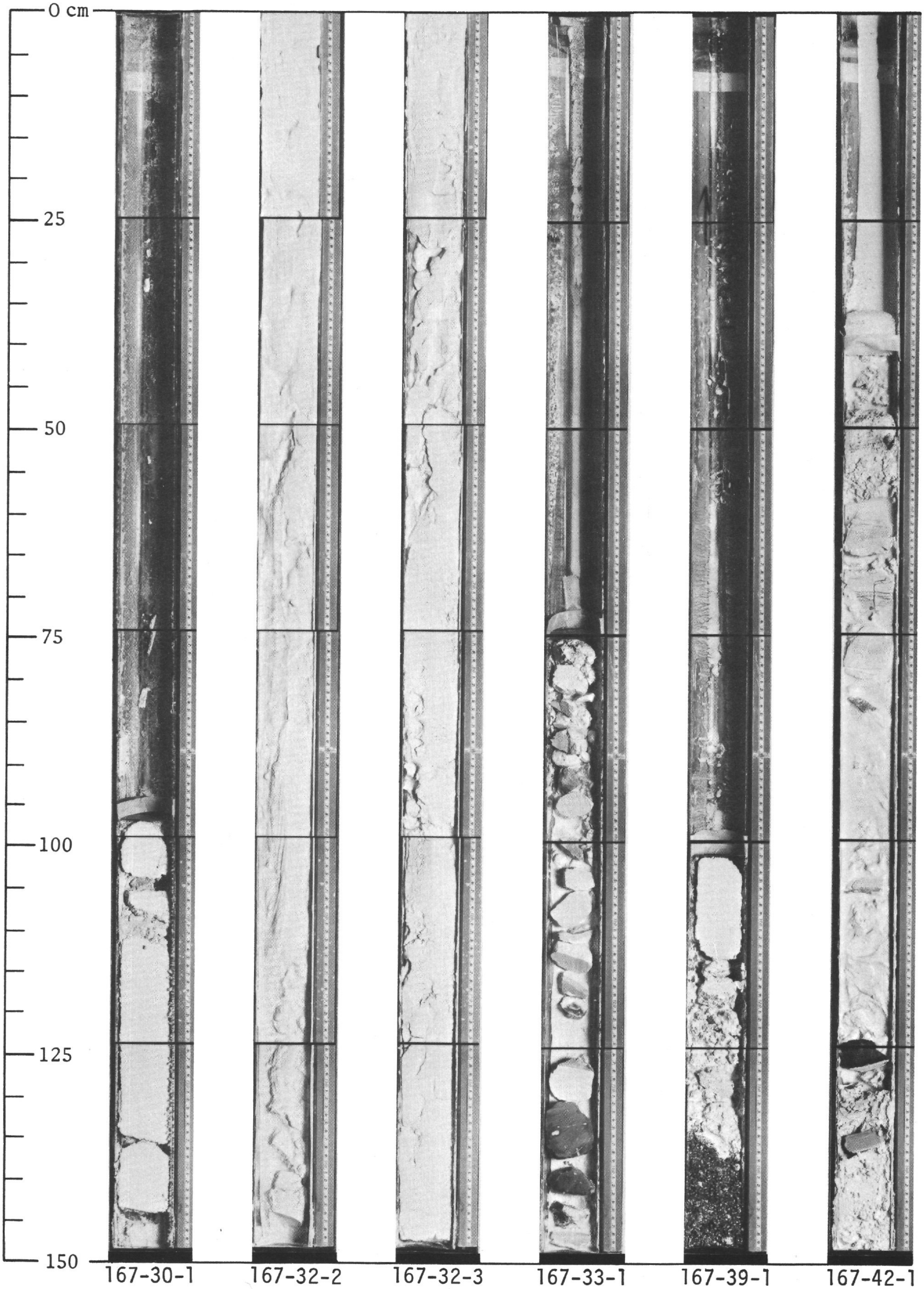
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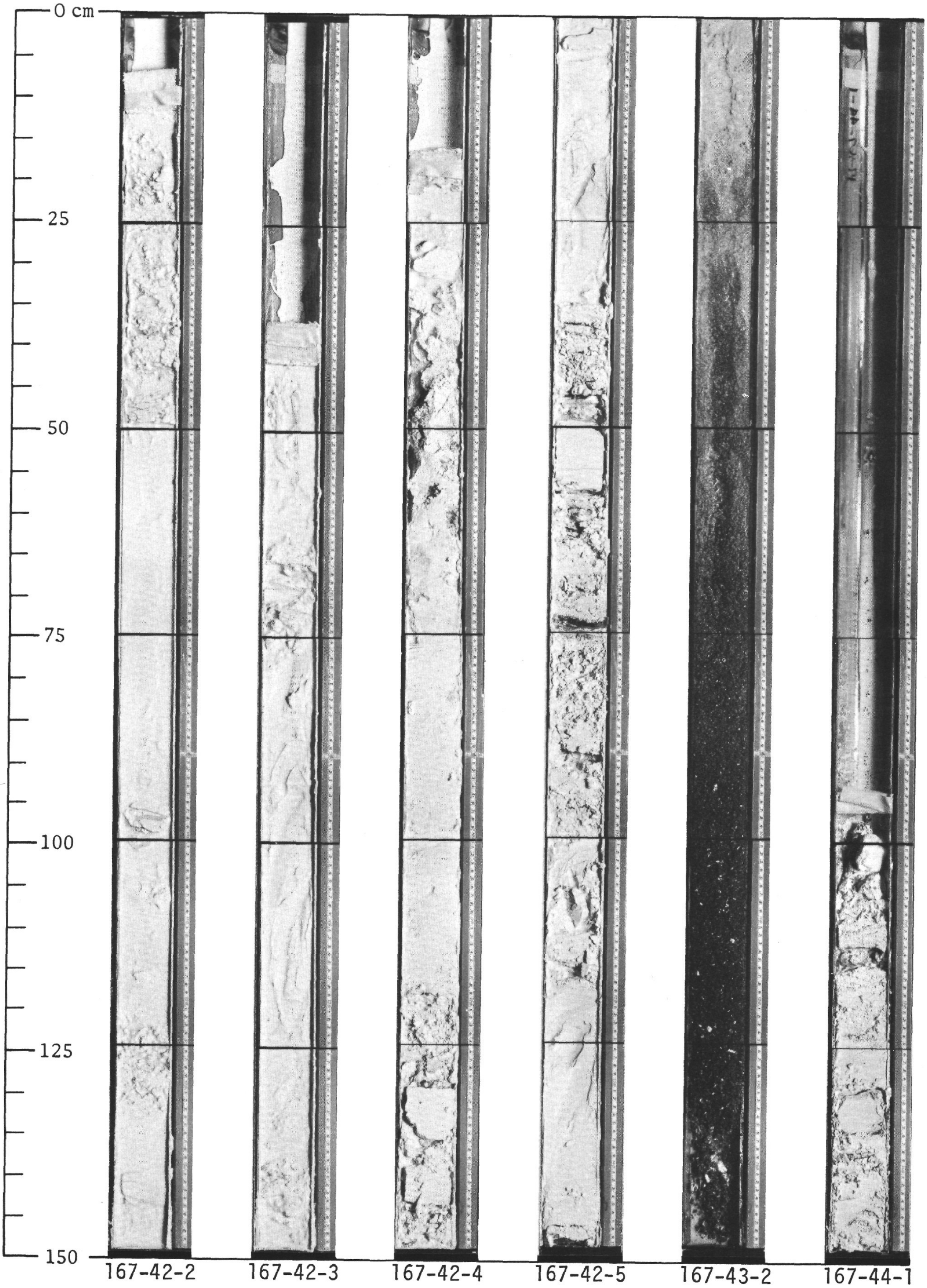
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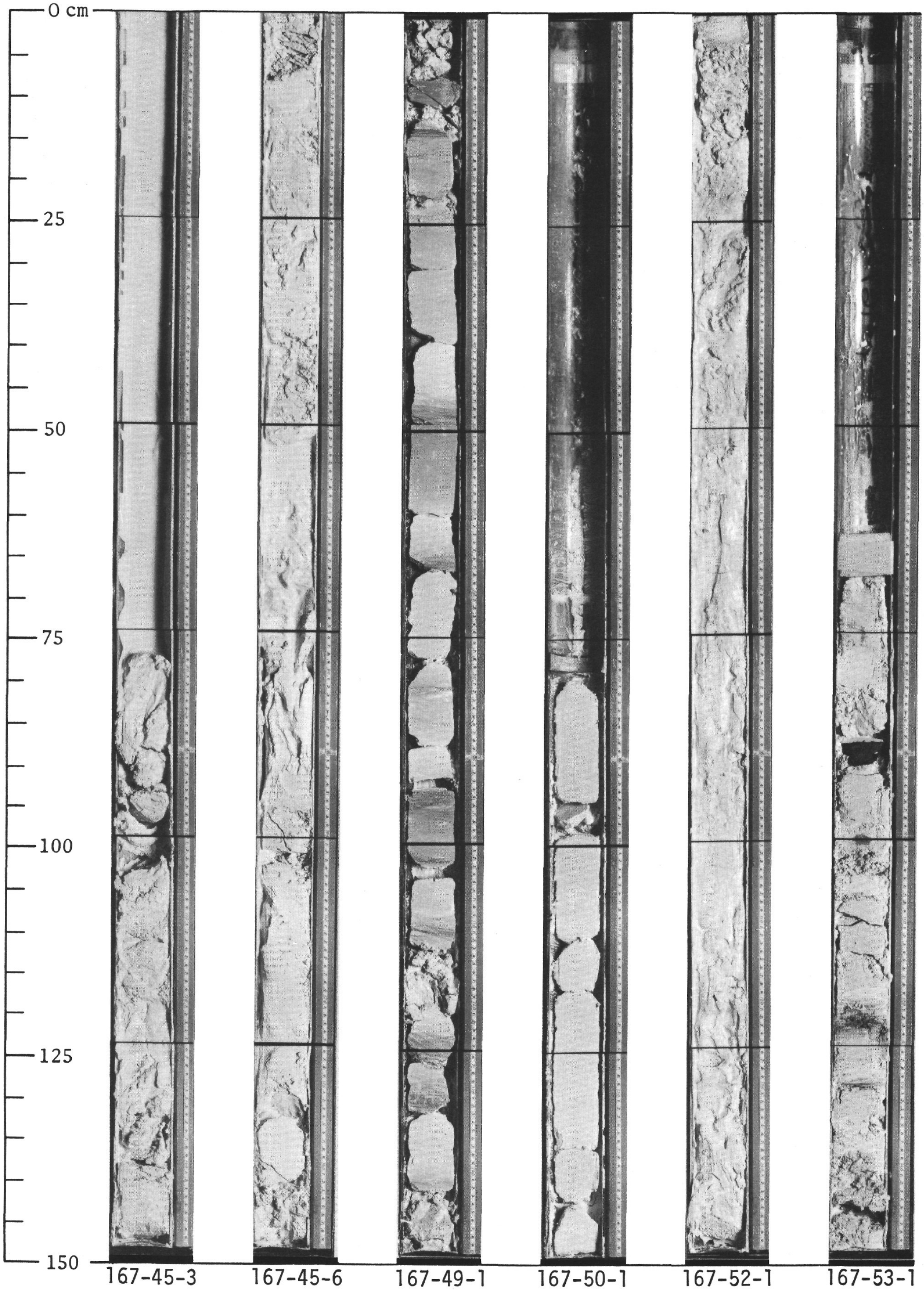
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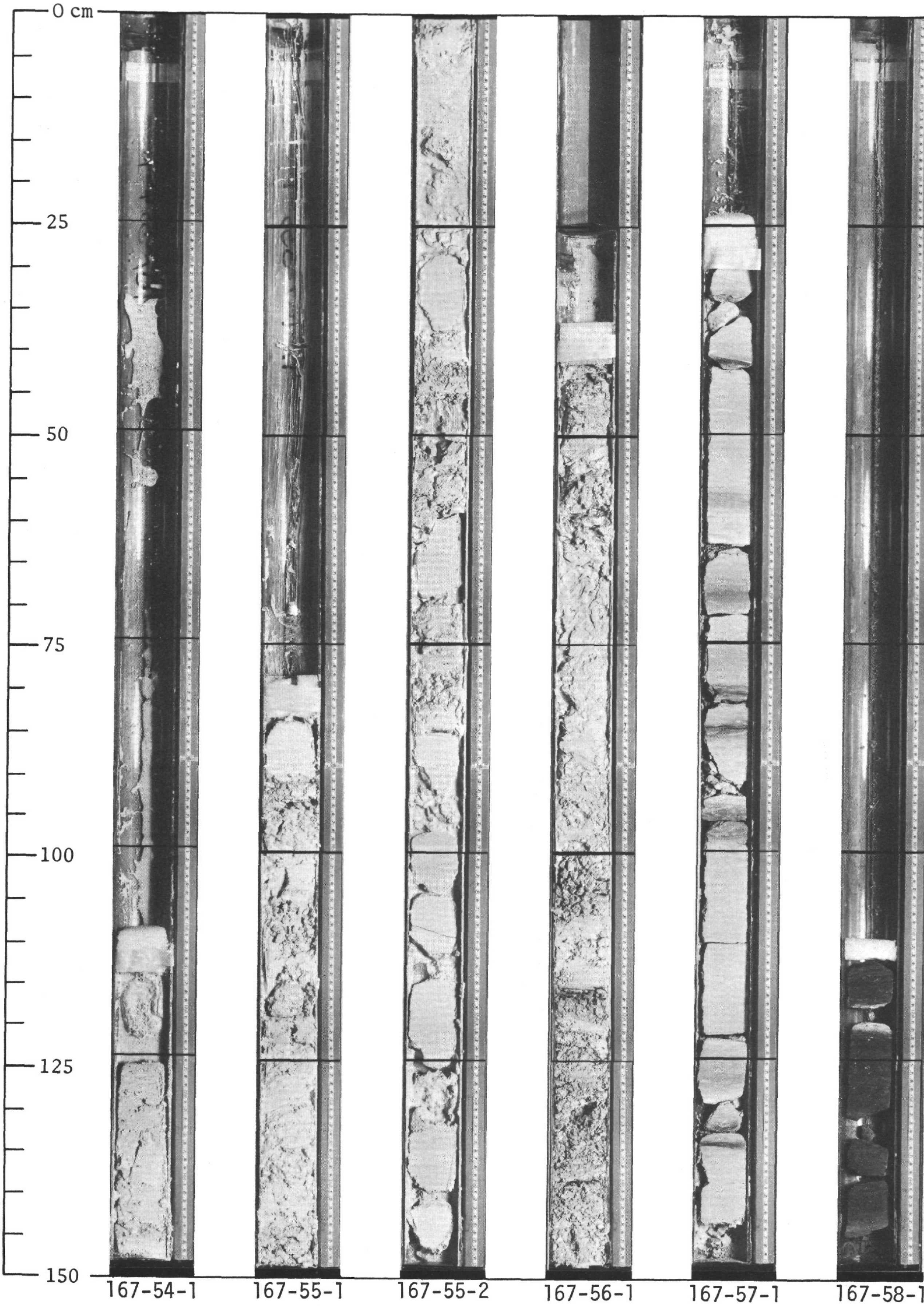
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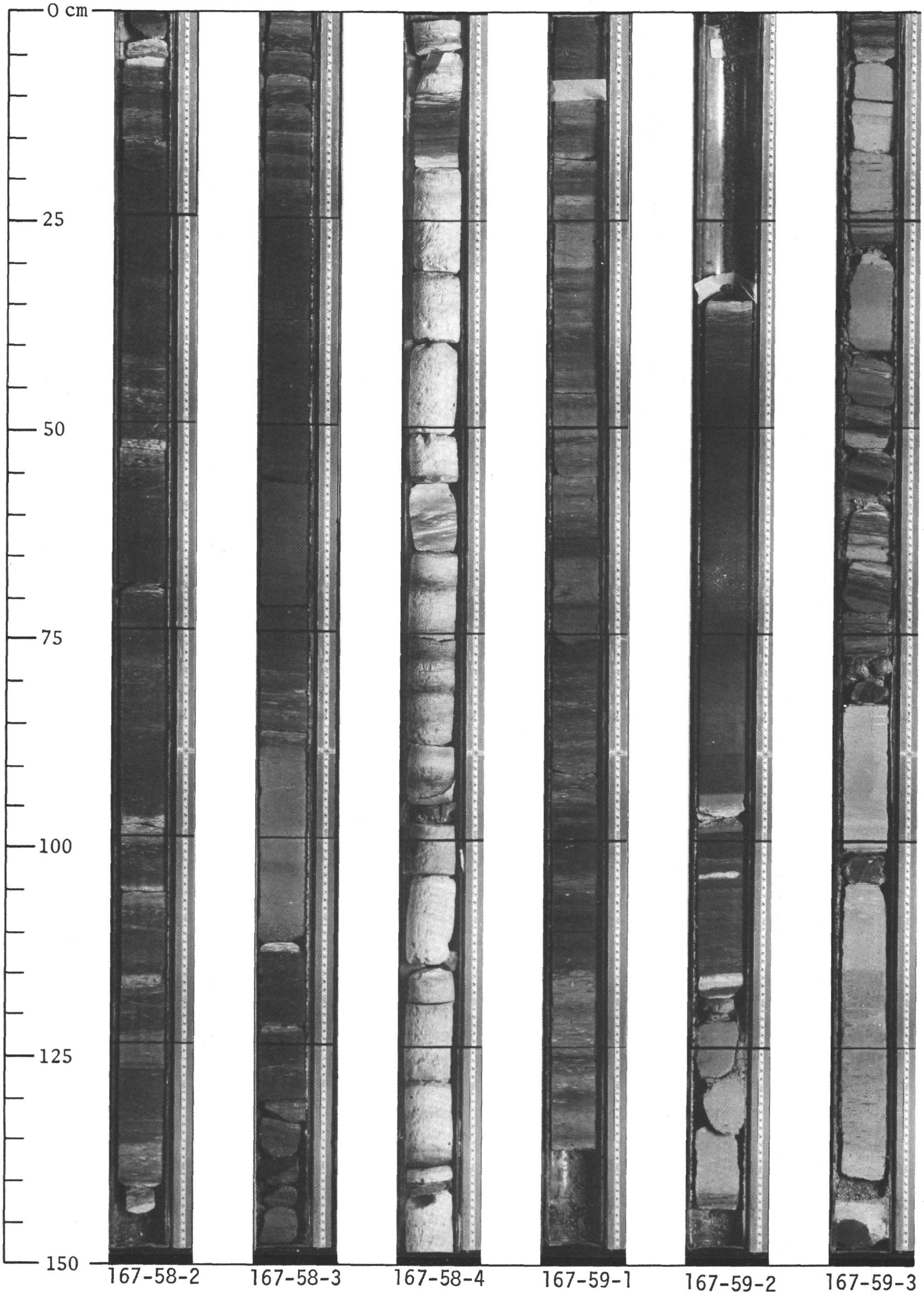
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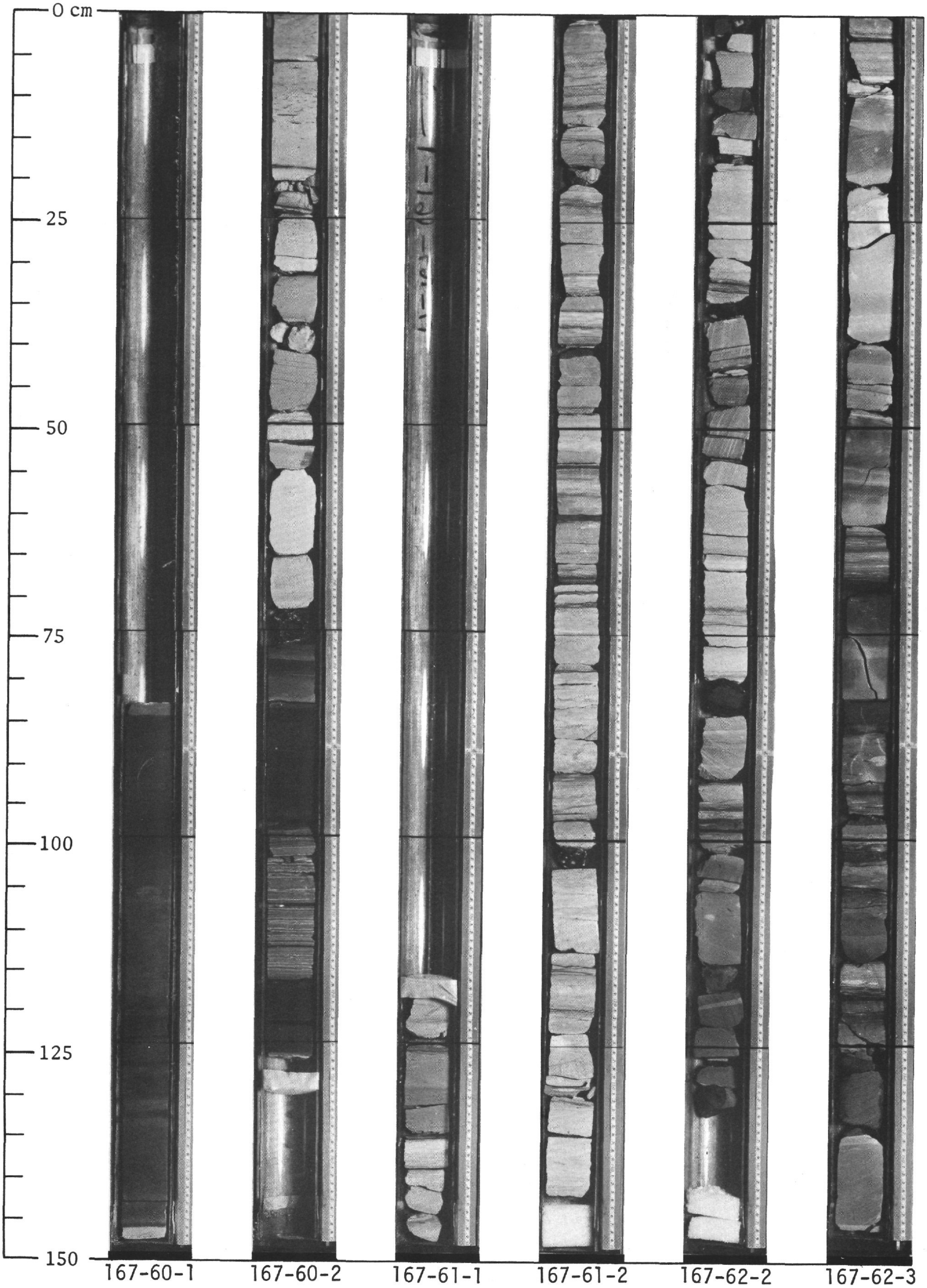
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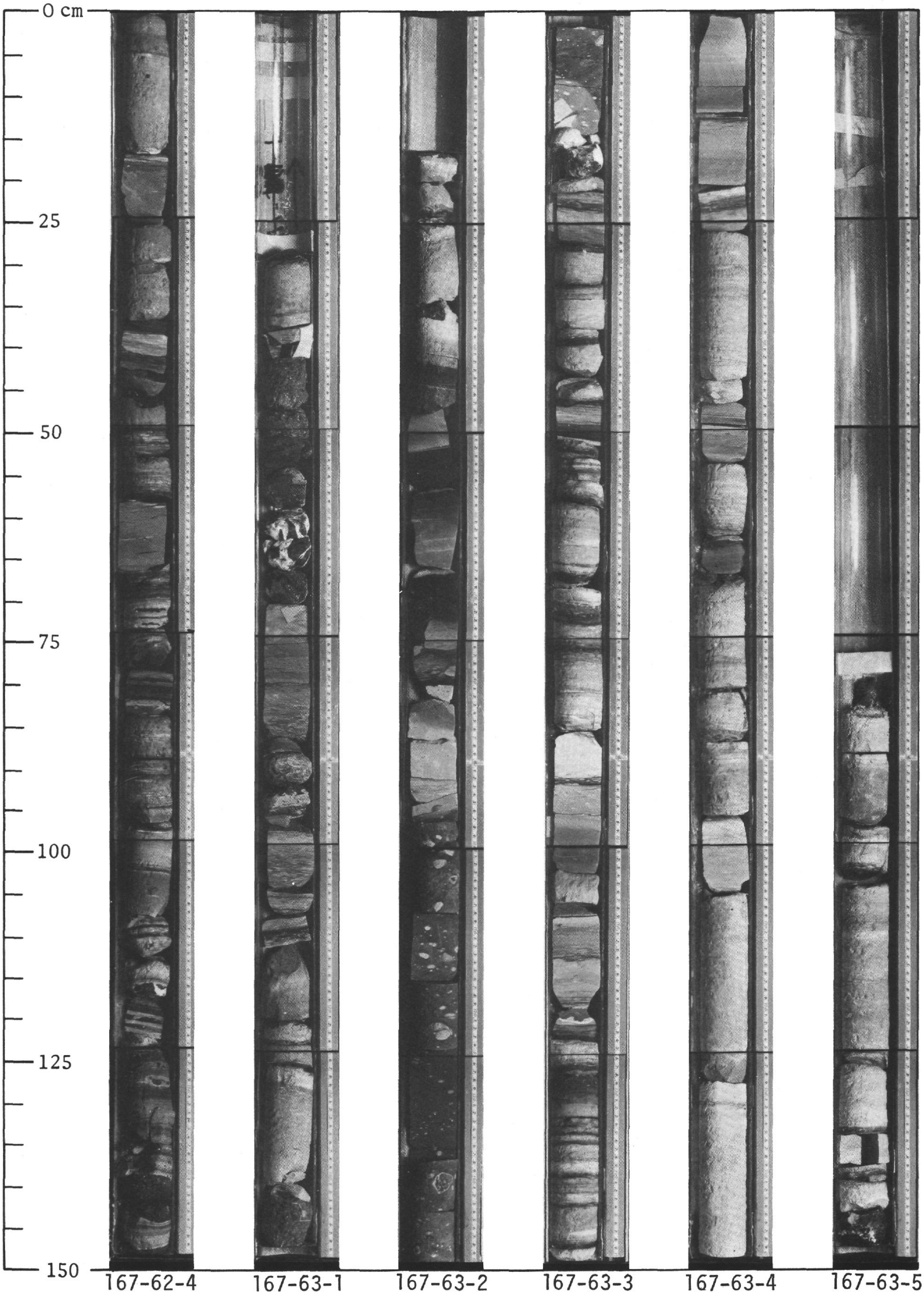
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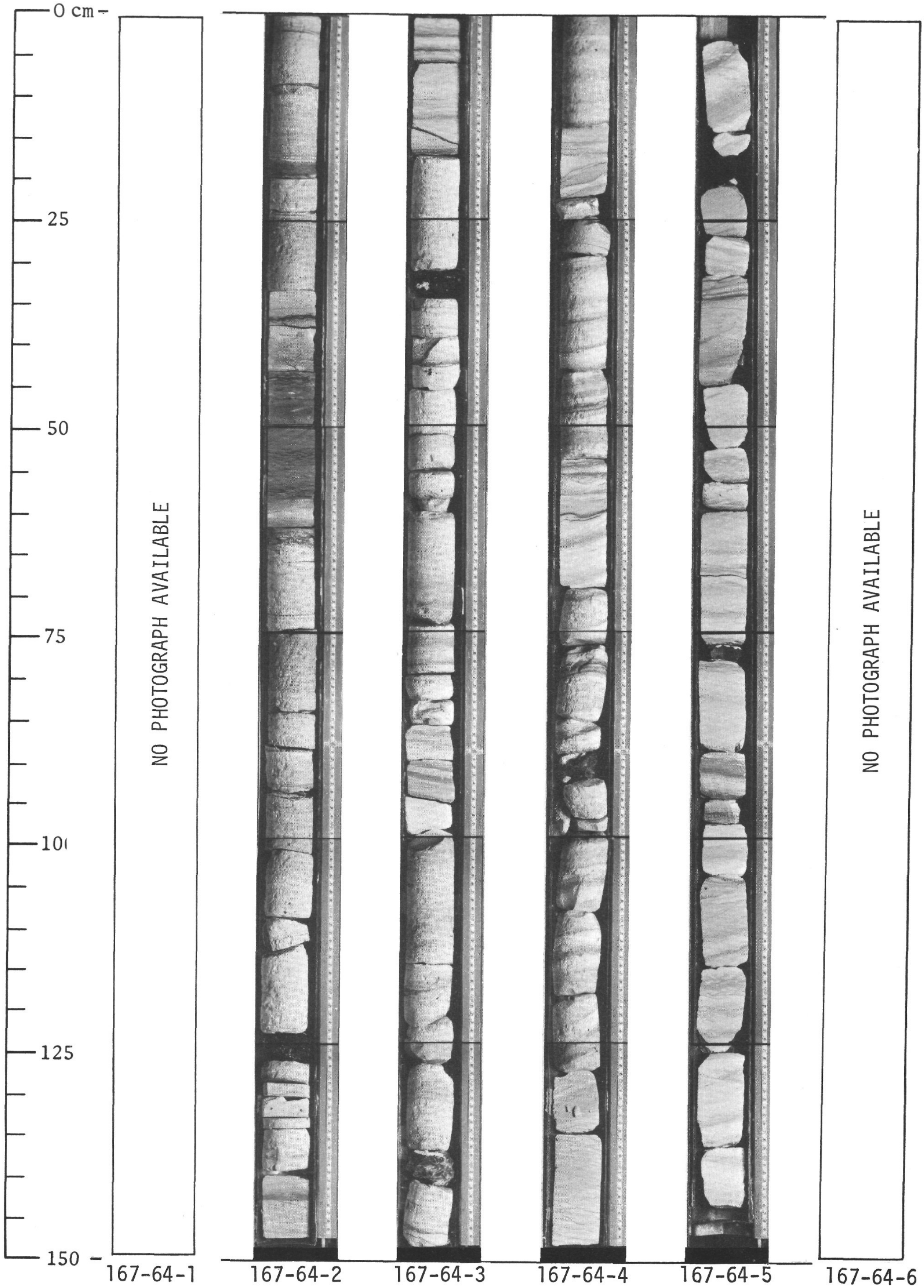
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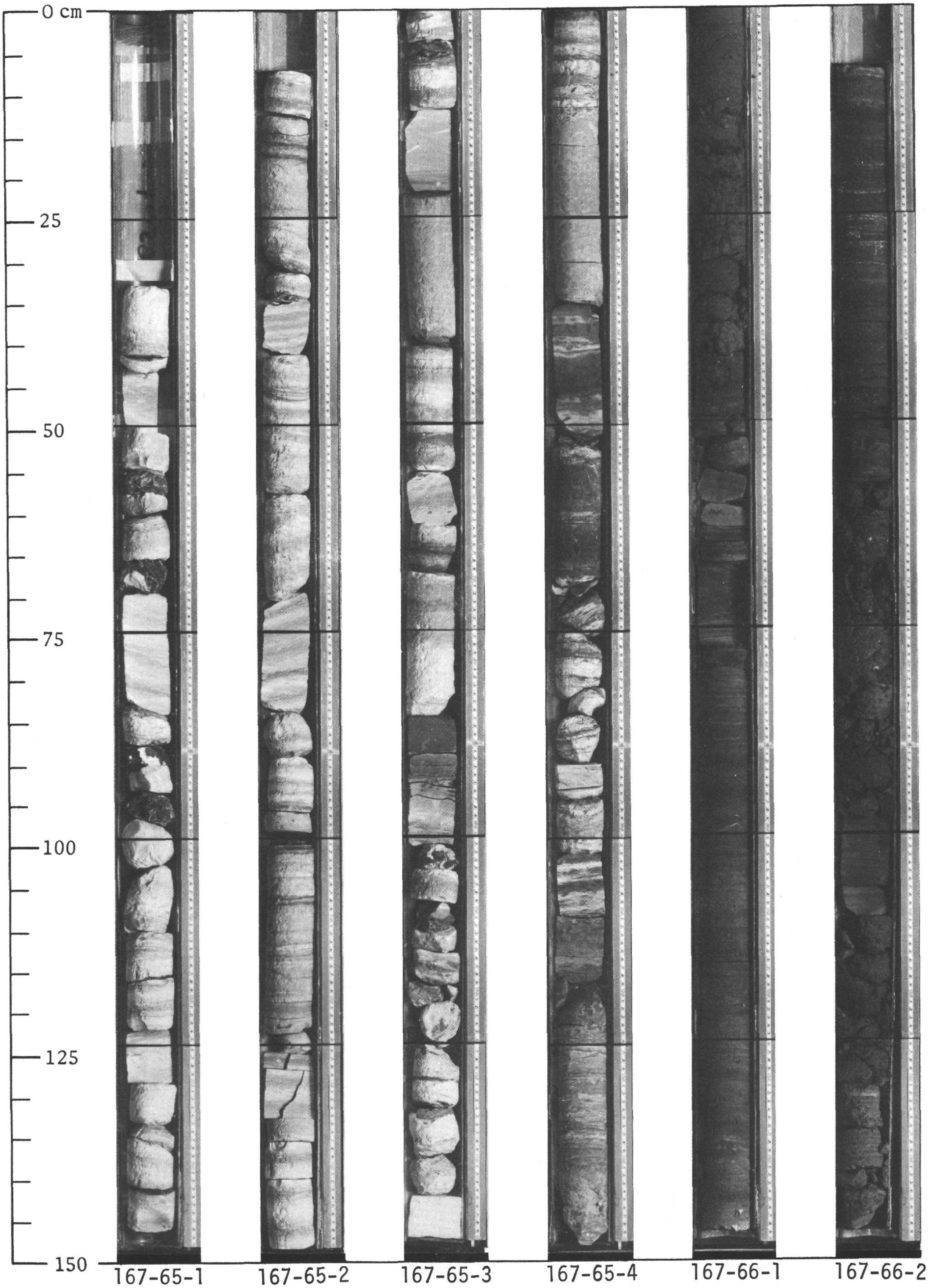
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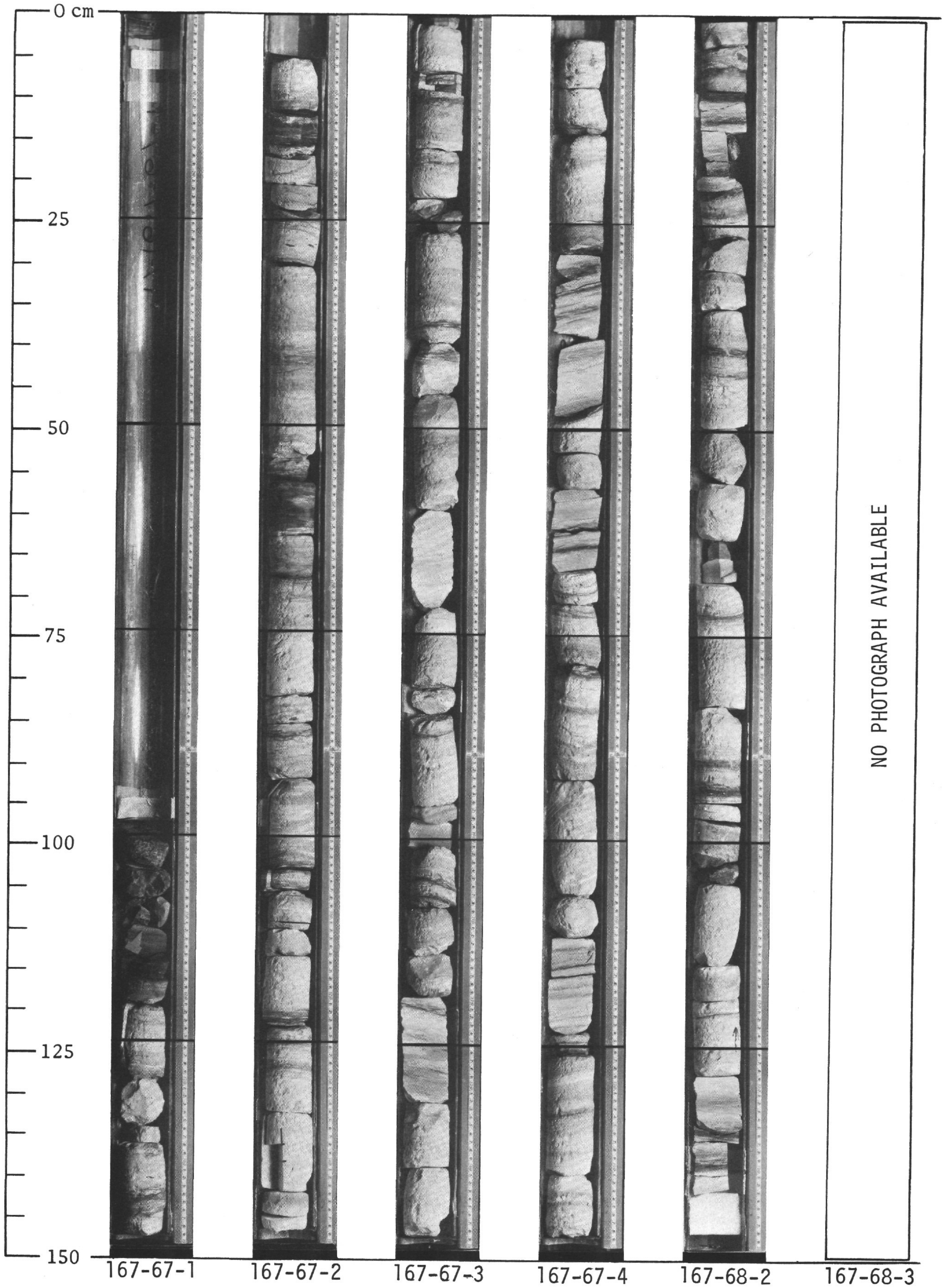
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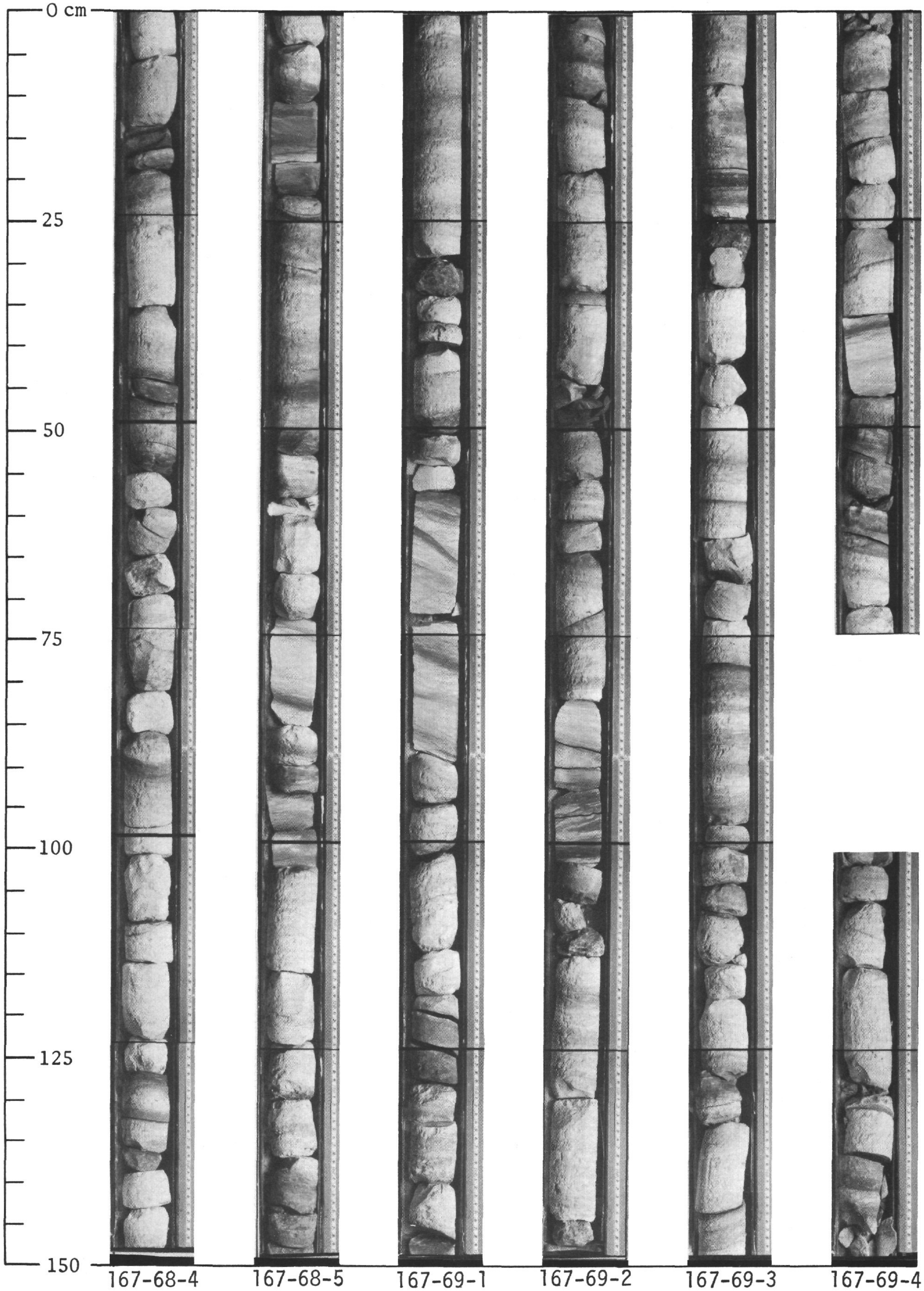
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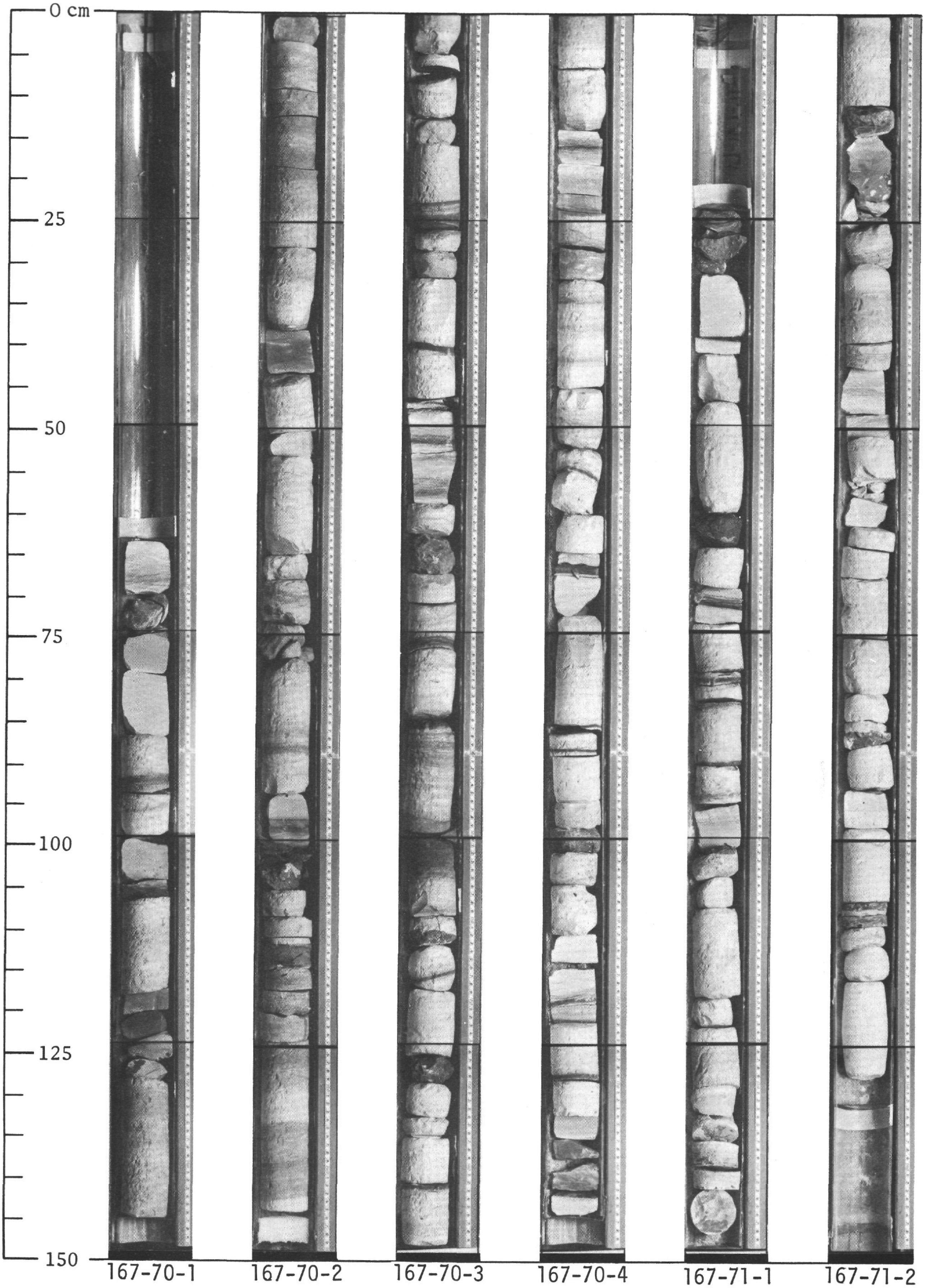
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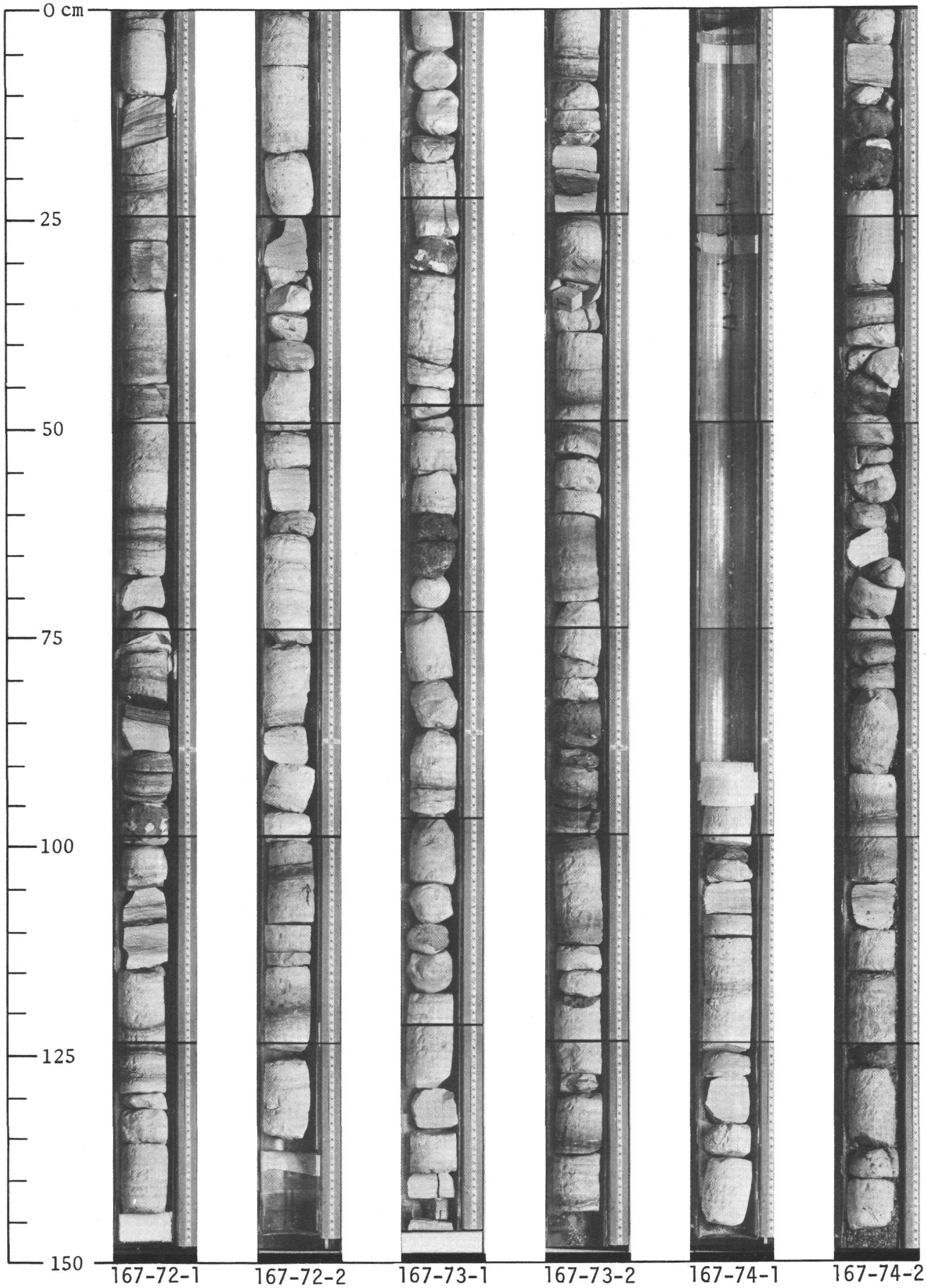
50
75
100
125
150
167-70-1
167-70-2
167-70-3
167-70-4
167-71-1
167-71-2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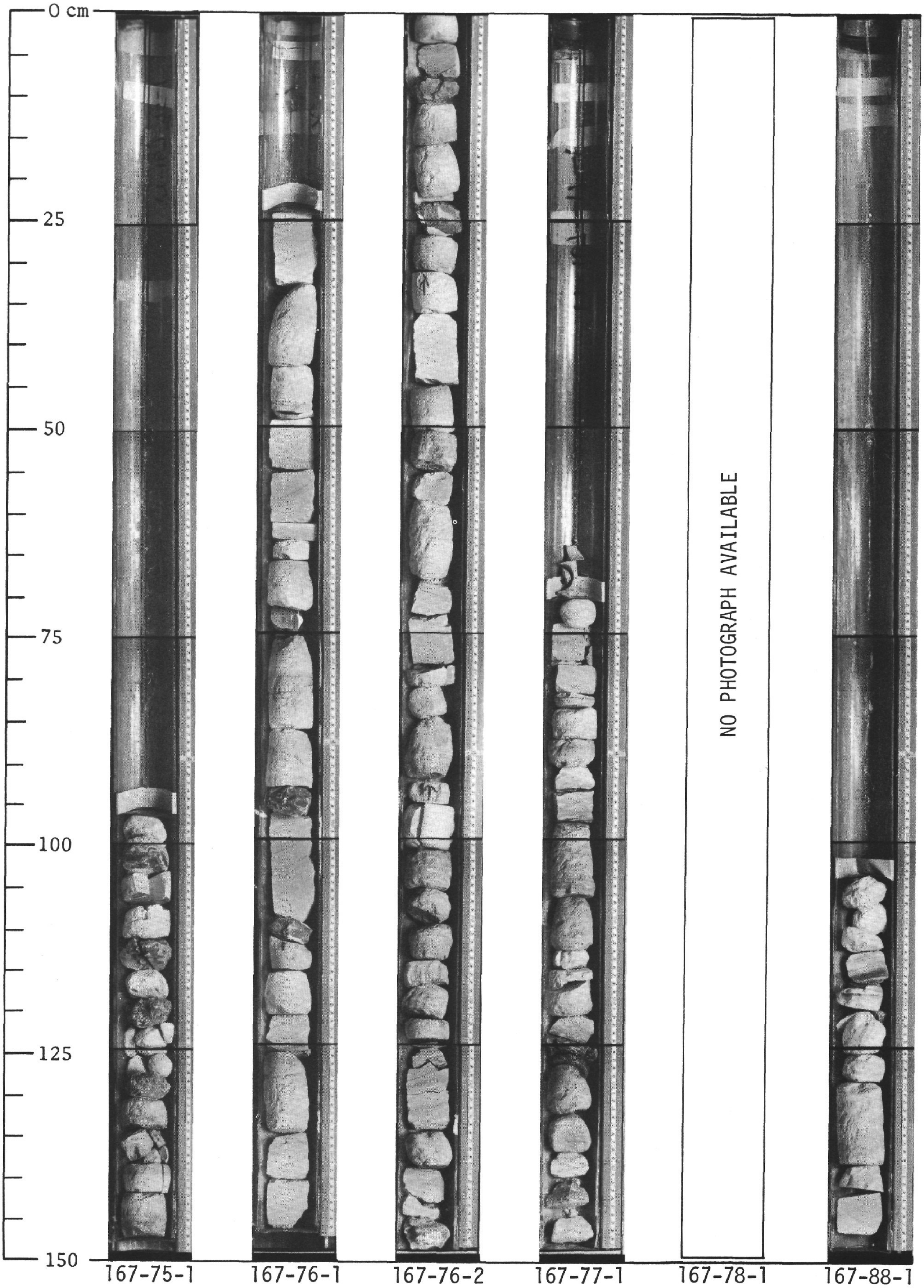
167-72-2
167-73-1
167-73-2
167-74-1
167-74-2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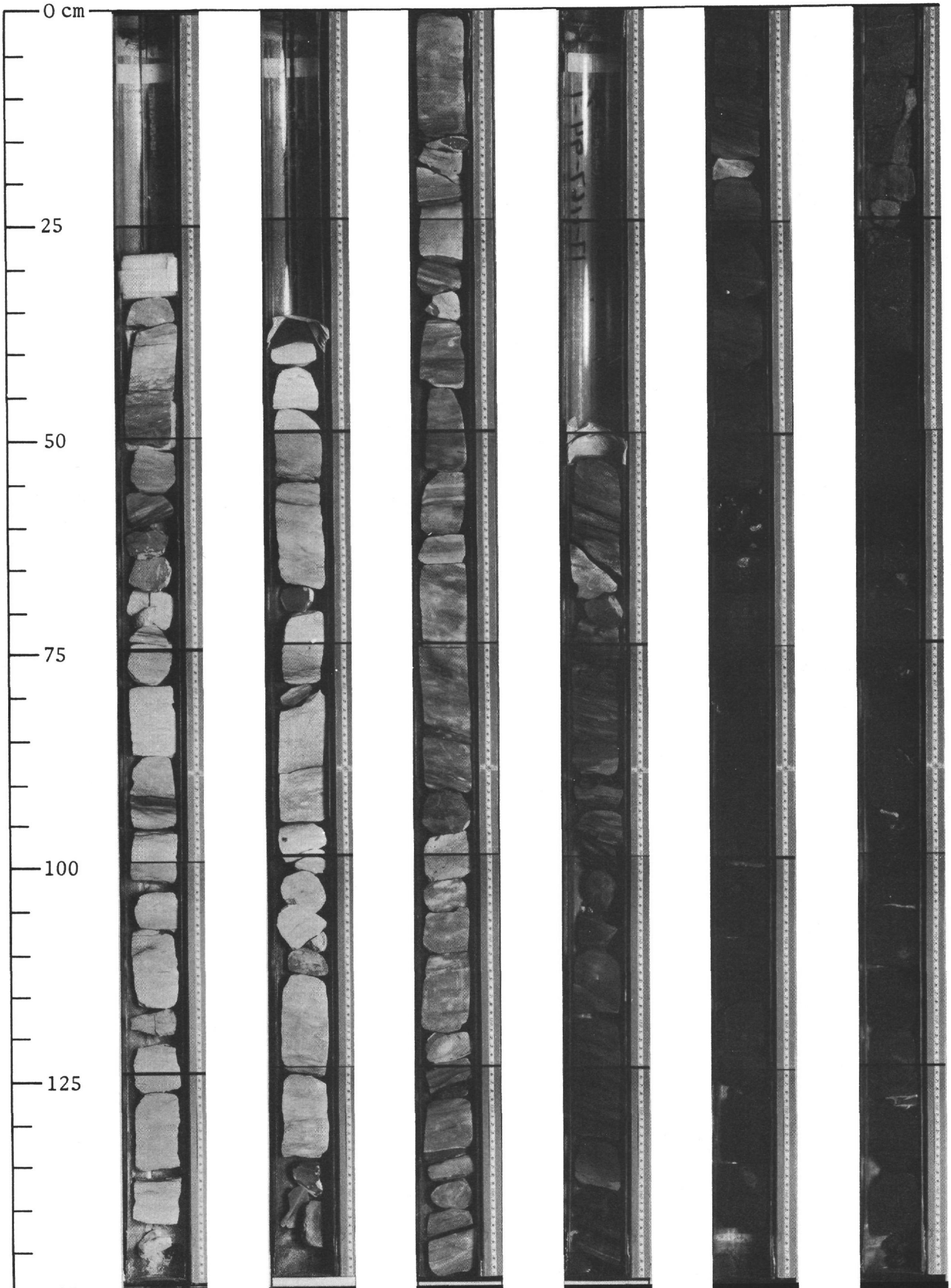
167-75-1
167-76-1
167-76-2
167-77-1
167-78-1
167-88-1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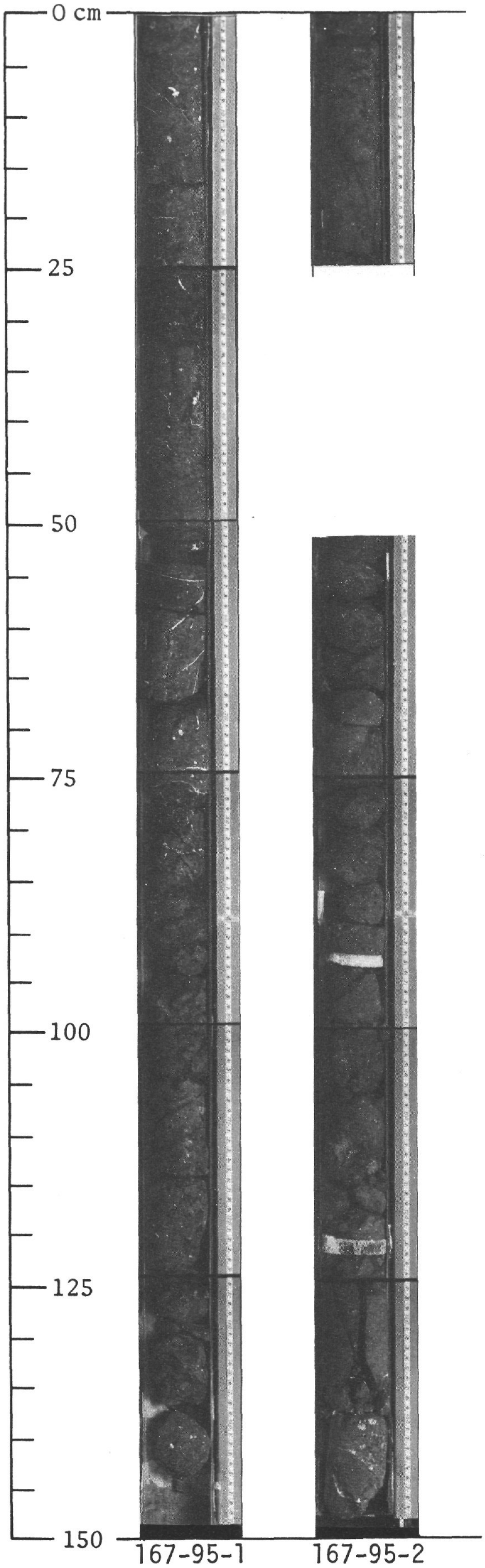
167-92-1
167-93-1
167-93-2
167-94-1
167-94-2
167-94-3


0 cm
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75
100
125
150
167-95-1
167-95-2