# 7. SITE 207

The Shipboard Scientific Party[1]
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**Location:** South Lord Howe Rise

**Position:** 36°57.75′, 165°26.06′E

**Water Depth:** 1389 meters

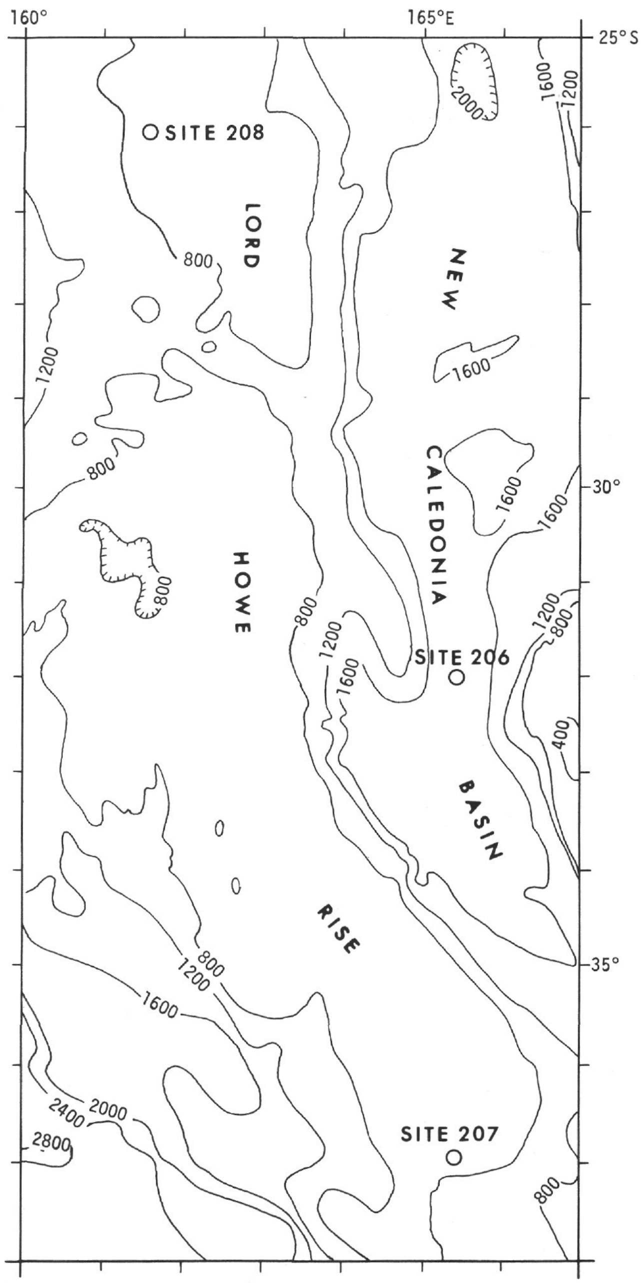
**Total Penetration:** 513 meters

**Summary:** The upper fossiliferous section represents an incomplete late Pleistocene to latest Cretaceous sequence which includes the most continuous and complete temperate late Cenozoic section collected in the Southern Hemisphere. Below the acoustic basement (309 m) approximately 50 meters of unfossiliferous silty claystone is underlain by rhyolitic lapilli tuffs and vitrophyric rhyolite flows.

## BACKGROUND AND OBJECTIVES

### General

Site 207 is the southern one of two sites located on the Lord Howe Rise. The rise, with continental crustal thickness, is one of the major structural elements of the Tasman Sea Basin. Data available prior to site survey indicated the presence of a dominant deep acoustic reflector continuous over most of the area, but with localized indications of deeper structure. This site was proposed as a pair of holes–one near the top of the local structure where the dominant reflector was relatively close to the sea floor and another down the flank where an expanded section could be sampled above the dominant reflector. The site, as drilled, is on the southern portion of the Lord Howe Rise, northwest of Bellona Gap and just west of the crest of the rise.




Contour interval 400 fathoms. (After Mammerickx, Chase, Smith, and Taylor, 1971. Bathymetry of the South Pacific, Charts 11 and 12; Scripps Institution of Oceanography, California.)

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Review by the JOIDES Panel on Pollution Prevention and Safety indicated that the site and proposed drilling program were acceptable providing there was continuous coring with maximum drilling precautions. The site was to be abandoned and the hole filled with mud if any detectable evidence of hydrocarbons was observed in the cores.

### Site Survey

Site survey for Site 207 was carried out by R/V *Kana Keoki* during September 1971. The site is located on the southern part of the Lord Howe Rise northwest of Bellona Gap and just west of the rise crest. In the region surrounding the site (Figure 1) the sea floor slopes gently and smoothly to the south.

The acoustic basement structure (Figure 2) is relatively rugged and is dominated by a deep east-west trending basin south of a roughly circular rise which has relief of over 1.0 sec (approximately 1 km). Sedimentation has smoothed and obscured the more rugged basement structure. Deep reflectors in the basin pinch out against the basement highs, while middepth and shallow reflectors converge and continue across the structure (Figure 3). An east-west crossing of the basement high (Figure 4) shows that the sedimentary structures are generally uniform about the high. At the site, it is difficult to distinguish between the major middepth reflector and acoustic basement as the two are close enough to converge. To the south of the site, the deepest reflector (acoustic basement) often disappears, possibly due to steep slopes on the structure.

The drilling site was selected just off the top of the structure to sample as complete a section as possible.

## OPERATIONS

### Site Approach

Site 207 was drilled near the top of the southern flank of the basement high which had been defined by the site survey. The approach was from the southeast on a track closely parallel to the R/V *Kana Keoki* survey approach track which permitted occupying the site after one crossing (Figure 5). The technique of dropping the beacon underway provides a very nice tie from the underway profile to the on-site sonobuoy record.

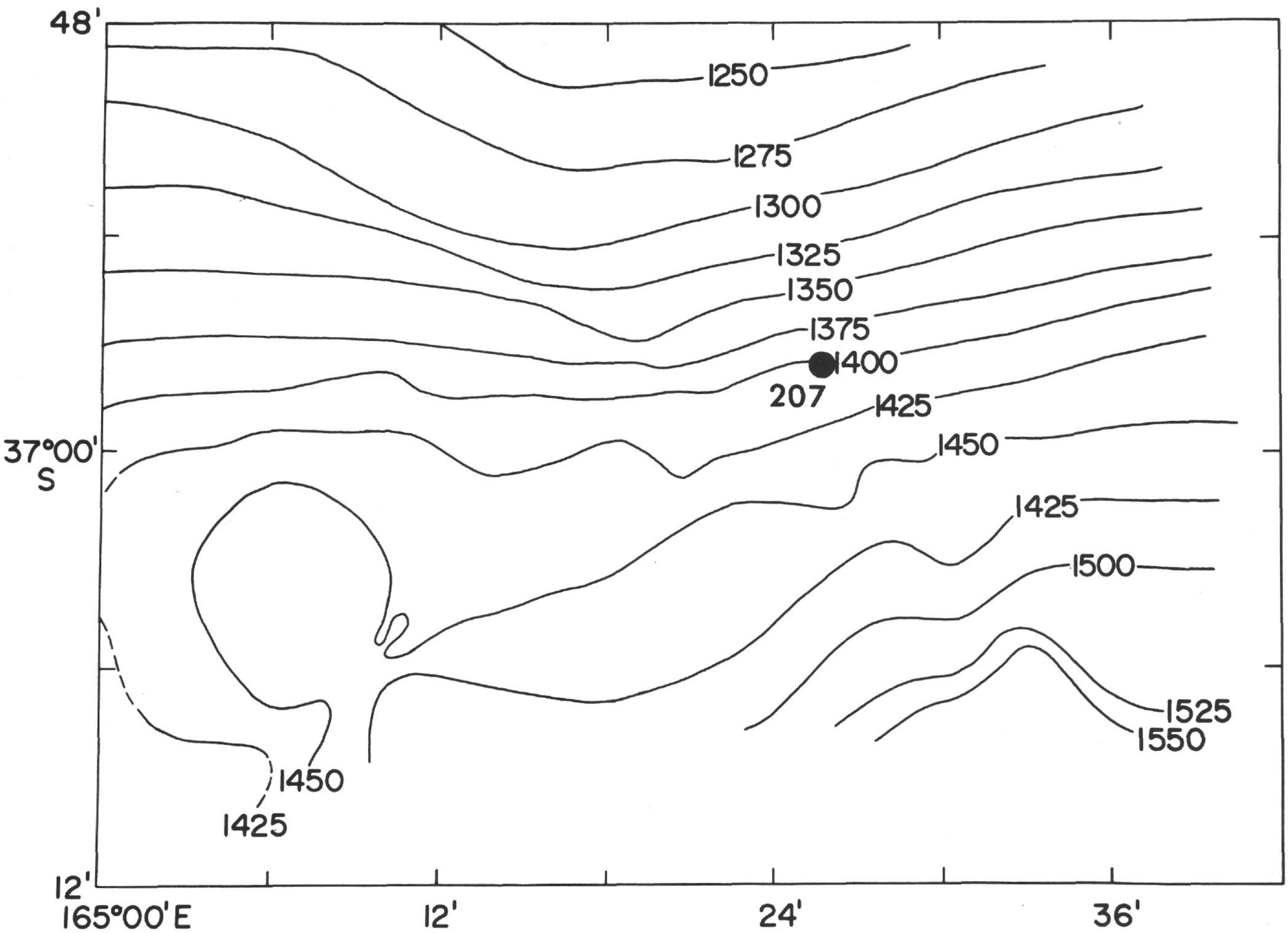


Figure 1. *Bathymetry at Site 207 (uncorrected meters). R/V* Kana Keoki *site survey September 1971.*

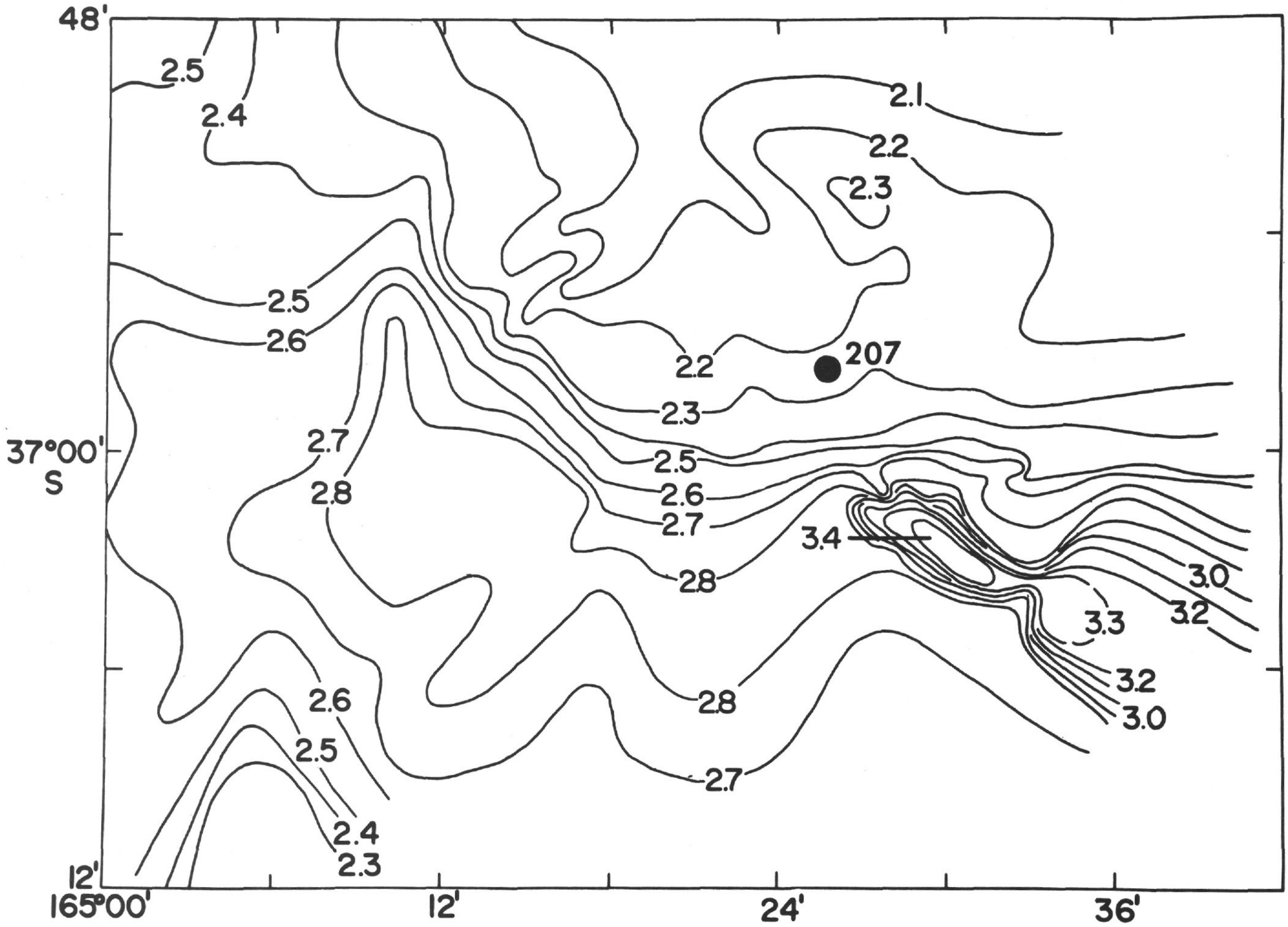


Figure 2. *Acoustic basement structure at Site 207 in seconds of reflection time. R/V* Kana Keoki *site survey September 1971.*

**Sonobuoy**

The on-site sonobuoy record (Figure 6) correlates well with the underway profiles. The reflector data are summarized in Table 1.[2] Reflector 6 at 0.37 sec is the major intermediate reflector in the basin south of the site. Reflector 7 at 0.42 sec is underway acoustic basement. South of the site this reflector is intermittent due to slope problems.

**Drilling Program**

This was the first of the two sites planned on the Lord Howe Rise, and coring was to be continuous following the recommendation of the Safety and Pollution Prevention Panel. Five cores (Table 2) were obtained down to a depth of 47 meters at Hole 207. Following the fifth core an unsuccessful attempt was made to obtain a downhole temperature measurement using the special "stinger" extension. The extension was broken off downhole, and only the instrument package was recovered. To avoid possible trouble from the extension, the bit was raised just above the mud line and Hole 207A was spudded at 1045 on 12 December.

Hole 207A (Table 3) produced 50 additional cores with penetration to 513 meters. Coring began at 47 meters below the sea floor and was continuous through the remainder of the section with the exception of four 3 to 5 meter wash intervals made to adjust the drill pipe breaks to the drilling deck level. Additional inhole temperature measurements were made at several levels before the sediment consolidation reached a point which precluded penetration by the probe. These measurements were made with the retractable unit and were incorporated routinely into the program of continuous coring.

Coring operations were terminated with Core 50A prior to reaching any clearly defined basement, but well after penetration of the deepest acoustic reflector observed at the site. The site was abandoned at 1500 on 15 December.

## LITHOLOGY

**General**

Site 207 was continuously cored to a depth of 513 meters below the sea floor. Fifty-five cores were cut (5 in Hole 207 and 50 in Hole 207A). Five core barrels came up empty. A total of 212.3 meters (47%) of core was recovered.

[2]Final correlations of sonobuoy profiles using laboratory-measured velocities, other physical properties, and lithologic boundaries are presented in Part II of this Initial Report.

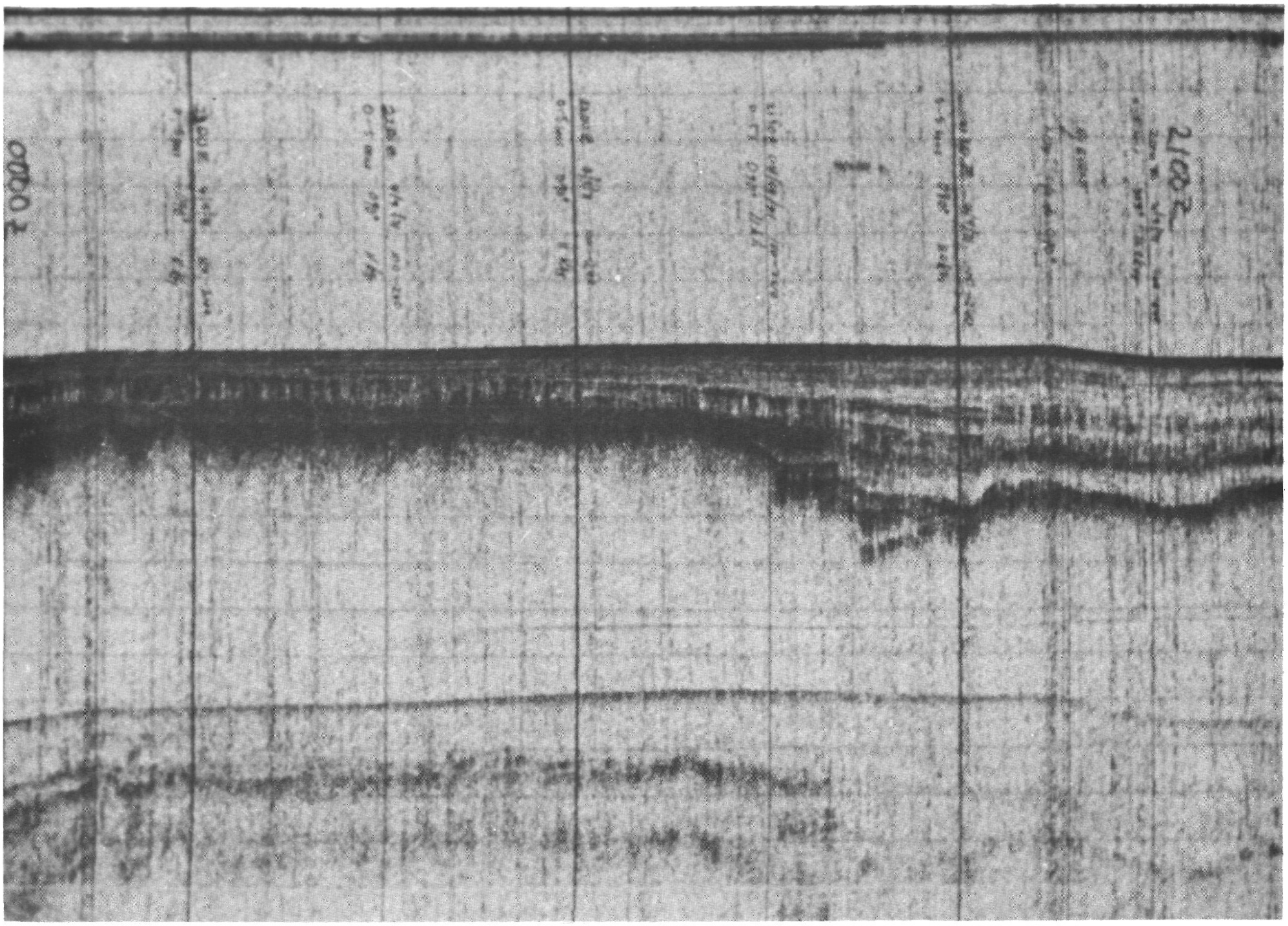

Figure 3. *Seismic profile across basement high (SE-NW) at Site 207. Note converging and truncated reflectors. R/V* Kana Keoki *site survey September 1971.*

Summaries of each of the cores are given in Appendix F.

The lithologic sequence can be divided into five units. These are, from top to bottom:

1) Unit 1 (0 to 142 m) – middle Miocene to Pleistocene: Foraminiferal nannofossil ooze and nannofossil-foraminiferal ooze.

2) Unit 2 (142 to 309 m) Paleocene to middle Miocene. – Foraminiferal-nannofossil ooze to foraminiferal-bearing nannofossil ooze and clay nannofossil ooze (or chalk), with subordinate siliceous fossil-bearing (to rich) foraminiferal-nannofossil ooze.

3) Unit 3 (309 to 357 m) Maastrichtian. – Glauconitic silty claystone (sandstone at the very base).

4) Unit 4 (357 to 433 m). Upper Cretaceous. – Rhyolitic (pumiceous) lapilli tuffs, and vitrophyric rhyolite flows (fragmented in part).

5) (433 to 513 m). Upper Cretaceous or older. – Vitrophyric rhyolite flows, fragmented in part.

**Unit I (Foraminiferal-Nannofossil Ooze and Nannofossil-Foraminiferal Ooze)**

This unit was penetrated by Cores 1 to 5 and 1A to 10A. It consists of white to very light gray ooze, with streaks and patches of shades in green, blue, and gray. Drilling disturbance is high. Percentages of foraminifera and nannofossils both vary around the 50% mark. Minor constituents of the sediment are volcanic glass shards and zeolites (up to 2%). At the base of this unit Eocene sediments are intercalated between Miocene sediments (Core 10A). Both have the same macroscopic appearance, and this disconformity could only be detected by paleontological age determinations. Overthrusting or slumping may have caused this disconformity.

**Unit 2 (Foraminiferal-Nannofossil Ooze to Foraminiferal-Bearing Nannofossil Ooze and Clay Nannofossil Ooze (or Chalk), with Subordinate Siliceous Fossil-Bearing (to Rich) Foraminiferal-Nannofossil Ooze)**

This unit was penetrated by Core 11A to the bottom of Core 28A. The boundary between Units 1 and 2 is the regional unconformity, also found at Sites 206, 208, 209, and 210. Though very similar in macroscopic appearance to Unit 1 (including color), this unit is distinguished by its siliceous content, consisting of siliceous fossils or chert. Siliceous fossils are found in Cores 12A to 22A, in amounts from a few to 35%. They are mainly radiolarians and sponge spicules. Chert fragments (broken up by drilling) are found in Cores 11A and 28A. Except for a small overlap in

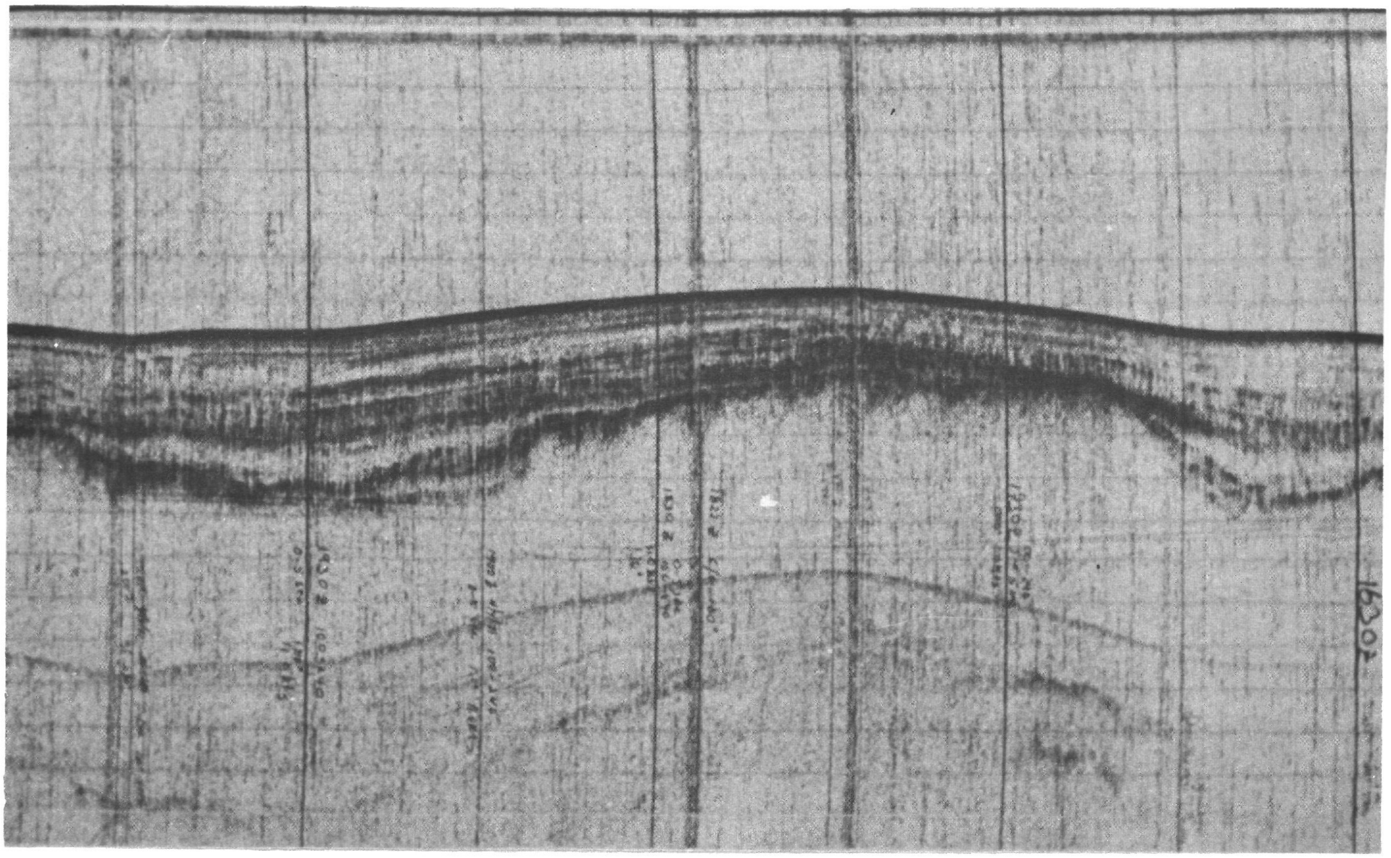


Figure 4. *East-west seismic profile showing lateral atent of the basement structure at Site 207. R/V* Kana Keoki *site survey.*

Core 22A (in which siliceous fossils occur as a trace only), chert and siliceous fossils are mutually exclusive. This suggests a mobilization and reprecipitation of the biogenic silica. Further support for this is found in the occurrence of partially silicified nannofossil ooze (porcellanite) and ghosts of foraminifera in the chert.

There is a gradual change in lithology downwards. From Core 20A clay-sized, noncalcareous material becomes a component of the sediment, increasing irregularly downwards. X-ray diffractometry and infrared spectrophotometry analyses, however, do not reveal the presence of recognizable clay minerals. Their identity remains unsolved at present. Glauconite in small quantities (up to a few percent) is found in Cores 26A to 28A. Higher content of clay-sized material seems to be associated with greater induration. In Cores 27A and 28A the sediment becomes indurated enough to be called a chalk. Sedimentary structures, mainly burrows and mottling, are better preserved in the more indurated rock.

**Unit 3 (Glauconitic Silty Claystone – Sandstone at the Very Base**

This unit extends from Core 29A to the top of Core 34A. Transition from Unit 3 to 2 is gradational. The unit consists of noncalcareous, dark olive-colored silty claystone. Silt-sized clastic particles, recognizable under the light microscope, include quartz, potash feldspar, plagioclase, and glauconite, with subordinate light and dark volcanic glass, mica, and opaque grains (mainly pyrite). Rare sponge spicules, silicoflagellates, and arenaceous foraminifera were observed also. X-ray diffraction indicates the presence of subordinate clay minerals (mainly montmorillonite). Infrared spectrophotometry, however, did not reveal the presence of clay minerals. Both techniques, on the other hand, showed cristobalite to be the main constituent of the sediment. This mineral must be present mainly in clay-sized foraminifera. Tridymite is present in relatively large amounts.

At the base of Unit 3 a glauconitic sandstone layer, a few centimeters thick, occurs directly overlying the volcanic rocks of Unit 4. The sand consists of glauconite grains and of particles derived from the underlying volcanics, such as quartz, potash feldspar, plagioclase, volcanic glass, and volcanic rock fragments. Apart from these, microcline and microperthitic orthoclase grains are also present. They are most likely derived from a plutonic (granitic) or high-grade metamorphic source. Accessory minerals include opaque grains and rare epidote. A large

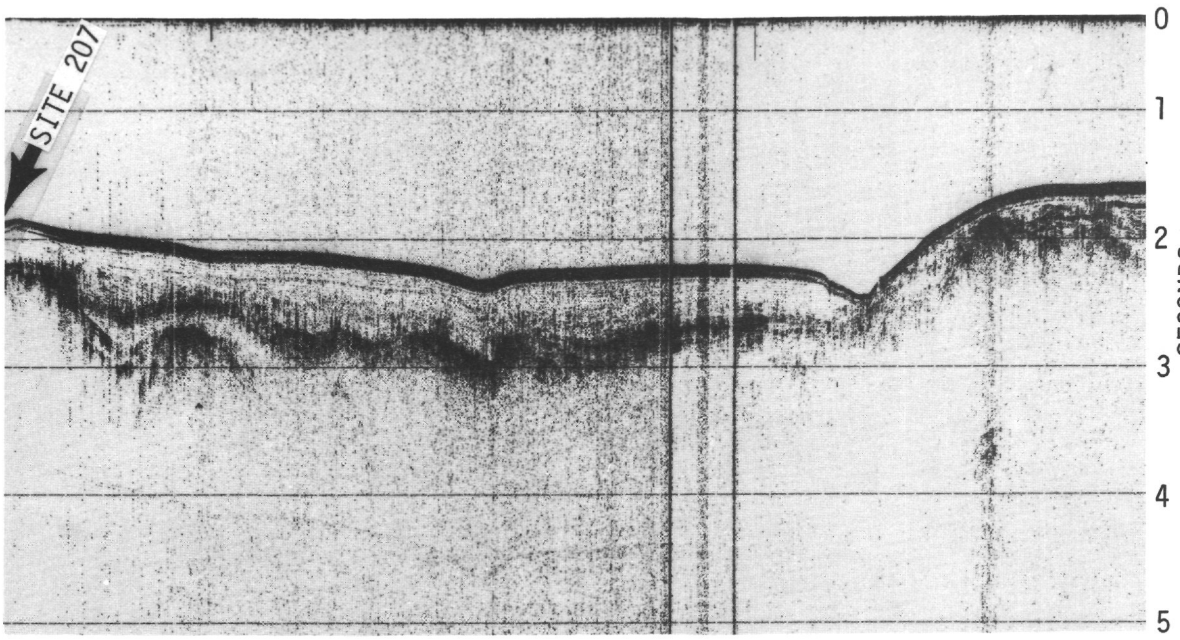


Figure 5. *Seismic profile along approach to Site 207.* Glomar Challenger *December 1971.*

proportion of the sand grains are well rounded, indicating extensive reworking by currents (and/or wave action).

### Unit 4 (Rhyolitic, Pumiceous Lapilli Tuffs and Vitrophyric Rhyolite Flows – (Fragmented in Part)

This unit was penetrated in Core 34A to the top of Core 42A. The bulk of the sequence consists of fragmental volcanics. Sizes of fragments vary greatly, from a few millemeters to several centimeters (maximum size observed: 8 cm). Pumice fragments have been observed in some parts (e.g., Cores 39A and 40A). They generally occur in finer grained (< 1 cm) parts of the sequence, which are fragments of vitrophyric rhyolite, whose mode of origin is less certain. They most likely represent autobrecciated flows. The ground mass consists of perlitic glass, moderately altered and/or devitrified, and has varying colors (shades of brown, black, gray, and green). Phenocrysts consist of quartz, potassium feldspar, and plagioclase. Potash feldspar content was determined by staining. Universal stage analyses give an average plagioclase composition of An 30 (andesine). Fluidal banding in the fragments is common. Secondary hematite locally gives the rock a bright red color. Secondary pyrite locally lines perlitic cracks.

It is not always possible to clearly distinguish between flow breccias and flows proper. Locally, intervals without or with few fragments are observed (e.g., in Core 35A). These may represent lava flows. The lithology, however, is the same as for the fragments in the brecciated parts. Discontinuous core recovery makes it impossible to distinguish individual units (flows).

Lithoidal rhyolite fragments have been observed in various samples (e.g., from Cores 35A, 39A, and 40A). They are probably accessory fragments from rhyolites crystallized at deeper levels.

### Unit 5 (Vitrophyric Rhyolite Flows, Fragmented in Part)

Rocks of this unit were penetrated in Cores 42A to 48A. Lithologically, these volcanics are very similar to those of Unit 4, the only difference being the apparent absence of potash feldspar, phenocrysts, and accessory components. The main differences from Unit 4 are the gross texture of the rocks and the amount of alteration. Texturally, the rocks show far less brecciation. Fluidal banding is common throughout the entire unit. These rocks therefore most likely represent lava flows. The localized fragmented horizons may represent auto-brecciated flows, although discontinuous core recovery makes it impossible to distinguish discrete flows. Vericular rhyolite was noted in Cores 44A and 47A.

The rocks have been devitrified and/or argillized to a far greater extent than in Unit 4. Locally, quartz grain "floating" in a clay matrix is all that remains. The clay is mainly montmorillonite. In Core 47A, however, the clay mineral is halloysite, with minor montmorillonite.

All stages of divitrification and argillization can be observed in Unit 5. Most typical are spherulites which start forming in the centers of the glass fragments, bounded by perlitic cracks. These spherulites consist of a cryptocrystalline intergrowth of cristobalite and anorthocalse. In hand specimens, these spherulites give a "salt and pepper" appearance to the rocks.

Other secondary minerals are a prismatic (blocky) zeolite (clinoptilolite), chalcedony, opal, and chlorite (?).

Phenocrysts consist of quartz and plagioclase and some rare pseudomorphs after ferromagnesian minerals. The composition of the plagioclase is similar to the one in Unit 4 (andesine). No potash feldspar was observed. The high degree of alteration in large parts of the unit, however, makes it difficult to determine if this absence is characteristic for the entire unit.

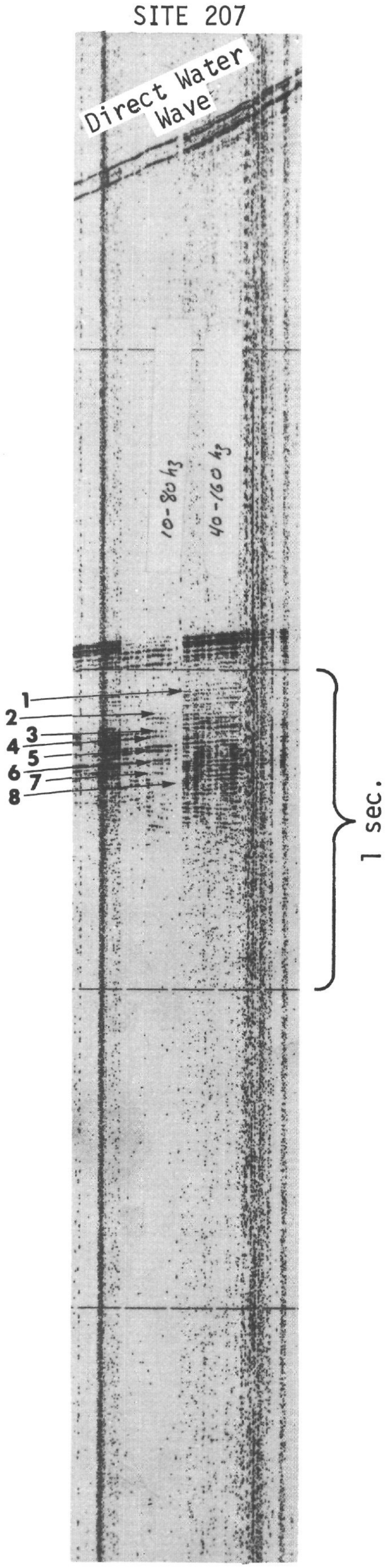


Figure 6. *On-site sonobuoy profile at Site 207.*

**TABLE 1**
**Site 207 Sonobuoy Data**

| Reflector | Depth (sec) | Nature | Estimated Velocity Structure (m/sec) | Estimated Depth (m) |
|---|---|---|---|---|
| 1 | 0.17 | Weak | 1600 | 136 |
| 2 | 0.22 | Weak | 1600 | 176 |
| 3 | 0.27 | Moderate | 1600 | 216 |
| 4 | 0.31 | Moderate/strong | 1600 | 248 |
| 5 | 0.34 | Strong/moderate | 1600 | 272 |
| 6 | 0.37 | Strong-basin, intermediate reflector | 3000 | 317 |
| 7 | 0.42 | Strong underway acoustic basement | 3000 | 392 |
| 8 | 0.45 | Strong/moderate | 4400 | 493 |

## Discussion

There are two main items which need further discussion, viz, changes in depth of deposition during the time span represented by the sequence cored and the mode of deposition of the rocks, more particularly the rhyolites.

The rhyolites of Unit 5 do not show clear signs of subaqueous extrusion. However, criteria for this are not clear-cut. The pumiceous lapilli tuffs in Unit 4 provide the best evidence for suggesting that at least part of the rocks in that unit are of subaerial or very shallow marine origin (for further discussion, see Chapter 15).

The composition and texture of the thin sandstone layer at the base of Unit 3 suggest rather strong currents bringing foreign (plutonic or metamorphic) material to the site and locally reworking the underlying volcanics. The rest of Unit 3 is a silty claystone. Its main constituent is α-cristobolite, the origin of which is uncertain. It may be derived from either siliceous fossils or volcanic glass. The fauna in the silty claystone suggests a neritic environment with restricted circulation. Paleontological data suggest a rapid deepening of the site over the interval of Cores 28A to 25A. By middle early Eocene a depth was reached similar to that of the present day. No depth changes since then are suggested by the fauna.

In conclusion, one can say that the data suggest a subsidence at the site from terrestrial (or very shallow water) to present-day depth over a period from at least Upper Cretaceous to early Eocene, remaining constant since then.

Part of the volcanics in Unit 4 are clearly tuffs and are the products of explosive eruptions. The rest of this unit is interpreted as rhyolitic flows, part of which are autobreccias. Although some intervals superficially resemble ignimbrites, detailed study did not reveal positive diagnostic ash-flow characteristics. The volcanics in Unit 5 are more homogeneous than those in Unit 4. They are interpreted as rhyolitic flows, which are autobrecciated in part.

TABLE 2
Coring Summary – Hole 207

| Core | Date | Time | Depth from Drill Floor (m) | Depth Below Sea Floor (m) | Cored (m) | Recovered (m) | Recovery (%) |
|---|---|---|---|---|---|---|---|
| 1 | 12/12 | 0635 | 1399-1405 | 0-6 | 6 | 5.5 | 92 |
| 2 | 12/12 | 0715 | 1405-1414 | 6-15 | 9 | 7.2 | 80 |
| 3 | 12/12 | 0745 | 1414-1423 | 15-24 | 9 | 9.0 | 100 |
| 4 | 12/12 | 0820 | 1428-1437 | 29-38 | 9 | 7.5 | 83 |
| 5 | 12/12 | 0855 | 1437-1446 | 38-47 | 9 | 8.8 | 98 |
| Total | | | | | 42 | 38.0 | 90 |

Note: Echo sounding depth (to drill floor) = 1393 meters; drill pipe length to bottom = 1399 meters.

## BIOSTRATIGRAPHY

### General

Paleontological examination of cores from Holes 207 and 207A reveals an incomplete latest Cretaceous to late Pleistocene sequence containing abundant and moderately to well-preserved planktonic foraminifera and calcareous nannofossils throughout much of the sequence and abundant Radiolaria in sediments of middle Eocene age. Five distinct episodes of deposition can be distinguished as follows: late Miocene to Pleistocene, early middle Miocene, early to middle Eocene, Paleocene, and Late Cretaceous. A sequence of events is defined as follows:

1) Late Cretaceous deposition of noncalcareous mudstones containing a few poorly preserved late Maastrichtian foraminifera.

2) Paleocene deposition, apparently highly condensed, of about 20 meters of calcareous mudstones which appear to become increasingly more clastic towards the base. These mudstones contain common poorly preserved planktonic foraminifera and nannofloras that are easily correlatable with the zonations of Edwards (1971) and Jenkins (1966). The low numbers of poorly preserved Maastrichtian planktonic foraminifera, calcareous nannofossils, and Late Cretaceous Radiolaria present in most of Core 28A appear to be reworked since this interval contains Paleocene benthonic foraminifera.

3) Early to late middle Eocene deposition of 140 meters of foraminiferal-nannofossil ooze containing abundant, moderately well preserved planktonic foraminifera and nannofloras. The middle Eocene is marked by an abundance of Radiolaria and other siliceous microfossils. Near the base, the presence of several neritic calcareous nannofossil species suggests proximity of this site to land – perhaps the Karamea Peninsula of Fleming (1962, fig. 6). This part of the sequence is readily correlatable with the relevant parts of both the New Zealand Stage classification (Bortonian to Mangaorapan stages) and with the zonal scheme of Edwards (1971).

4) Erosion and/or nondeposition of latest Eocene to early Miocene sediments followed by a sequence of sediments assumed to reflect a complex history of slumping that possibly occurred in the late middle Miocene. The sequence in this interval, based primarily on the foraminiferal sequence is as follows:

207A-CC: Earliest Tongaporutuan to latest Waiauan (early late Miocene to latest middle Miocene).

207A-9-1, 75-77 cm to 207A-9-3, 75-77 cm: Lillburian (middle Miocene)

207A-9-4, 75-77 cm to 207A-9-5, 75-77 cm: Clifdenian (middle Miocene)

207A-9-5, 115-117 cm to 207A-9, CC: Kaiatan (late Eocene); also present is a Miocene foraminiferal assemblage

207A-10-1, 110-112 cm to 207A-10, CC: Late Lillburian (middle Miocene)

207A-11-2, 75-77 cm to 207A-13, CC: Bortonian (late middle Eocene)

An age inversion occurs in this sequence with Late Lillburian sediments immediately overlying the Bortonian sequence. The disturbed sequence from 207A-9-1, 75 cm to 207A-10, CC appears to be best explained by a complex sequence of slumping which took place in the Late Lillburian (late middle Miocene) during which time slump blocks of various ages were transported to the area in the vicinity of Site 207. This event may in part be related to an interval of intense andesitic volcanism and tectonism in Northland, New Zealand, represented by the Waitamata Group (including Manukau Breccia) of early Miocene age followed by massive and widespread slumpiing (Onerahi Chaos) involving redeposition of Late Cretaceous to early Miocene strata.

5) Late Miocene to Pleistocene continuous deposition of about 120 meters of foraminiferal nannofossil oozes containing foraminifera and calcareous nannofossils with temperate affinities. As in Site 206, this part of the sequence has an upward increasing sedimentation rate (see Table 4) and does not have a New Zealand on-land lithologic counterpart. Planktonic foraminiferal frequency changes reflect oscillations of subtropical and subantarctic water masses throughout the sequence and indicate that cold (glacial) cycles have occurred since the late Miocene. Correlation with the Pliocene-Pleistocene of New Zealand is difficult because of general lack of New Zealand microfossil biostratigraphy within this interval. Climatic cycles within the late Miocene enable correlation with the Kapitean and Tongaporutuan stages.

### Paleodepth Interpretation

Benthonic foraminifera were examined in eight samples ranging in age from the Late Cretaceous to the late

**TABLE 3**
**Coring Summary – Hole 207A**

| Core | Date | Time | Depth from Drill Floor (m) | Depth Below Sea Floor (m) | Cored (m) | Recovered (m) | Recovery (%) |
|---|---|---|---|---|---|---|---|
| 1 | 12/12 | 1140 | 1446-1455 | 47-56 | 9 | 8.6 | 96 |
| 2 | 12/12 | 1214 | 1455-1464 | 56-65 | 9 | 1.0 | 11 |
| 3 | 12/12 | 1250 | 1464-1473 | 65-74 | 9 | 9.0 | 100 |
| 4 | 12/12 | 1320 | 1473-1482 | 74-83 | 9 | 6.5 | 72 |
| 5 | 12/12 | 1400 | 1482-1491 | 83-92 | 9 | 9.0 | 100 |
| 6 | 12/12 | 1440 | 1491-1500 | 92-101 | 9 | 8.4 | 93 |
| 7 | 12/12 | 1505 | 1500-1509 | 101-110 | 9 | 9.0 | 100 |
| 8 | 12/12 | 1555 | 1509-1518 | 110-119 | 9 | 8.5 | 94 |
| 9 | 12/12 | 1630 | 1518-1527 | 119-128 | 9 | 9.3 | 100 |
| 10 | 12/12 | 1710 | 1532-1541 | 133-142 | 9 | 5.3 | 59 |
| 11 | 12/12 | 1755 | 1541-1550 | 142-151 | 9 | 6.1 | 68 |
| 12 | 12/12 | 1855 | 1550-1559 | 151-160 | 9 | 1.0 | 11 |
| 13 | 12/12 | 1935 | 1559-1568 | 160-169 | 9 | 8.0 | 89 |
| 14 | 12/12 | 2020 | 1568-1577 | 169-178 | 9 | 1.9 | 21 |
| 15 | 12/12 | 2100 | 1577-1586 | 178-187 | 9 | 6.0 | 67 |
| 16 | 12/12 | 2145 | 1586-1595 | 187-196 | 9 | 3.8 | 42 |
| 17 | 12/12 | 2230 | 1595-1604 | 196-205 | 9 | 3.5 | 39 |
| 18 | 12/12 | 2315 | 1604-1613 | 205-214 | 9 | 8.9 | 99 |
| 19 | 12/12 | 2355 | 1613-1622 | 214-223 | 9 | 7.7 | 86 |
| 20 | 12/13 | 0035 | 1622-1631 | 223-232 | 9 | 9.0 | 100 |
| 21 | 12/13 | 0115 | 1636-1645 | 237-246 | 9 | 8.8 | 98 |
| 22 | 12/13 | 0200 | 1645-1654 | 246-255 | 9 | 1.0 | 11 |
| 23 | 12/13 | 0250 | 1654-1663 | 255-264 | 9 | 8.0 | 89 |
| 24 | 12/13 | 0340 | 1663-1672 | 264-273 | 9 | 6.3 | 70 |
| 25 | 12/13 | 0430 | 1672-1681 | 273-282 | 9 | 5.4 | 60 |
| 26 | 12/13 | 0520 | 1681-1690 | 282-291 | 9 | 4.8 | 53 |
| 27 | 12/13 | 0645 | 1690-1699 | 291-300 | 9 | 2.4 | 27 |
| 28 | 12/13 | 0750 | 1699-1708 | 300-309 | 9 | 0.7 | 8 |
| 29 | 12/13 | 0930 | 1708-1717 | 309-318 | 9 | 2.7 | 30 |
| 30 | 12/13 | 1020 | 1717-1726 | 318-327 | 9 | 1.5 | 17 |
| 31 | 12/13 | 1140 | 1729-1738 | 330-339 | 9 | 4.6 | 51 |
| 32 | 12/13 | 1240 | 1738-1747 | 339-348 | 9 | 0.0 | 0 |
| 33 | 12/13 | 1345 | 1747-1756 | 348-357 | 9 | 3.6 | 40 |
| 34 | 12/13 | 1505 | 1756-1765 | 357-366 | 9 | 3.0 | 33 |
| 35 | 12/13 | 1620 | 1765-1774 | 366-375 | 9 | 2.9 | 32 |
| 36 | 12/13 | 1740 | 1774-1783 | 375-384 | 9 | 0.4 | 4 |
| 37 | 12/13 | 1840 | 1783-1792 | 384-393 | 9 | 0.0 | 0 |
| 38 | 12/13 | 1925 | 1792-1801 | 393-402 | 9 | 0.1 | 1 |
| 39 | 12/13 | 2025 | 1801-1810 | 402-411 | 9 | 0.6 | 7 |
| 40 | 12/13 | 2130 | 1810-1819 | 411-420 | 9 | 0.8 | 9 |
| 41 | 12/14 | 0000 | 1819-1828 | 420-429 | 9 | 0.0 | 0 |
| 42 | 12/14 | 0130 | 1831-1840 | 432-441 | 9 | 2.1 | 23 |
| 43 | 12/14 | 0245 | 1840-1849 | 441-450 | 9 | 0.4 | 4 |
| 44 | 12/14 | 0415 | 1849-1858 | 450-459 | 9 | 1.4 | 16 |
| 45 | 12/14 | 0705 | 1858-1867 | 459-468 | 9 | 4.5 | 50 |
| 46 | 12/14 | 0925 | 1867-1876 | 468-477 | 9 | 6.0 | 67 |
| 47 | 12/14 | 1230 | 1876-1885 | 477-486 | 9 | 3.3 | 37 |
| 48 | 12/14 | 1705 | 1885-1894 | 486-495 | 9 | 6.5 | 72 |
| 49 | 12/14 | 1840 | 1894-1903 | 495-504 | 9 | 0.0 | 0 |
| 50 | 12/14 | 2130 | 1903-1912 | 504-513 | 9 | 0.0 | 0 |
| Total | | | | | 450 | 212.3 | 47 |

Note: Echo sounding depth (to drill floor) = 1393 meters;
drill pipe length to bottom = 1399 meters.

Pleistocene. Cretaceous paleodepth determination is difficult because the benthonic foraminifera have little relationship with present-day and Cenozoic forms. The rarity of planktonic foraminifera and absence of calcareous nannofissils may suggest restriction of oceanic circulation which is generally associated with shelf deposition.

Paleocene benthonic foraminifera (207A-27, CC and 207A-26, CC) are distinctly shallower than all younger sediments. based on relatively high frequencies of discorbids, polymorphinids, *Cibicides* and *Anomalinoides*, and higher frequencies of *Bolivina*. Planktonic foraminifera and calcareous nannofossils have much lower frequencies than in the younger sediments, suggesting shallower depths. Upper bathyal depths are suggested by the foraminifera.

Rapid increase in depth of deposition to middle bathyal depths occurred within the early Eocene (207A-25, CC).

TABLE 4
Sedimentation Rates in the Late Cenozoic

| | Time Represented | Sediment Thickness (m) | Sedimentation Rate m/$10^6$ yr. |
|---|---|---|---|
| Pleistocene | 1.8 | 27 | 15 |
| Pliocene | 3.7 | 50 | 14 |
| Late Miocene | 4.5 | 45 | at least 10 |

These depths have remained much the same until the present day with only minor fluctuations.

Thus, a major subsidence appears to have taken place at Site 207 during the Paleocene and earliest Eocene with little vertical movement since.

## Foraminifera

The 33 fossiliferous cores obtained during continuous coring at Site 207 represent an incomplete latest Cretaceous to late Pleistocene sequence of abundant and well-preserved planktonic foraminifera. This sequence will be of special value in providing additional resolution for planktonic foraminiferal biostratigraphy, evolution, and paleoclimatology in temperate waters of the Southern Hemisphere. The planktonic foraminiferal sequence is readily discussed under six age groupings as follows:

### Pleistocene, Pliocene, and Late Miocene:

An apparently continuous sequence of over 120 meters (Cores 1 to 5 and 1A to 8A) of foraminiferal-nannofossil oozes containing extremely abundant, well-preserved planktonic foraminifera. This sequence represents the most continuous, complete temperate late Cenozoic section in the Southern Hemisphere. Tropical elements are essentially absent at this site. The relative closeness of Site 207 to the Subtropical Convergence is of particular interest, as fluctuations in subtropical and subantarctic water masses since the late Miocene are clearly reflected by frequency changes in the planktonic foraminifera. Quantitative work is required for detailed evaluation of the paleoclimatic-paleooceanographic oscillations. However, one trend that is readily apparent is that a distinctly cool interval marks the latest Miocene in 207A-4-3, 75 cm to 207A-5-1, 75 cm. During this interval, subantarctic waters migrated northward over Site 207, reflecting a cooling equivalent to those of glacial stages of the Pleistocene. This cooling has been detected previously in New Zealand sections much further to the south during the Kapitean Stage (Kennett, 1967; 1968). Representation of this cooling event at the lower latitude of Site 207 is thus of additional value in the evaluation of the magnitude of these and other oceanographic changes in the late Cenozoic. Coiling direction switches in *Globigerina pachyderma* are valuable guides to paleooceanographic change.

The Pliocene-Pleistocene boundary (between 207-3, CC and 207-4-1, 50 cm is marked by the first appearance of *Globorotalia truncatulinoides* and the Miocene-Pliocene boundary (between 207A-4-2, 75 cm and 207A-4-3, 75 cm by the appearance of nonkeeled *Globorotalia* as in New Zealand on-land sections. Earlier late Miocene strata equivalent to the Tongaporutuan Stage contain a warmer-water fauna than that of the latest Miocene (Kapitean Stage). The late Miocene cooling represented at Site 207 represents the first late Cenozoic cold interval and is synchronous with the first major late Cenozoic buildup of ice on Antarctica.

### Early Late Eocene and Early Middle Miocene

A disturbed interval of the sequence is represented by Cores 9A and 10A with middle middle Miocene immediately overlain by the late Miocene and underlain by early late Eocene sediments, which are in turn underlain by late middle Miocene sediments. These in turn are underlain by undisturbed early to middle Eocene sediments. Within the disturbed sequence the *Orbulina* bioseries is well represented in the section from 207A-9-1, 75 cm to 207A-9-5, 75 cm.

### Early to Middle Eocene (207A-11-2, 75 cm to 207A-25, CC)

A fine, apparently continuous sequence of abundant, well-preserved planktonic foraminifera can be correlated with the Bortonian (late middle Eocene) to Mangaorapan (middle early Eocene) stages of New Zealand.

### Late Paleocene to Early Eocene

Interval 207A-26-3, 80 cm to 207A-26-4, 77 cm contains a rich and varied assemblage of planktonic taxa. Taxa present include *Globorotalia (Morozovella) dolabrata* Jenkins, *G. (M.) aequa marginodentata* Subbotina, *Globorotalia (Planorotalites) australiformis* Jenkins, and *Truncorotaloides pseudotopilensis* Subbotina. This assemblage is Waipawain age. There is a considerable amount of Upper Teurian contamination in this interval.

### Paleocene

Interval 207A-27-1, 126 cm to 207A-27-2, 72 cm contains much richer assemblages of foraminifera than those underlying this interval. Agglutinated taxa are uncommon, calcareous benthonic taxa are dominant, and planktonic taxa are quite common. Taxa present include *Pseudoclavulina anglica anglica* Cushman, *Citharina rakauroana* (Finlay), *Neoflabellina semireticulata* (Cushman and Jarvis), *Gavelinella becarriiformis* (White), *Alabamina creta* (Finlay), *Buliminella creta* (Finlay), *Tappanina selmensis* (Cushman), *Globigerina* (Subbotina) *triloculinoides* Plummer, *Globorotalia (Turborotalia) pseudobulloides* (Plummer), *Globorotalia (Acarinina) mckannai* (White), *G. (A.) acarinata* (Subbotina), and a single specimen of *Globorotalia (Planorotalites) pseudomenardii* Bolli. This assemblage is clearly Mid to Upper Teurian in age equivalent to the lower part of the *G. triloculinoides* Zone of Jenkins (1966).

Interval 207A-28-1, 137-139 cm contains a varied assemblage of agglutinated and calcareous benthonic Teurian taxa, including *Pseudoclavulina anglica* Cushman, *Gaudryina whangaia* Finlay, *Alabamina creta* (Finlay), and *Gavelinella beccariiformis* (White). No planktonic foraminifera were extracted from this interval, which is probably Lower Teurian in age and in part equivalent to Jenkins, *G. pauciloculata Zone.*

The major change of lithology and microfauna (foraminifera) which occurs immediately below this interval is taken at the Maastrichtian-Paleocene boundary.

#### Maastrichtian (207A-29-1, 20 cm to 207A-34-1, 8 cm)

The interval 207A-33-3, 40 cm to 207A-34-1, 8 cm contains no foraminifera. Interval 207A-29-1, 20 cm to 207A-33-2, 119 cm contains *Hyperammina elongata* Brady, *Ammodiscus pennyi* Cushman and Jarvis, *Cyclammina* cf. *elegans* Cushman and Jarvis, *Gaudryina healyi* Finlay, and *Dorothia elongata* Finlay. The latter two species indicate a Haumaurian age. One sample within this interval (207A-31-2, 116-118 cm) contains *Heterohelix globulosa* (Ehrenberg), *Globigerinelloides volutus* (Shite), and *Hedbergella monmouthensis* (Olsson), indicating that at least the 207A-29-1, 20 cm to 207A-31-2, 118 cm interval falls within the *G. (R.) circumnodifier* Zone of Webb (1966).

Reworked Maastrichtian planktonic foraminifera and molluscan prisms into Paleocene sediments are noted in Samples 207A-27-2, 70-72 cm and 207A-28-1, 137-139 cm. The latter sample includes specimens of *G. (R.) circumnodifier* (Finlay) and *G. (A.) mayaroensis* Bolli. Preservation of calcareous taxa is poor, and much of the fauna has obviously been destroyed since deposition.

### Calcareous Nannofossils

Materials from Holes 207 and 207A yielded nannofloras indicating the presence at this site of an incomplete latest Cretaceous to sub-Recent sequence which, particularly in the lower part, closely resembles, both lithologically and paleontologically, the age-equivalent sequences of eastern New Zealand. The age groupings identified are, in downhole order, as follows:

#### Pleistocene (207-1-1, 60 cm to 207-4-1, 25 cm: Nannofossil-Foraminiferal Ooze)

The Pleistocene sediments contain abundant, well-preserved calcareous nannofossils. Species commonly present are: *Emiliania huxleyi, Gephyrocapsa oceanica,* other *Gephyrocapsa* spp., *Pseudoemiliania lacunosa, Coccolithus pelagicus, Cyclococcolithus leptoporus, Helicopontosphaera kamptneri,* and *Cyclococcolithina macintyrei.* Other species present in small quantities, or as isolated specimens, are: *Rhabdosphaera claviger, Syracosphaera pulchra, Pontosphaera alboranensis, Pontosphaera distincta, Pontosphaera japonica, Pontosphaera pacificus, Scapholithus ganerotus, Cyclolithella anulla, Oolithotus antillarum, Discoaster perplexus, Scyphosphaera apstenii, Thoracosphaera heimi, Scyphosphaera* cf. *campanula*, and a holococcolith species.

Considerable fluctuations in environmental conditions have occurred during the Pleistocene, as shown by the changes in the calcareous nannofossil assemblages. The environment of deposition was mid-subtropical in the lowermost Pleistocene sediments (Sections 3-4 and 3-5), corresponding to a present-day latitudinal position slightly north of the location of Hole 207. This changed through a warm subtropical (Section 3-4) to a marginal tropical/warm subtropical environment (Section 3-3). A warm-water environment persisted for a period (Section 3-3 to 2-2) but with several slightly cooler fluctuations (Section 3-2 and 3-5). A gradual cooling through a warm subtropical (Section 2-2) to a cool subtropical environment followed (Section 2-1). This cool subtropical environment persisted throughout the period of uppermost sediment deposition and corresponds to conditions found in the most recent sediments of this latitude (Burns, in press).

The Pleistocene sediments can be fitted to the zonal scheme of Martini (1971) as follows: 207-1-1, 60 cm, NN21; 207-1-2, 25 cm to 207-1-3, 25 cm; NN20; and 207-1-4, 25 cm to 207-4-1, 25 cm; NN19.

#### Late Pliocene (207-4-2, 25 cm to 207-5-6, 25 cm; Nannofossil-Foraminiferal Ooze)

The late Pliocene sediments contain abundant, moderately preserved calcareous nannofossils. Species commonly present are: *Gephyrocapsa* spp., *Pseudoemiliania lacunosa, Coccolithus pelagicus,* and *Cyclococcolithina macintyrei.* Other species present in small numbers are: *Discoaster brouweri, Discoaster pentaradiatus, Discoaster surculus, Umbilicosphaera mirabilis, Helicopontosphaera kamptneri, Syrocosphaera pulchra, Pontosphaera* spp., *Rhabdosphaera claviger, Cyclococcolithus leptoporus, Scyphosphaera apstenii,* and *Scyphosphaera campanula.*

The late Pliocene sediments of Hole 207 are characterized by an extremely low content of discoasters. Discoaster content of the sediments is often as low as 2% to 5% of the total assemblage and hence makes stratigraphical zonal definition difficult. The zonal scheme of Martini has been fitted to the late Pliocene sediments, for the present, by placing the boundaries at the first or last appearance of a few good, well-preserved zonal index calcareous nannofossils. It is, however, clear that the zonal scheme for such southern latitude sequences requires further consideration.

The low numbers of discoasters in the sediments indicate a late Pliocene environment of deposition in generally cool southern subtropical conditions.

The late Pliocene sediments have been conditionally fitted to the zonal scheme of Martini (1971) as follows: 207-4-2, 25 cm to 207-4-3, 25 cm, NN18; 207-4-4, 25 cm to 207-4-5, 25 cm, NN17; and 207-4-CC to 207-5-6, 25 cm, NN16.

#### Early Pliocene to Middle Miocene (207-5, CC to 207A-10, CC; Foraminiferal-Nannofossil Ooze)

This interval contains abundant, more or less moderately preserved diverse unwinnowed nannofloras having temperate affinities and therefore less easily correlated with the zonal scheme of Martini (1971). Correlation with the age-equivalent strata of New Zealand is at present also difficult to achieve due to lack of detailed knowledge of the on-land sequence, but present indications are that the latter part of this sequence will correlate much more easily with those of northern New Zealand than with those of central and southern New Zealand. For convenience, a slumped block of late Eocene age within this interval is dealt with separately below.

**Late Eocene (207A-9-5, 120 cm to 207A-9, CC; Foraminiferal-Nannofossil Ooze)**

Taxa present in this interval, represented by three richly nannofossiliferous samples, include: *Chiasmolithus oamaruensis, Coccolithus eopelagicus, C. ovalis, Cyclicargolithus reticulatus, Discoaster tani nodifer, D. saipanensis, Reticulofenestra bisecta, R. hampdenensis, R. placomorpha, Spenolithus morifermis, Thoracosphaera prolata, Zygrhablithus bijugatus* (abundant), and rhabdoliths. Clearly these assemblages conform to the late Eocene 2/5 (mid-Kaiatan) *Chiasmolithus oamaruensis* zones of both Edwards (1971) and Martini (NP18, 1971). Their disordered position is ascribed to mid Miocene slumping as a semiconsolidated block. Whatever, their fortuitous occurrence in this sequence is particularly interesting for, being significantly younger than any other Eocene assemblages present encountered, they help fill in part of a very large hiatus at this site (see below). If, as seems likely, the Eocene-Oligocene unconformity of Sites 206 and 208 to 210 (q.v.) was formerly present in this sequence, then the occurrence of these assemblages would imply that the event causing it occurred subsequent to the Late Eocene 2/5 interval. No obvious indication of stratigraphic direction could be determined from these assemblages.

**Major Unconformity (Between 207A-10, CC and 207A-11-2, 30 cm)**

An unconformity, involving all of the mid Eocene 7/7 to early Miocene 5/5, interval, occurs between Cores 10A and 11A as judged by a major floral turnover.

**Mid Eocene (207A-11-2, 30 cm to 207A-24-4, 25 cm; Foraminiferal-Nannofossil Ooze to Nannofossil Ooze with Chert)**

Taxa present in this interval, which contains moderately well preserved, abundant nannofloras throughout, include: *Braarudosphaera bigelowi* (top at 207A-21, CC); *Chiasmolithus expansus; C. grandis; C. solitus; Chiphragmalithus cristatus* (base at 207A-20-3, 25 cm and sporadic in Cores 12A and 13A); *C. cristatus* var. (cf. *Nannotetrina fulgens*, 207A-14, CC to 207A-16-1, 100cm); *Coccolithus eopelagicus; C. ovalis* s.l.; *Discoaster barbadiensis; D. distinctus, D. lodoensis* (sporadic above 207A-21, CC); *D. sublodoensis* (207A-18-6, 100 cm to 207A-24-4, 25cm); *Discoasteroides kuepperi* (top at 207A-21-2, 100 cm); *Reticulofenstra dictyoda; R. hampdenensis* (base at 207A-12-1, 100 cm); *R. placomorpha* (base at 207A-16-2, 100 cm); *Spenolithus moriformis; S. radians* (top at 207A-22, CC); *Zygolithus dubius;* and *Zygrhablithus bijugatus* (abundant). The following biostratigraphic assignments are made, in downhole order, with the zonal scheme of Edwards (1971):

1) 207A-11-2, 30 cm to 207A-12-1, 100 cm: mid Eocene 6/7 (mid to early Bortonian) combined *Discoaster distinctus* and *Reticulofenestra hampdenensis* zones. Probably only the equivalent of the latter (early Bortonian) zone is present, but this cannot be confirmed due to the apparent unreliability of the top *Chiphragmalithus cristatus* datum level in this sequence.

2) 207A-12, CC to 207A-16-2, 100 cm: mid Eocene 5/7 (early Bortonian to late Porangan) part of the *Chiphragmalithus cristatus* Zone.

3) 207A-16, CC to 207A-18-6, 25 cm: mid Eocene 4/7 (early Porangan) part of the *Chiphragmalithus cristatus* Zone.

4) 207A-18-6, 100 cm to 207A-20-3, 25 cm: mid Eocene 3/7 (late Heretaungan) part of the *Chiphragmalithus cristalus* Zone.

5) 207A-20-3, 100 cm to 207A-21-1, 60 cm: mid Eocene 2/7 (mid Heretaungan) *Discoaster elegans* Zone.

6) 207A-21-1, 100 cm to 207A-24-4, 25 cm: mid Eocene 1/7 (early Heretaungan and possibly late Mangaorapan) part of the *Reticulofenestra dictyoda* Zone. The top *Spenolithus radians* datum level (207A-22, CC) may provide a useful further subdivision.

Judging from the above, a complete open-water mid Eocene 1/7 to 6/7 (early Heretaungan to early Bortonian) sequence is present. Despite this, accurate correlation with the zonal scheme of Martini (1971) is not possible; intervals 1 to 3 and 4 to 6 above appearing to be approximate correlatives of this *Chiphragmalithus alatus* (NP15) and *Discoaster sublodoensis* (NP14) zones, respectively. Even so these broad correlations are more accurate than those given by Edwards (1971) based on New Zealand material.

**Early Eocene (207A-24-4, 100 cm to 207A-26-3, 25 cm; Nannofossil Ooze with Chert)**

Taxa present in this interval, which contains abundant but variably preserved nannofloras throughout, include: *Braarudosphaera bigelowi* (base at 207A-25,CC); *Chiasmolithus grandis, C. solitus; Coccolithus cavus* s.l.; *C. eopelagicus; Discoaster barbadiensis* (base about 207A-24, CC); *D. diastypus* (top at 207A-26-2, 145 cm); *D. distinctus* (base about 207A-24, CC); *D. lodoensis* (base at 207A-25-4, 100 cm; *Discoasteroides kuepperi* (base at 207A-26-3, 66 cm), *Marthasterites tribrachiatus* (top at 207A-24, CC); *Reticulofenestra dictyoda* (base at 207A-25-1,100 cm); *Spenolithus moriformis; S. radians* (base at 207A-26-3, 25 cm); and *Zygrhablithus bijugatus* (dominant). The following biostratigraphic assignments are made, in downhole order:

1) 207A-24-4, 100 cm to 207A-24-5, 135 cm: early Eocene 5/5 (late Mangaorapan) part of the *Reticulofenestra dictyoda* Zone of Edwards (1971) plus the whole of the *Discoaster lodoensis* (NP13) Zone of Martini (1971).

2) 207A-24, CC to 207A-25-1, 100 cm: early Eocene 5/5 (late Mangaorapan) part of the *Reticulofenestra dictyoda* Zone of Edwards (1971) plus part of the *Marthasterites tribrachiatus* (NP12) Zone of Martini (1971). Note the different (improved) correlation between these two zonal schemes and that given by Edwards (1971).

3) 207A-25-2, 100 cm to 207A-25-4, 100 cm: early Eocene 4/5 (early Mangaorapan) *Discoaster lodoensis* Zone of Edwards (1971) and part of *Marthasterites tribrachiatus* (NP12) Zone of Martini (1971).

4) 207A-25, CC to 207A-26-3, 66 cm: early Eocene 3/5 (early Mangaorapan to late Waipawan) part of the *Chiasmolithus grandis* Zone of Edwards (1971) and, based on sequential position, the *Discoaster binodosus* (NP11) Zone of Martini (1970).

The above indicates that a complete, but rather condensed (relative to the overlying siliceous microfossil-rich sediments), open-water early Eocene 3/5 to 5/5 (late Waipawan to late Mangaorapan) sequence is present. Particularly notable in these floras is the presence of poorly preserved (overgrown) braarudosphaerid pentaliths and segments. These warm-water taxa have a well-known general restriction to sublittoral and hemipelagic sediments, although the reasons for this distribution are disputed. In this particular case, for reasons given in the report by

Edwards (Chapter 18), their occurrence is attributed to the presence of large shoal areas around the southernmost part of the New Caledonia Basin (cf. Fleming, 1962, figs. 4 and 6; Stevens and Suggate, in press, figs. 11.19 and 11.20) Perhaps significantly, the lowest sample in which this group was observed, (Sample 207A-25, CC), also contains very rare, badly corroded *Discolithina pulchra*–a "neritic" species. The following species were observed in 207A-25-2, 25 cm, the sample in which braarudosphaerids are present in their greatest numbers (common): *Braarudosphaera bigelowi, B. discula, Micrantholithus* cf. *flos*, and *M. inaequalis*. Also observed was a single, poorly preserved (overgrown) ascidian sclerite cluster (see report by Edwards, Chapter 18).

**Paleocene-Eocene Boundary (207A-26-3, 66 cm to 207A-26-4, 25 cm; Nannofossil Ooze)**

Taxa present in this interval, represented by four richly nannofossiliferous samples, indicate the repetitive occurrence of two distinctly different open-water assemblage types having different age implications (see below). The reason for this situation is not known, but could be due to slumping following a disconformity involving part or all of the late Paleocene 3/3 to early Eocene 2/5 interval.

In Samples 207A-26-3, 66 cm and 207A-26-4, 25 cm taxa present include *Chiasmolithus grandis, C. solitus, Coccolithus cavus, "C." pertusus, Discoaster diatypus, Discoasteroids kuepperi, Marthasterites tribrachiatus* (common), and *Zygrhabdithus bijugatus* (dominant, plus rarer *Chiasmolithus consuetus, Markalius astroporus, Spenolithus moriformis*, and *Zygolithus concinnus*. Single specimens, attributed to contamination or reworking, of the late Paleocene index species *Discoaster multiradiatus* were found in both samples. Apart from this, these assemblages conform to the early Eocene 3/5 (late Waipawan) part of the *Chiasmolithus grandis* Zone of Edwards (1971) and are probably correlative with the *Discoaster binodosus* (NP11) Zone of Martini (1971).

In Samples 207A-26-3, 71 cm and 207A-26-3, 125 cm taxa present include *Chiasmolithus bidens?, C.* sp. cf. *grandis, Coccolithus cavus, "C." pertusus, Discoaster diastypus, D. mediosus?, D. multiradiatus, Semihololithus kerabyi*, (lower sample only), *Toweius eminens*, and *Zygrhablithus bijugatus* (very abundant) plus rarer *Biantholithus sparsus, Chiasmolithus consuetus, Discoaster lenticularis, Ellipsolithus macellus, Fasciculithus tympaniformis, Hornibrookina* n.sp. (minute), *Markalius astroporus, Spenolithus moriformis*, and *Toweius tovae*. These assemblages appear to be correlative of the late Paleocene 2/3 (latest Teurian to earliest Waipawan) *Discoaster mediosus* Zone of Edwards and of the combined *Discoaster multiradiatus* (NP9) and *Marthasterites contortus* (NP10) zones of Martini (1971). A single specimen of the early Eocene index species *Marthasterites tribrachiatus* found in the lower sample is tentatively attributed to contamination. Much coccolith debris is present.

**Late Paleocene (207A-26-4, 100 cm to 207A-26, CC; Nannofossil Ooze)**

Taxa present in this interval, represented by two richly nannofossiliferous samples, include: *Chiasmolithus bidens, "Coccolithus" pertusus, Discoaster multiradiatus, Fasciculithus tympaniformis, Prinsius martinii martinii, Semihololithus kerabyi* (very abundant), and *Toweius eminens* plus rarer *Chiasmolithus consuetus, Coccolithus cavus, Discoaster lenticularis, Hornibrookina* n.sp. (minute), *Markalius astroporus, Prinsius bisulcus, Spenolithus moriformis, Thoracosphaera operculata*, and *Zygolithus concinnus*. These open-water assemblages conform to the late Paleocene 1/3 (late Teurian) *Discoaster multiradiatus* Zone of Edwards (1971) and appear to be correlatives of the combined *Discoaster multiradiatus* (NP9) and *Marthasterites contortus* (NP10) zones of Martini (1971).

**Mid Paleocene (207A-27-1, 126 cm to 207A-207, CC; Nannofossil Chalk)**

Taxa present in this interval, represented by four richly nannofossiliferous samples, include: *Chiasmolithus bidens, "Coccolithus" pertusus, Fasciculithus tympaniformis, Prinsius martinii*, and *Toweius tavae* plus rarer *Coccolithus cavus, Heliolithus kleinpelli, Markalius astroporus, Thoracosphaera operculata, Zygodiscus sigmoides, Zygolithus concinnus*, and *Z. junctus*. These diverse open-water assemblages conform to the mid Paleocene 2/3 (mid Teurian) *Heliolithus kleinpelli* zones of both Edwards (1971) and Martini (1971; NP6). The core-catcher sample contains clay-grade rounded isotropic clastic debris similar to that characteristic of the underlying intervals (q.v.).

**Early Paleocene (207A-28-1, 78 cm; Clay Chalk)**

This sample, which immediately overlies a prominent bedding plane (disconformity?), contains a small, low diversity flora which includes rare *Chiasmolithus danicus, Coccolithus cavus*, and *Prinsius martinii* plus occasional *Conococcolithus panis, Hornibrookina teuriensis* (an Austral realm element), *Thoracosphaera operculata* (fragments only), and *Zygodiscus sigmoides*. This assemblage conforms to the early Paleocene 4/5 (early Teurian) *Prinsius martinii* Zone of Edwards (1971) and is correlatable with the combined *Chiasmolithus danicus* (NP3) and *Ellipsolithus macellus* (NP4) zones of Martini (1971). No reworking from older strata is evident. The associated debris not demonstrably of biogenic origin includes a very abundant clay-grade rounded isotropic clastic material and abundant fine silt and clay-grade calcite. By analogy with similar Austral regime Paleocene nannoflora/sediment associations in nearby New Zealand, Site 207 was shallow sublittoral (*Sensu lato*) during the deposition of this sample. The nearest land may have been in the northern South Island area (Fleming, 1962, figs. 4 and 6), some hundreds of kilometers to the southeast.

**?Late Maastrichtian (207A-28-1, 79 cm to 207A-28, CC; Clay and Clay Chalk)**

Taxa present in this interval, represented by four samples, include: *Arkhangelskiella cymbiformis, Deflandrius spinosus, Kamptnerius magnificus*, and *Nephrolithus frequens* (a well-known Austral and Boreal element) plus rarer *Cretarhabdus surirella, Deflandrius cretaceus, Eiffelithus turriseiffeli, Glaukolithus amphipons, Markalius astroporus*, and *Microrhabdulus decoratus*. These assemblages conform to the Maastrichtian 3/3 (late Haumurian) part of the *Nephrolithus frequens* zones of both Edwards (1971) and Cepek and Hay (1969). They are more diverse than the equivalent Austral realm assemblages of nearby New Zealand and probably reflect more open-water conditions.

However, all four samples contain unusually high proportions of coccolith "shard" fragments. Since the associated clastic debris is of clay grade and thus likely to have been deposited under low energy conditions, it seems probable that these assemblages represent the redeposited "fines" resulting from the winnowing of an older deposit. Further support for such an origin is provided by the distribution of the calcareous nannofossils in this interval–they are abundant in the lower part (207A-28, CC and 207A-28-1, 137 cm) but very much rarer in the upper part (Samples 207A-28-1, 85 cm and 207A-28-1, 79 cm). Since the relative topographic position, but not necessarily the depth, of this site is unlikely to have changed since the deposition of this interval, the hypothetical source of the nannofossils need not have been shallower. If this theory is correct, the age of this interval is, on sequential grounds, within the late Maastrichtian (Late Haumurian) to early Paleocene 4/5 (early Teurian). No nannofossils characteristic of the inferred age of this interval were found apart from single, very robust, specimens of the early Paleocene (including Danian) species *Conococcolithus panis* in the lower two samples. The higher of these samples also contains obvious, but very minor, contamination, such as: *Cyclicargolithus* sp., *Discoaster* sp. (6 armed), *Fasciculithus tympaniformis* (Mid Paleocene), *Reticulofenestra* sp?. and *Spenolithus moriformis,* from uphole Cenozoic.

**Unfossiliferous Interval**
**(Cores 29A to 33A; Silty Claystone)**

This interval, which is noncalcareous, was sampled at 207A-29-1, 80 cm, 207A-29, CC, and 207A-33, CC, but did not yield nannofossils apart from very occasional specimens of Paleogene taxa such as *Reticulofenestra* sp.?, *R. dictyoda, R. placomorpha,* and *Zygrhablithus bijugatus.* Clearly these specimens, which are abundant uphole, represent contamination–a conclusion consistent with the presence in this interval of Maastrichtian foraminifera (Dr. P.N. Webb, New Zealand Geological Survey, Lower Hutt, personal communication, samples from 207A-30-1 and 207A-31-2). In this and the overlying intervals (q.v.), the major clastic component present is rounded isotropic material of clay and fine silt grade.

### Radiolaria

The radiolarians are practically absent in the five cores recovered in the first hole of Site 207. Isolated corroded individuals of *Lamprocyclas maritalis, Lithomelissa* sp., *Druppatractus* sp., *Spongodiscus* sp., and a few other species have, however, been recognized in 207-1, CC and 207-2, CC.

A rich radiolarian fauna was encountered only in Cores 207A-11, CC through 207A-21-5 (late middle Eocene to early middle Eocene). Below this level in 207A-21, CC and 207A-22, CC they become very rare and poorly preserved. Rare and poorly preserved Upper Cretaceous radiolarians (*Amphipyndax* sp. and *Dictyomitra andersoni*) were found in 207A-28, CC.

In spite of their abundance in the middle Eocene assemblages, no short-ranged species known for the tropical Pacific were found to make possible a zonation of this rather long sequence. Several events observed by the investigation of the core-catcher samples might be useful for such a purpose.

The following species are among the most common throughout most of the sequence: *Lychnocanium* aff. *bellum, Velicucullus magnificus, Petalospyris eupetala, Lophocyrtis biaurita.* Other species such as *Eusyringium lagena, Phormocyrtis striata, Amphicraspedum prolixum, Dictyomitra* sp., *Anthocyrtoma* sp., and *Thyrsocyrtis* sp. have been recorded only at some levels. They might be taken into consideration for a future zonation of the middle Eocene middle latitude radiolarians.

## PHYSICAL PROPERTIES

### Bulk Density

Fore Cores 2 through 27, values of bulk density were calculated from the GRAPE curves. Below Core 27 (300 m) the cores consisted of individual rock fragments. In this situation the GRAPE technique gives unreliable values, and densities were determined by weighing rock samples of known volume. Because of the motion of the ship and the limited equipment available, these determinations are probably not better than ±5%. The density values are plotted against subbottom depth in the hole summary illustration.

The sequence cored can be divided, on the basis of density, into four parts, roughly corresponding to major lithologic changes:

1) In the top 50 meters of the sequence the density is low, about 1.6 gm/cc. This represents the essentially unconsolidated part of the sequence.

2) Below 50 meters compaction increases, and the density rises into the range 1.59 to 1.77 gm/cc, although it is quite variable due to disturbance of the sediments by drilling. Density continues in this range down through Core 20A (230 m).

3) From Core 20A to Core 23A the density rises as the sediments become increasingly lithified and cherty to reach a maximum of about 2.09 gm/cc in Core 23A (255 m). Individual chert fragments have densities as high as 2.24 gm/cc. The pronounced change in lithology between Cores 28A and 29A corresponds to a drop in density.

4) In Core 34A the density rises abruptly again accompanied by a similar change in sonic velocity. This corresponds to the top of the rhyolites. From Core 34A to the bottom of the hole (357 to 500 m) the sequence sampled consisted of glassy rhyolites having a mean density about 2.10 gm/cc. The upper part of the rhyolite section (Cores 34A to 36A), with densities ranging from 2.25 to 2.84 gm/cc, is markedly denser than the lower part of the sequence.

### Sonic Velocity

Sonic velocity measurements were made on one or two samples from each core. These values are also plotted in the hole summary. The essentially uniform lithology of the upper 250 meters of the sequence cored is reflected in the velocity measurements which give virtually uniform values in the range 1.58 to 1.66 km/sec, although this does rise slightly through the last 50 meters and reaches a value of 1.91 km/sec in Core 25A (275 m). Velocities from Core 25A through Core 33A remain in the range 1.74 to 2.16 km/sec, although the velocity of individual chert fragments is as high as 4.59 km/sec. Velocities in the volcanic sequence are very variable since the rhyolites are quite strongly altered in parts. The mean value is about 3.35 km/sec, but individual values range from 1.94 to 5.32 km/sec. The upper part of the rhyolitic sequence (Cores 34A to 36A) has generally higher velocities (4.45-5.32 km/sec), reflecting the increased density of these cores.

**Thermal Conductivity and Heat Flow**

Thermal conductivity values on sediment cores recovered from this site range between 2.8 and 3.7 m cal/°C cm sec (TCU), uncorrected for ambient pressure and temperature conditions at the sea floor. The values show an overall increase with depth down to about 290 meters beneath the sea floor, below which the sediment cores are too indurated for the standard needle probe technique. The increase in thermal conductivity with depth corresponds to a similar increase in density, although individual values do not generally show such a correspondence. Probably the variability in both parameters within each core is sufficiently large to obscure any detailed correlation. The relatively high values of thermal conductivity, in comparison with other sites of this leg, is probably the result of higher calcium carbonate content of the sediments compared with other sites.

Due to various operational difficulties, no reliable in situ sediment temperatures were measured downhole at this site. A measurement at 110 meters (Core 8A) gave 7.4 ±0.2°C, but it seems likely that this was the temperature inside the core barrel before coring, rather than that of the sediment.

## SUMMARY AND CONCLUSIONS

Drilling at Site 207 was planned as one of the two holes to investigate the nature and history of the Lord Howe Rise, as well as providing part of the biostratigraphic tie between New Zealand temperate faunas and floras and those of tropical and subtropical latitudes. The site is located on the southern Lord Howe Rise northwest of the Bellona Gap. The lithostratigraphic section provides some indications of the development of the rise.

At the base of the cored sequence are the Upper Cretaceous rhyolites (flows, breccias, and pumiceous lapilli tuffs) of Units 4 and 5. A marked basement high (Figure 4) shown by the site survey may represent the eruptive center.

The overlying silty claystone, also of Upper Cretaceous age (Unit 3), was probably deposited in a shallow marine environment with restricted (nonoceanic) circulation. This interpretation is based on a rarity of planktonic fossils and the fine-grained nature of the sediments. The latter suggests that the source area must have been either of rather low relief or at some distance. Alternatively, the environment of deposition was close to land, but restricted sufficiently to limit the grain size of the sediments. At the base of Unit 3 there is a larger sand-sized fraction in the form of material derived from the underlying rhyolite as well as from a granitic or metamorphic source.

Oceanic conditions began, as seen at the base of Unit 2, in middle Paleocene. Although the clay-sized terrigenous component is still relatively high in the lower portion of Unit 2, Units 1 and 2 are both clearly oceanic in nature. These two units are basically composed of carbonate oozes of Paleocene to Recent age which were deposited well above carbonate compensation depth. Unit 2 contains frequent to abundant siliceous microfossils in its upper part. The regional unconformity at this site is between Units 1 and 2 and separates late middle Eocene from early middle Miocene sediments. No reworked Oligocene microfossils have been found in the early middle Miocene beds. However, early late Eocene microfossils occur above the early middle Miocene fauna, introduced apparently by slumping. This site and Site 208 exhibit the largest time span in the unconformity. A second unconformity is present between Paleocene and Eocene sediments deeper in the section and represents the smallest time loss for this unconformity (latest Paleocene and earliest Eocene) which also occurs at Sites 206 and 208.

Benthonic foraminifera indicate rapid increase in depth of sedimentation from the relatively shallow depths in the Maastrichtian to depths approximately equivalent to those of the present day (1400 m) during the early Eocene.

A general reconstruction of the site history fits well in the regional picture. The rhyolites were erupted at or near sea level 94 m.y. B.P. K/Ar Date (McDougall, personal communication; see, also, Chapter 15, this volume). This is just prior to the earliest development of oceanic crust in the Tasman Sea at 80 m.y. B.P. (Hays and Ringis, 1972), and the activity may be related to early separation of the Lord Howe Rise from Australia. The silty claystone was laid down in the ensuing shallow restricted sea, with at least some of the material being derived from the rise. Oceanic conditions entered the area in latest Cretaceous time, and the rise underwent a slow subsidence from near sea level to the present upper bathyal depth by early Eocene. Relatively stable conditions have persisted since that time.

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## NOTE CONCERNING THE APPENDICES

The appendices consist of tables of shore laboratory determinations of grain size, carbon content, and mineralogical composition, summary visual descriptions of the cores recovered from the site, photographs of the cores and, finally, an overall summary of the results of drilling at the site. The symbols used to represent lithology in the core summary forms are explained in Chapter 2 of this volume. The lithologic description of each core contains typical results of shipboard examination of smear slides of each lithology. In order to make the lithologic descriptions more complete we have also included many of the shore laboratory results. These are identified by being placed in square brackets.

**APPENDIX A**
**Grain Size Determinations, Holes 207 and 207A**

| Core, Section, Top of Interval (cm) | Depth (cm) | Sand (%) | Silt (%) | Clay (%) | Classification |
|---|---|---|---|---|---|
| **Hole 207** | | | | | |
| 1-4,84.0 | 5.3 | 37.0 | 20.5 | 42.5 | Sand-silt-clay |
| 2-3,80.0 | 9.8 | 13.0 | 20.6 | 66.5 | Silty clay |
| 3-4,40.0 | 19.9 | 34.7 | 24.4 | 40.9 | Sand-silt-clay |
| 4-2,30.0 | 30.8 | 23.2 | 26.3 | 50.5 | Sand-silt-clay |
| 5-5,30.0 | 44.3 | 24.0 | 26.8 | 49.2 | Sand-silt-clay |
| **Hole 207A** | | | | | |
| 1-4,20.0 | 51.7 | 11.5 | 28.1 | 60.3 | Silty clay |
| 3-3,40.0 | 68.4 | 17.5 | 24.6 | 57.9 | Silty clay |
| 4-4,60.0 | 79.1 | 42.0 | 21.8 | 36.2 | Sand-silt-clay |
| 5-2,60.0 | 85.1 | 23.7 | 29.1 | 47.2 | Sand-silt-clay |
| 6-5,30.0 | 98.3 | 25.3 | 33.2 | 41.5 | Sand-silt-clay |
| 7-6,75.0 | 109.3 | 29.3 | 39.8 | 31.0 | Sand-silt-clay |
| 8-6,140.0 | 118.9 | 27.1 | 42.2 | 30.6 | Sand-silt-clay |
| 9-4,80.0 | 124.3 | 29.6 | 43.2 | 27.2 | Sand-silt-clay |
| 10-3,60.0 | 136.6 | 32.7 | 37.4 | 29.8 | Sand-silt-clay |
| 11-4,60.0 | 147.1 | 18.4 | 45.1 | 36.5 | Clayey silt |

**APPENDIX A** – *Continued*

| Core, Section, Top of Interval (cm) | Depth (cm) | Sand (%) | Silt (%) | | Classification |
|---|---|---|---|---|---|
| **Hole 207A** – *Continued* | | | | | |
| 13-6,60.0 | 168.1 | 4.9 | 45.4 | 49.6 | Silty clay |
| 14-2,30.0 | 170.8 | 4.1 | 49.6 | 46.3 | Clayey silt |
| 15-2,60.0 | 180.1 | 1.4 | 38.0 | 60.6 | Silty clay |
| 16-2,90.0 | 189.4 | 2.6 | 52.2 | 45.2 | Clayey silt |
| 17-2,70.0 | 198.2 | 5.5 | 40.1 | 54.3 | Silty clay |
| 18-3,35.0 | 208.4 | 4.4 | 46.4 | 49.2 | Silty clay |
| 20-3,48.0 | 226.5 | 4.4 | 51.2 | 44.4 | Clayey silt |
| 21-3,60.0 | 240.6 | 2.7 | 46.6 | 50.7 | Silty clay |
| 25-4,50.0 | 278.0 | 5.4 | 59.6 | 35.0 | Clayey silt |
| 26-3,96.0 | 286.0 | 5.9 | 46.1 | 47.9 | Silty clay |

**APPENDIX B**
**Carbon-Carbonate Determinations, Holes 207 and 207A**

| Core, Section, Top of Interval (cm) | Depth in Hole (m) | Carbon Total (%) | Organic Carbon (%) | $CaCO_3$ (%) |
|---|---|---|---|---|
| **Hole 207** | | | | |
| 1-2,80.0 | 2.3 | 11.5 | 0.0 | 95 |
| 2-3,123.0 | 10.2 | 10.2 | 0.0 | 84 |
| 3-4,50.0 | 20.0 | 11.1 | 0.1 | 92 |
| 4-2,40.0 | 30.9 | 11.3 | 0.1 | 93 |
| 5-5,40.0 | 44.4 | 11.2 | 0.1 | 93 |
| **Hole 207A** | | | | |
| 1-4,30.0 | 51.8 | 11.4 | 0.1 | 94 |
| 3-3,60.0 | 68.6 | 11.5 | 0.1 | 95 |
| 4-4,70.0 | 79.2 | 11.6 | 0.1 | 96 |
| 5-2,70.0 | 85.2 | 11.6 | 0.1 | 96 |
| 6-5,40.0 | 98.4 | 11.6 | 0.0 | 96 |
| 7-6,80.0 | 109.3 | 10.7 | 0.0 | 89 |
| 8-6,145.0 | 118.9 | 11.4 | 0.0 | 94 |
| 9-4,90.0 | 124.4 | 11.3 | 0.0 | 94 |
| 10-3,70.0 | 136.7 | 11.5 | 0.0 | 95 |
| 11-4,65.0 | 147.1 | 11.3 | 0.0 | 94 |
| 13-6,70.0 | 168.2 | 10.9 | 0.0 | 90 |
| 14-2,40.0 | 170.9 | 10.9 | 0.0 | 90 |
| 15-2,70.0 | 180.2 | 11.1 | 0.0 | 92 |
| 16-2,75.0 | 189.3 | 11.2 | 0.0 | 93 |
| 17-2,80.0 | 198.3 | 11.0 | 0.0 | 92 |
| 18-3,43.0 | 208.4 | 10.9 | 0.0 | 91 |
| 20-3,60.0 | 226.6 | 10.8 | 0.0 | 89 |
| 21-3,70.0 | 240.7 | 11.0 | 0.0 | 92 |
| 25-4,54.0 | 278.0 | 10.6 | 0.0 | 88 |
| 26-3,96.0 | 286.0 | 9.2 | 0.1 | 76 |
| 27-2,18.0 | 292.7 | 10.5 | 0.1 | 87 |
| 28-1,135.0 | 301.4 | 5.4 | 0.5 | 41 |
| 31-2,30.0 | 331.8 | 1.2 | 1.2 | 0 |
| 33-2,2.0 | 349.5 | 1.4 | 1.4 | 0 |

## APPENDIX C
### X-ray Mineralogy Determination, Site 207

| Core | Cored Interval Below Sea Floor (m) | Sample Depth Below Sea Floor (m) | Diff. | Amor. | Calc. | Quar. | Plag. | Kaol. | Mica. | Chlo. | Mont. | Cris. | K-Fe. | Trid. | Clin. | Pyri. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hole 207 Bulk Samples** | | | | | | | | | | | | | | | | |
| 3 | 15-24 | 19.5 | 53.5 | 27.4 | 98.9 | 1.1 | – | – | – | – | – | – | – | – | – | – |
| **Hole 207 $<2\mu$ Fraction** | | | | | | | | | | | | | | | | |
| 3 | 15-24 | 19.5 | 89.5 | 83.5 | – | 24.7 | 11.7 | 9.8 | 37.1 | 6.0 | 10.7 | – | – | – | – | – |
| **Hole 207A Bulk Samples** | | | | | | | | | | | | | | | | |
| 33 | 348-357 | 349.5 | 86.4 | 78.8 | – | 8.4 | 3.8 | – | 1.6 | – | 3.7 | 69.2 | 1.5 | 8.5 | 1.4 | 1.8 |
| | | 351.1 | 87.2 | 80.1 | – | 5.9 | 2.3 | – | 0.9 | – | 3.0 | 69.2 | 1.4 | 14.4 | 0.9 | 1.9 |
| 42 | 432-441 | 434.5 | 73.0 | 57.9 | – | 0.6 | 4.6 | – | – | – | 89.3 | 5.5 | – | – | – | – |
| 46 | 468-477 | 471.7 | 82.9 | 73.2 | – | 8.1 | 20.3 | – | – | – | 32.9 | 38.7 | – | – | – | – |
| **Hole 207A 2-20$\mu$ Fractions** | | | | | | | | | | | | | | | | |
| 33 | 348-357 | 349.5 | 81.1 | 70.5 | – | 14.9 | 6.8 | – | 3.0 | – | – | 60.5 | 2.8 | 7.4 | 2.3 | 2.3 |
| | | 351.1 | 81.2 | 70.6 | – | 21.6 | 10.6 | – | 2.1 | – | – | 42.6 | 5.1 | 6.5 | 6.0 | 5.5 |
| 42 | 432-441 | 434.5 | 80.2 | 69.1 | – | 1.2 | 21.8 | – | – | – | 51.3 | 23.9 | – | 1.9 | – | – |
| 46 | 468-477 | 471.7 | 88.2 | 81.6 | – | 3.1 | 10.3 | – | – | – | 46.4 | 38.3 | – | 1.3 | 0.6 | – |
| **Hole 207A $<2\mu$ Fraction** | | | | | | | | | | | | | | | | |
| 33 | 348-357 | 349.5 | 87.9 | 81.1 | – | 0.7 | 0.7 | – | – | – | 10.0 | 79.0 | – | 7.6 | – | 1.9 |
| | | 351.1 | 88.9 | 82.6 | – | 0.9 | 0.7 | – | – | – | 5.0 | 79.1 | 1.0 | 11.3 | 0.5 | 1.5 |
| 42 | 432-441 | 434.5 | 74.8 | 60.7 | – | – | – | – | – | – | 93.6 | 6.4 | – | – | – | – |
| 46 | 468-477 | 471.7 | 69.3 | 52.1 | – | – | – | – | – | – | 95.8 | 4.2 | – | – | – | – |

**APPENDIX D**
**Thermal Conductivity Measurements, Holes 207 and 207A**

| Core, Section, Interval Below Top (cm) | Thermal Conductivity (mcal/°C cm sec) | Standard Deviation | Ambient Core Tempera-ture (°C) | Remarks |
|---|---|---|---|---|
| 2-4,100 | 0.002772 | 0.009022 | 18.92 | |
| 3-3,85 | 0.002881 | 0.009589 | 19.11 | |
| 4-3,45 | 0.002960 | 0.006095 | 20.82 | |
| 5-4,42 | 0.002959 | 0.006806 | 20.71 | |
| 1A-5,115 | 0.002946 | 0.006011 | 20.01 | |
| 2A-1,115 | 0.002946 | 0.009757 | 19.70 | |
| 4A-3,84 | 0.003002 | 0.005387 | 18.07 | |
| 5A-3,84 | 0.003093 | 0.007216 | 19.70 | |
| 6A-3,77 | 0.003242 | 0.006424 | 19.46 | |
| 7A-3,91 | 0.002982 | 0.006394 | 20.57 | |
| 8A-3,81 | 0.003076 | 0.010349 | 20.30 | |
| 9A-3,75 | 0.002983 | 0.005508 | 18.58 | |
| 10A-3,85 | 0.003438 | 0.006814 | 21.45 | |
| 11A-4,84 | 0.003159 | 0.005523 | 21.29 | |
| 13A-5,90 | 0.003149 | 0.008342 | 18.92 | Stiff sed at 84 cm |
| 14A-2,79 | 0.002930 | 0.004147 | 18.54 | |
| 15A-3,80 | 0.003221 | 0.006062 | 17.86 | |
| 16A-3,56 | 0.002959 | 0.010481 | 20.69 | |
| 17A-3,56 | 0.003209 | 0.009900 | 20.30 | |
| 24A-3,58 | 0.003646 | 0.007383 | 21.98 | |
| 25A-3,58 | 0.003561 | 0.008681 | 22.07 | |
| 26A-3,58 | 0.003605 | 0.008674 | 22.54 | |

Site 207 Hole Core 1 Cored Interval: 0-6 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MID TO LATE PLEISTOCENE | NN21 | N | A | G | 1 | 0.5, 1.0 | EMPTY | 3 | | 5Y8/1 NANNO FORAM OOZE Yellowish gray to greenish gray; creamy. 5GY6/1 patches of: N8. Smear Slide at Section 1, 75 cm: 55% forams, 42% nannos, 2% glass, 1% zeolites |
| | NN20 | N | A | G | 2 | | EMPTY | 3 | CC | N8 irregular layers of: 5Y6/1. [95% $CaCO_3$] N9 FORAM NANNO OOZE Light olive gray to white; creamy. 5Y6/1 |
| | | N | A | G | 3 | | | 4 | | Smear Slide at Section 3, 70 cm: 59% nannos, 40% forams, 1% zeolites. 5Y6/1→ →5GY6/1 |
| | NN19 | N | A | G | 4 | | | 4 | GZ | 5B9/1→ →5GY6/1 [37% sand, 21% silt, 43% clay] |
| | | F N R | A A + | G G M | Core Catcher | | | | | FORAM RICH NANNO OOZE 75% nannos, 25% forams |

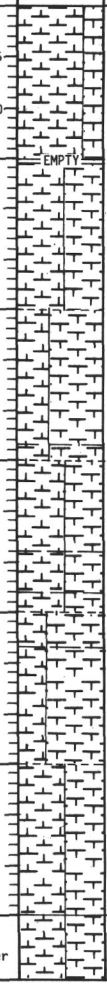
Site 207 Hole Core 2 Cored Interval: 6-15 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| PLEISTOCENE | NN19 | N | A | M | 1 | 0.5, 1.0 | EMPTY | 4 | | N8 patches of: 5GY6/1→ N8 FORAM NANNO OOZE Very light gray with greenish gray to very light gray patches; creamy. Smear Slide at Section 1, 110 cm: 53% nannos, 45% forams, 1% glass, 1% zeolites |
| | | N | A | M | 2 | | EMPTY | 4 | | 5GY6/1 patches of: N8 FORAM RICH NANNO OOZE Greenish gray with patches of very light gray; creamy. Smear Slide at Section 2, 70 cm: 78% nannos, 20% forams, 1% glass, 1% mica |
| | | N | A | M | 3 | | EMPTY | 4 | GZ, CC | N8. N8 GLASS BEARING FORAM NANNO OOZE Very light gray; creamy. Smear Slide at Section 3, 80 cm: 56% nannos, 40% forams, 3% glass, 1% sponge spicules. →grading into: 5GY6/1 [13% sand, 21% silt, 67% clay] [84% $CaCO_3$] |
| | | N | A | M | 4 | | | 4 | | FORAM NANNO OOZE Very light gray with greenish gray streaks; soupy. N8 streaks of: 5GY6/1. Smear Slide at Section 4, 85 cm: 59% nannos, 40% forams, 1% glass |
| | | N | A | M | 5 | | | 4 | | NANNO FORAM OOZE Very light gray; soupy to creamy. Smear Slide at Section 5, 81 cm: 50% forams, 48% nannos, 2% glass. patches of 5GY6/1 |
| | | F N R | A A + | G M M | Core Catcher | | | | | FORAM RICH NANNO OOZE 78% nannos, 20% forams, 1% glass, 1% zeolites |

Site 207 Hole Core 3 Cored Interval: 15-24 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|
| EARLY PLEISTOCENE | NN19 | N | A | M | 1 | 0.5, 1.0 | 4 | |
| | | N | A | M | 2 | | 4 | |
| | | N | A | M | 3 | | 4 | XM |
| | | N | A | M | 4 | | 4 | GZ CC |
| | | N | A | M | 5 | | 4 | |
| | | N | A | M | 6 | | | |
| | | F N R | A A - | G M - | Core Catcher | | | |

LITHOLOGY




LITHOLOGIC DESCRIPTION

5B9/1 with streaks of: N5

FORAM RICH NANNO OOZE
Bluish white with some medium gray streaks. Soupy to creamy.

Smear Slide at Section 1, 80 cm:
78% nannos
20% forams
1% glass
1% zeolites

FORAM NANNO OOZE
Bluish white with medium gray patches. Soupy to creamy.

Smear Slide at Section 2, 75 cm:
54% nannos
45% forams
1% glass

N8 with streaks of: 5Y8/1

NANNO FORAM OOZE
Very light gray with streaks of yellow gray; creamy.

Smear Slide at Section 3, 70 cm:
55% forams
43% nannos
1% quartz
1% feldspar

5Y6/1

[X-ray - 27% amorphous, 73% crystalline: 99% calc., 1% qtz.]

5B9/1 with patches of: 5GY6/1

[35% sand, 24% silt, 41% clay]

[92% $CaCO_3$]

5GY6/1

FORAM NANNO OOZE
Bluish white with greenish gray patches; creamy.

Smear Slide at Section 4, 50 cm:
59% nannos
40% forams
1% zeolites

5B9/1

5GY6/1

N8 with streaks of: 5GY6/1 and N6

NANNO FORAM OOZE
Greenish gray and very light gray (with medium gray streaks). Creamy.

Smear Slide at Section 5, 75 cm:
55% forams
43% nannos
1% glass
1% quartz

FORAM NANNO OOZE
Creamy texture.

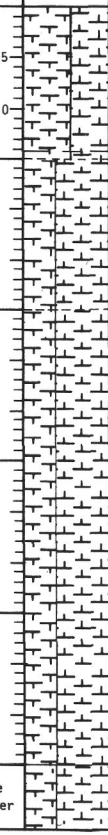
Smear Slide at Section 6, 40 cm:
54% nannos
45% forams
1% glass

FORAM NANNO OOZE
68% nannos
1% glass
30% forams
1% feldspar

Site 207 Hole Core 4 Cored Interval: 29-38 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|
| PLEISTOCENE | NN19 | N | A | M | 1 | 0.5, 1.0 | | |
| LATE PLIOCENE | NN18 | N | A | M | 2 | | 4 | GZ CC |
| | | N | A | M | 3 | | 4 | |
| | NN17 | N | A | M | 4 | | 4 | |
| | | N | A | M | 5 | | 4 | |
| | NN16 | F N R | A A - | G M - | Core Catcher | | | |

LITHOLOGY



LITHOLOGIC DESCRIPTION

5B9/1 to 5GY6/1 with patches of pure: 5GY6/1

NANNO FORAM OOZE
Bluish white to greenish gray with patches of greenish gray. Creamy.

Smear Slide at Section 1, 75 cm:
54% forams
45% nannos
1% glass

5B9/1

[23% sand, 26% silt, 51% clay]

[93% $CaCO_3$]

N8 with streaks of: 5Y6/1

FORAM NANNO OOZE
(to base of 5). Very light gray with streaks of yellowish gray. Creamy texture.

Smear Slide at Section 4, 75 cm:
53% nannos
45% forams
1% pyroxene

N8 to N9 with patches and streaks of N5 and 5Y6/1

FORAM NANNO OOZE
69% nannos
30% forams
1% glass

Site 207 Hole Core 5 Cored Interval: 38-47 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE PLIOCENE | NN16 | N | A | M | 1 | 0.5 / 1.0 | | 4 | | N8 — FORAM NANNO OOZE. Very light gray. Creamy, homogeneous. Smear Slide at Section 4, 75 cm: 50% nannos, 46% forams, 2% glass, 1% feldspar, 1% pyroxene? |
| | | N | A | M | 2 | | | | | |
| | | N | A | M | 3 | | | | | |
| | | N | A | M | 4 | | | 4 | | 5B9/1 to N8 — FORAM NANNO OOZE. Bluish white to very light gray. [24% sand, 27% silt, 49% clay] [93% $CaCO_3$] |
| | | N | A | M | 5 | | | 4 | GZ CC | N8 with swirls of: 5GY6/1 and N5 — NANNO FORAM OOZE. Very light gray with swirls of greenish gray and medium gray. |
| | | N | A | M | 6 | | EMPTY | 4 | | 5B9/1 with swirls of: N5 — NANNO FORAM OOZE. Bluish gray with rare swirls of medium gray. Creamy texture. |
| | NN15 | F N R | A A - | G M - | Core Catcher | | | | | FORAM RICH NANNO OOZE — 83% nannos, 15% forams, 1% glass |

Site 207 Hole A Core 1 Cored Interval: 47-56 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE PLIOCENE | NN14-NN15 | N | A | M | 1 | 0.5 / 1.0 | EMPTY | 4 | | N8 with streaks and patches of: N5, 5Y8/1, N4 lower down some N3 patches and streaks — FORAM NANNO OOZE. Very light gray with streaks of other colors. Creamy texture. Smear Slide at Section 1, 100 cm: 50% nannos, 48% forams, 2% glass |
| | | N | A | M | 2 | | | 4 | | |
| | ≈NN13 | N | A | M | 3 | | | 4 | | NANNO FORAM OOZE. Creamy texture. Smear Slide at Section 3, 75 cm: 54% forams, 45% nannos, 1% glass |
| | | N | A | M | 4 | | | 4 | GZ CC | [11% sand, 28% silt, 60% clay] [94% $CaCO_3$] FORAM NANNO OOZE. Creamy texture. Smear Slide at Section 5, 75 cm: 55% nannos, 45% forams |
| | | N | A | M | 5 | | | 4 | | |
| | ≈NN11-NN12 | N | A | M | 6 | | | 4 | | |
| | | F N R | A A - | G M - | Core Catcher | | | | | FORAM RICH NANNO OOZE — 73% nannos, 25% forams, 1% glass, 1% zeolites |

Site 207 Hole A Core 2 Cored Interval: 56-65 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | FOSSIL CHARACTER: ABUND. | FOSSIL CHARACTER: PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE PLIOCENE | ≈NN11-NN12 | N | A | P | 1 | 0.5<br>1.0 | EMPTY | 4 | | N9 with swirls of: 5Y8/1 some streaks of: N3<br><br>NANNO FORAM OOZE<br>White, with swirls of yellowish gray and rare dark gray streaks. Creamy texture.<br><br>Smear Slide at Section 1, 100 cm:<br>54% forams<br>45% nannos<br>1% zeolites |
| | | F N R | A A - | G P - | Core Catcher | | | | | FORAM RICH NANNO OOZE<br>59% nannos<br>40% forams<br>1% glass |

Site 207 Hole A Core 3 Cored Interval: 65-74 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | FOSSIL CHARACTER: ABUND. | FOSSIL CHARACTER: PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| EARLY PLIOCENE (OPOITIAN STAGE) | ≈NN11-NN12 | N | A | P | 1 | 0.5<br>1.0 | | 4 | | N8 with streaks and irregular patches of: 5Y8/1, N4, N5 |
| | | | | | 2 | | | 4 | | NANNO FORAM OOZE<br>Very light gray with streaks of yellowish gray and medium dark gray and medium gray. Creamy texture.<br><br>Smear Slide at Section 2, 80 cm:<br>60% forams<br>39% nannos<br>1% glass |
| | | | | | 3 | | | 4 | GZ<br>CC | [18% sand, 25% silt, 58% clay]<br>[95% $CaCO_3$] |
| | | N | A | P | 4 | | | 4 | | |
| | | | | | 5 | | | 4 | | |
| | | | | | 6 | | | 4 | | |
| | | F N R | A A - | G P - | Core Catcher | | | | | NANNO FORAM OOZE<br>55% forams<br>45% nannos |

Site 207 Hole A Core 4 Cored Interval: 74-83 m

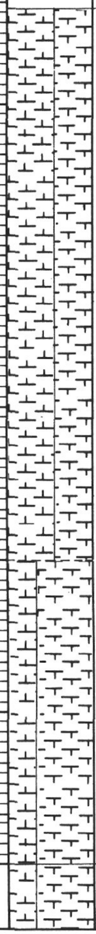
| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| EARLY PLIOCENE (OPOITIAN STAGE) | ≈NN11-NN12 | N | A | P | 1 | 0.5, 1.0 | | 4 | | N8 with irregular streaks and patches of: 5Y8/1, N5 and N3 |
| | | F | A | G | 2 | | | 4 | | FORAM NANNO OOZE Very light gray. Streaks and patches of yellowish gray, medium gray and dark gray. Soupy to creamy texture. Smear Slide at Section 2, 80 cm: 55% nannos 43% forams 1% zeolites 1% fish debris |
| LATE MIOCENE (KAPITEAN STAGE) | | N | A | P | 3 | | | 4 | | |
| | | F | A | G | | | | | | |
| | | | | | 4 | | | 4 | GZ CC | [42% sand, 22% silt, 36% clay] [96% $CaCO_3$] |
| | | | | | 5 | | | 4 | | |
| | | F N R | A A - | G P - | Core Catcher | | | | | NANNO FORAM OOZE 54% forams 45% nannos 1% glass |

Site 207 Hole A Core 5 Cored Interval: 82-92 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| LATE MIOCENE (KAPITEAN STAGE) | ≈NN11-NN12 | N | A | P | 1 | 0.5, 1.0 | | | | N8 with irregular streaks and patches of: 5Y8/1 and N5 |
| | | | | | 2 | | | | GZ CC | FORAM NANNO OOZE Very light gray with streaks and patches of yellowish gray and medium gray. Creamy texture. [24% sand, 29% silt, 47% clay] [96% $CaCO_3$] Smear Slide at Section 3, 80 cm: 60% nannos 40% forams |
| | | F | A | G | 3 | | | | | |
| (TONGAPORUTUAN STAGE) | | N | A | P | 4 | | | | | |
| | | N | A | P | 5 | | | | | |
| | | N | A | P | 6 | | | | | N9 and N8 irregular streaks of: N4 |
| | | F N R | A A - | G P - | Core Catcher | | | | | FORAM NANNO OOZE 55% nannos 45% forams |

Site 207 Hole A Core 6 Cored Interval: 92-101 m

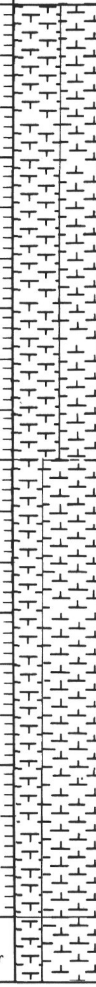
| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| LATE MIOCENE (TONGAPORUTUAN STAGE) | ≈NN10-NN11 | N | A | P | 1 | 0.5 1.0 | EMPTY | 4 | | N9 with irregular streaks of: N3<br>FORAM NANNO OOZE<br>White with streaks of dark gray. Creamy texture. |
| | | | | | 2 | | | 4 | | Smear Slide at Section 2, 75 cm:<br>59% nannos<br>40% forams<br>1% glass |
| | | | | | 3 | | | 4 | | |
| | | N | A | P | 4 | | | 4 | | |
| | ≈NN10 | N | A | P | 5 | | | 4 | GZ CC | [25% sand, 33% silt, 42% clay]<br>[96% $CaCO_3$]<br>NANNO FORAM OOZE<br>Creamy.<br>Smear Slide at Section 5, 75 cm:<br>55% forams<br>44% nannos<br>1% quartz? |
| | | | | | 6 | | | 4 | | |
| | | F N R | A A - | G P - | Core Catcher | | | | | NANNO FORAM OOZE 55% forams 45% nannos |



Explanatory notes in Chapter 1

Site 207 Hole A Core 7 Cored Interval: 101-110 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| LATE MIOCENE (TONGAPORUTUAN STAGE) | ≈NN10 | N | A | P | 1 | 0.5 1.0 | | 4 | | N9 with some irregular streaks of N5 and N3 in Sections 5 and 6<br>NANNO FORAM OOZE<br>White, *homogeneous*. *Soupy texture*. |
| | | | | | 2 | | | 4 | | Smear Slide at Section 2, 75 cm:<br>60% forams<br>39% nannos<br>1% quartz? |
| | | | | | 3 | | | 4 | | |
| | N9 | N | A | M | 4 | | | 4 | | FORAM NANNO OOZE<br>White, with streaks of medium gray and dark gray. Soupy to creamy texture.<br>Smear Slide at Section 4, 75 cm:<br>55% nannos<br>45% forams |
| | | | | | 5 | | | 4 | | |
| | | | | | 6 | | | 4 | GZ CC | [29% sand, 40% silt, 31% clay]<br>[89% $CaCO_3$] |
| | | F N R | A A - | G M - | Core Catcher | | | | | FORAM NANNO OOZE 54% nannos 45% forams 1% glass |



Explanatory notes in Chapter 1

Site 207 Hole A Core 8 Cored Interval: 110-119 m

AGE: LATE MIOCENE (WAIAUAN OR EARLY TONGAPORUTUAN STAGE)

| ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| NN9 | N | A | M | 1 | 0.5, 1.0 | 4 | | N9 |
| | | | | 2 | | 4 | | FORAM NANNO OOZE<br>White. Soupy texture.<br>Smear Slide at Section 4, 75 cm:<br>60% nannos<br>40% forams |
| ≈NN8-NN9 | | | | 3 | | 4 | | |
| | N | A | M | 4 | | 4 | | |
| | | | | 5 | | 4 | | |
| | | | | 6 | | 4 | CC<br>GZ | [94% $CaCO_3$]<br>[27% sand, 42% silt, 31% clay] |
| | F<br>N<br>R | A<br>A<br>- | G<br>M<br>- | Core Catcher | | | | FORAM NANNO OOZE 60% nannos 40% forams |

Explanatory notes in Chapter 1

Site 207 Hole A Core 9 Cored Interval: 119-128 m

AGE: (LILLBURNIAN STAGE) MIDDLE MIOCENE (CLIFDENIAN STAGE); MIXED LATE EOCENE AND MIOCENE

| ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| ≈NN6 | N<br>F | A<br>A | M<br>G | 1 | 0.5, 1.0 | 4 | | 2.5Y8/2<br>FORAM NANNO OOZE<br>White (yellow tint). Creamy texture.<br>Smear Slide at Section 1, 75 cm:<br>60% nannos<br>40% forams |
| | N<br>F | A<br>A | M<br>G | 2 | | 4 | | |
| ≈NN5 | N<br>F | A<br>A | M<br>G | 3 | | 4 | | |
| | N<br>F | A<br>A | M<br>G | 4 | | 4 | GZ<br>CC | [30% sand, 43% silt, 27% clay]<br>NANNO FORAM OOZE<br>White to pale yellow. Creamy texture.<br>Smear Slide at Section 4, 75 cm:<br>55% forams<br>45% nannos<br>[94% $CaCO_3$]<br>gradational change from:<br>2.5Y8/2<br>↓ to |
| | N<br>F | A<br>A | M<br>G | 5 | | 4 | | 2.5Y8/4 (pale yellow) |
| Chiasmolithus oamaruensis | F<br>N | A<br>A | G<br>M | 6 | | 4 | | N9 with<br>streaks of:<br>2.5Y8/4 |
| | F<br>N<br>R | A<br>A<br>- | G<br>M<br>- | Core Catcher | | | | FORAM NANNO OOZE 70% nannos 30% forams |

Explanatory notes in Chapter 1

Site 207 Hole A Core 10 Cored Interval: 133-142 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| EARLY MIDDLE MIOCENE (LILLBURNIAN STAGE) | ≈NN5 | F<br>N | A<br>A | G<br>M | 1 | 0.5<br>1.0 | EMPTY | 4 | | 2.5Y8/4 (pale yellow) with streaks of: N9 (white)<br>FORAM NANNO OOZE<br>Pale yellow with streaks of white. Creamy texture.<br>N9 |
| | | | | | 2 | | | 4 | | 2.5Y8/4 with streaks of: N9 |
| | | N | A | M | 3 | | | 4 | GZ<br>CC | FORAM NANNO OOZE<br>As above.<br>[33% sand, 37% silt, 30% clay]<br>[95% $CaCO_3$]<br>Smear Slide at Section 4, 50 cm:<br>55% nannos<br>45% forams |
| | | | | | 4 | | | 4 | | |
| | | F<br>N<br>R | A<br>A<br>- | G<br>M<br>- | Core Catcher | | Z | | | ZEOLITE BEARING NANNO FORAM OOZE 50% forams<br>44% nannos<br>5% zeolites<br>1% glass |

Site 207 Hole A Core 11 Cored Interval: 142-151 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (BORTONIAN STAGE) | ≈Reticulofenestra hampdenensis + Discoaster distinctus | | | | 1 | 0.5<br>1.0 | | | | |
| | | N<br>F | A<br>A | M<br>G | 2 | | | 4 | | N9<br>FORAM NANNO OOZE<br>White. Creamy texture.<br>Contains broken (drilling) chert fragments (light gray - 2.5Y7/2).<br>Smear Slide at Section 4, 75 cm:<br>60% nannos<br>40% forams |
| | | | | | 3 | | | 4 | | |
| | | | | | 4 | | | 4 | GZ<br>CC | [18% sand, 45% silt, 37% clay]<br>[94% $CaCO_3$] |
| | | | | | 5 | | | 4 | | |
| | | F<br>N<br>R | A<br>A<br>C | G<br>M<br>G | Core Catcher | | | | | FORAM NANNO OOZE 59% nannos<br>40% forams<br>1% zeolites |

Site 207 Hole A Core 12 Cored Interval: 151-160 m

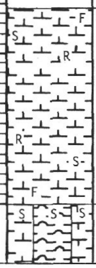
| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (BORTONIAN STAGE) | Chiphragmalithus cristatus (upper) | | | | 1 | 0.5 – 1.0 | EMPTY | 4 | | N9 FORAM NANNO OOZE White. Creamy to stiff. Smear Slide at Section 1, 130 cm: 50% nannos, 46% forams, 2% rads, 2% sponge spicules |
| | | F N R | A A C | G M G | Core Catcher | | | | | SPONGE SPICULE BEARING FORAM AND RAD RICH NANNO OOZE 56% nannos, 20% forams, 20% rads, 3% sponge spicules, 1% zeolites |

Site 207 Hole A Core 13 Cored Interval: 160-169 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (BORTONIAN STAGE) | Chiphragmalithus cristatus (upper) | | | | 1 | 0.5 – 1.0 | EMPTY | 4 | | N9 with very rare streaks of: N4 |
| | | | | | 2 | | | 4 | | N9 SPONGE SPICULE, RAD AND FORAM BEARING NANNO OOZE White. Creamy texture. Smear Slide at Section 2, 75 cm: 89% nannos, 5% forams, 3% rads, 2% sponge spicules, 1% plant debris |
| | | | | | 3 | | | 4 | | |
| | | | | | 4 | | | 4 | | |
| | | | | | 5 | | | 4 | | FORAM AND RAD RICH NANNO OOZE White. Creamy texture. Smear Slide at Section 5, 75 cm: 69% nannos, 15% forams, 15% rads, 1% feldspar |
| | | | | | 6 | | | | GZ CC | [5% sand, 45% silt, 50% clay] [90% $CaCO_3$] |
| | | F N R | A A C | G M G | Core Catcher | | | | | SPONGE SPICULE BEARING FORAM RICH RAD NANNO OOZE 43% nannos, 30% rads, 20% forams, 5% sponge spicules, 1% glass, 1% zeolites |

Site 207 Hole A Core 14 Cored Interval: 169-178 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (PORANGAN STAGE) | Chiphragmalithus cristatus (upper) | N | A | M | 1 | 0.5, 1.0 | EMPTY | 2/3 | |
| | | F N | A A | G M | 2 | | | 2/3 | GZ CC |
| | | F N R | A A C | G M G | Core Catcher | | | | |



LITHOLOGIC DESCRIPTION

5B9/1
with streaks of:
5G8/1

[4% sand, 50% silt, 46% clay]
[90% $CaCO_3$]

laminae of 5G6/1

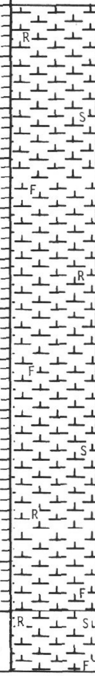
SPONGE SPICULE, RAD AND FORAM BEARING NANNO OOZE
Bluish white with streaks of light greenish gray and laminae of greenish gray.
Stiff to semilithified.

Smear Slide at Section 2, 56 cm:
(greensih gray lamina):
92% nannos
4% forams
2% rads
2% sponge spicules

SPONGE SPICULE BEARING FORAM RICH RAD NANNO OOZE
54% nannos
30% rads
10% forams
5% sponge spicules
1% zeolites

Site 207 Hole A Core 15 Cored Interval: 178-187 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (PORANGAN STAGE) | Chiphragmalithus cristatus (upper) | | | | 1 | 0.5, 1.0 | | 3/4 | |
| | | | | | 2 | | | 4 | GZ CC |
| | | | | | 3 | | | 3 | |
| | | | | | 4 | | | 1/2 | |
| | | F N R | C A C | P M G | Core Catcher | | | | |



LITHOLOGIC DESCRIPTION

5B9/1
with some faint streaks of 5GY6/1
and N5

[1% sand, 38% silt, 61% clay]
[92% $CaCO_3$]

RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE
Bluish white with faint streaks of medium gray and greenish gray (5GY6/1).
Creamy to semilithified.

Smear Slide at Section 4, 80 cm:
89% nannos
5% forams
3% rads
3% sponge spicules

layers, light greenish gray (5GY8/1)

RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE
89% nannos
5% forams
3% sponge spicules
2% rads
1% zeolites

Site 207 Hole A Core 16 Cored Interval: 187-196 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (PORANGAN STAGE) | Chiphragmalithus cristatus (upper) | | | | 1 | 0.5 1.0 | EMPTY | 2 | | 5GY6/1 5B9/1 |
| | | | | | 2 | | | 1/2 | | 5G8/1 SPONGE SPICULE, RAD AND FORAM BEARING NANNO OOZE Bluish white with laminae of greenish gray, and light greenish gray. Stiff to semilithified. Pyrite fragment (nodule?) at base. Smear Slide at Section 3, 70 cm: 90% nannos, 5% forams, 3% rads, 2% sponge spicules. [93% $CaCO_3$] [3% sand, 52% silt, 45% clay] |
| | | | | | 3 | | | 2 | CC GZ | 5G8/1 |
| | Chiphragmalithus cristatus (middle) | F N R | A A C | M M G | Core Catcher | | | | | GLASS, SPONGE SPICULE AND RAD BEARING FORAM RICH NANNO OOZE: 78% nannos, 10% forams, 5% rads, 3% sponge spicules, 2% glass, 1% feldspar?, 1% zeolites |

Site 207 Hole A Core 17 Cored Interval: 196-205 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE | Chiphragmalithus cristatus (middle) | | | | 1 | 0.5 1.0 | EMPTY | 1/2 | | 5B9/1 with streaks and laminae of 5GY8/1 |
| | | | | | 2 | | | 2 | GZ CC | [6% sand, 40% silt, 54% clay] SPONGE SPICULE, RAD AND FORAM BEARING NANNO OOZE Bluish white with streaks and laminae of light greenish gray and dark gray. Stiff to semi-lithified. Pyrite fragment (nodule?) in top of core. Smear Slide at Section 2, 70 cm: 85% nannos, 10% forams, 3% rads, 2% sponge spicules. [92% $CaCO_3$] |
| | | | | | 3 | | | 2/3 | | In Section 3: Some streaks of N3. |
| | | F N R | A A C | M M G | Core Catcher | | | | | RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE: 85% nannos, 5% forams, 5% sponge spicules, 3% rads, 1% zeolites, 1% glass |

Site 207 Hole A Core 18 Cored Interval: 205-214 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE | Chiphragmalithus cristatus (middle) | | | | 1 | 0.5 1.0 | EMPTY | 1/2 | | 5B9/1 RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE Light bluish white. Stiff to semilithified. Smear Slide at Section 1, 75 cm: 84% nannos 10% forams 3% sponge spicules 2% rads 1% glass |
| | | | | | 2 | | | 1/2 | | 5GY8/1 |
| | | | | | 3 | | | 1/2 | GZ CC | [4% sand, 46% silt, 49% clay] [91% $CaCO_3$] |
| | | | | | 4 | | | 1/2 | | |
| | | | | | 5 | | R S | 1/2 | | RAD, SPONGE SPICULE BEARING FORAM RICH NANNO OOZE Similar appearance as above. Smear Slide at Section 5, 75 cm: 74% nannos 20% forams 3% sponge spicules 3% rads |
| | Chiphragmalithus cristatus (lower) | N N | A A | M M | 6 | | R R S | | | |
| | | F N R | A A C | G M G | Core Catcher | | S S S | | | SPONGE SPICULE BEARING RAD AND FORAM RICH NANNO OOZE 51% nannos 3% sponge spicules 25% forams 20% rads 1% glass |

Site 207 Hole A Core 19 Cored Interval: 214-223 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Chiphragmalithus cristatus (lower) | | | | 1 | 0.5 1.0 | EMPTY | | | |
| | | | | | 2 | | R S | 2 1/2 | | 5B9/1 RAD AND SPONGE SPICULE BEARING FORAM RICH NANNO OOZE Bluish white. Stiff to semilithified. Smear Slide at Section 2, 75 cm: 84% nannos 10% forams 2% rads 2% sponge spicules |
| | | F | A | G | 3 | | R | 1 | | ↓ change in induration, becoming more semilithified |
| | | | | | 4 | | S | 1 | | |
| | | F | A | G | 5 | | R S | 1 | | |
| | | | | | 6 | | R | 1 | | |
| | | F N R | A A C | G M G | Core Catcher | | S R F | | | SPONGE SPICULE, RAD AND FORAM BEARING NANNO OOZE 87% nannos 3% sponge spicules 5% forams 5% rads |

Site 207 Hole A Core 20 Cored Interval: 223-232 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Chipragmalithus cristatus (lower) | N | A | M | 1 | 0.5, 1.0 | F | 1 | | 5B9/1 |
| | | | | | 2 | | | 1 | | FORAM BEARING NANNO OOZE<br>Bluish white. Stiff to semilithified.<br>Smear Slide at Section 2, 75 cm:<br>93% nannos<br>5% forams<br>1% rads<br>1% sponge spicules |
| | | N | A | M | 3 | | F | 1 | GZ CC | [4% sand, 51% silt, 44% clay]<br>[89% $CaCO_3$] |
| | Discoaster elegans | N | A | M | | | | | | |
| | | | | | 4 | | F | 1 | | |
| | | | | | 5 | | R | 1 | | faint stratification at right angles to core length<br>RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE<br>Bluish white. Semilithified.<br>Smear Slide at Section 5, 75 cm:<br>91% nannos<br>5% forams<br>2% rads<br>2% sponge spicules |
| | | | | | 6 | | F, S | | | |
| | | F N R | A A C | G M G | Core Catcher | | R, S, F | | | RAD, CLAY(?), SPONGE SPICULE AND FORAM BEARING NANNO OOZE — 80% nannos, 5% sponge spicules, 5% forams, 5% rads, 5% clay(?) |

Site 207 Hole A Core 21 Cored Interval: 237-246 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Discoaster elegans | N | A | M | 1 | 0.5, 1.0 | R | 1 | | N9 |
| | Reticulofenestra dictyoda (upper) | N | A | M | 2 | | S | 1 | | RAD, SPONGE SPICULE AND FORAM BEARING NANNO OOZE<br>Bluish white and white.<br>Semilithified.<br>Smear Slide at Section 2, 75 cm:<br>91% nannos<br>5% forams<br>2% rads<br>2% sponge spicules |
| | | | | | 3 | | F, R | 1 | GZ CC | 5B9/1<br>[3% sand, 47% silt, 51% clay]<br>[92% $CaCO_3$] |
| | | N | A | M | 4 | | S | 1 | | |
| | | | | | 5 | | sh, F | 1 | | N9 |
| | | | | | 6 | | R | 1 | | |
| | | F N R | A A R | G M P | Core Catcher | | | | | FORAM RICH NANNO OOZE (clay bearing?) — 85% nannos, 10% forams, 5% clay? |

Site 207 Hole A Core 22 Cored Interval: 246-255 m

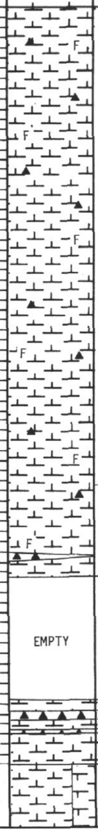
| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Reticulofenestra dictyoda (upper) | | | | 1 | 0.5<br>1.0 | EMPTY | 1 | | N9<br>N7 → N8<br>5B9/1 FORAM RICH NANNO OOZE<br>White to bluish white. Semilithified.<br>Chert fragments. |
| | | F<br>N<br>R | A<br>A<br>R | G<br>P<br>P | Core Catcher | | | | | FORAM RICH NANNO OOZE 89% nannos<br>10% forams<br>1% glass |

Site 207 Hole A Core 23 Cored Interval: 255-264 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Reticulofenestra dictyoda (upper) | | | | 1 | 0.5<br>1.0 | EMPTY | 4 | | N9 |
| | | | | | 2 | | F | 4 | | FORAM BEARING NANNO OOZE<br>White. Soupy to stiff.<br>Smear Slide at Section 2, 75 cm:<br>89% nannos<br>10% forams<br>1% glass |
| | | | | | 3 | | F | 4 | | |
| | | | | | 4 | | F | 1→<br>→ 4 | | ← Chert fragment (light olive gray, 5Y6/1) |
| | | | | | 5 | | F | 1-2<br>4<br>1-2<br>4 | | N9 FORAM BEARING NANNO OOZE<br>White and bluish white. Soupy to semilithified. Chert horizons in Section 6. Chert replaces nanno ooze (irregular boundaries and semi-silicified ooze)<br>Smear Slide at Section 5, 75 cm:<br>97% nannos<br>3% forams |
| | | | | | 6 | | F | 2<br>to<br>4 | | 5B9/1 |
| | | F<br>N | A<br>A | G<br>P | Core Catcher | | | | | FORAM RICH NANNO OOZE 79% nannos 20% forams<br>1% zeolites |

Site 207 Hole A Core 24 Cored Interval: 264-273

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|
| MIDDLE EOCENE (HERETAUNGAN STAGE) | Reticulofenestra dictyoda (upper) | N | A | M | 1 | 4 | |
| | | | | | 2 | 4 | |
| | | | | | 3 | 4 | |
| | | N | A | M | 4 | 1/2 | |
| EARLY EOCENE (MANGAORAPAN STAGE) | Retizulofenestra dictyoda (lower) | N | A | M | 4 | | |
| | | | | | 5 (EMPTY) | | |
| | | N | A | M | 5 | 1, 4, 1, 2 | |
| | | F<br>N | A<br>A | G<br>M | Core Catcher | | |




LITHOLOGIC DESCRIPTION

N9

FORAM BEARING NANNO OOZE
White. Soupy, with medium to light gray angular (drilling) fragments of chert and porcellanite (?, partly altered nanno ooze). Ghosts of microfossils can be seen in the chert fragments.

Smear Slide at Section 3, 75 cm:
95% nannos
5% forams

5B9/1

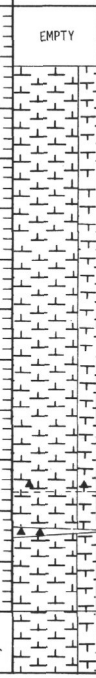
N9 (Nanno ooze)

As above.

FORAM RICH NANNO OOZE — 90% nannos, 10% forams

Site 207 Hole A Core 25 Cored Interval: 273-282 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|
| EARLY EOCENE (MANGAORAPAN STAGE) | Reticulofenestra dictyda (lower) | N | A | M | 1 | 1→3 | |
| | Discoaster lodoensis | N | A | M | 2 | 1→3 | |
| | | N | A | P | 2 | | |
| | | N | A | P | 3 | 3 | |
| | | N | A | M | 4 | 1→4 | |
| | | N | A | M | 4 | 1 | GZ<br>CC |
| | Chiasmolithus grandis | F<br>N | A<br>A | G<br>M | Core Catcher | | |




LITHOLOGIC DESCRIPTION

5B9/1 → 5GY8/1

5GY8/1

FORAM RICH NANNO OOZE
Bluish white and light greenish gray. Semilithified to creamy.

Smear Slide at Section 2, 54 cm:
90% nannos
10% forams

In semilithified part of Section 4 moderate mottling is visible. Burrows up to 15 mm, some subparallel, others vertical to bedding.

← Chert layer: 5GY6/1

Chert consists of ≈90% opal and 10% chalcedony.

[5% sand, 60% silt, 35% clay]
[88% $CaCO_3$]

FORAM RICH NANNO OOZE — 88% nannos, 10% forams, 1% glass, 1% zeolites

Site 207 Hole A Core 26 Cored Interval: 282-291 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| EARLY EOCENE | Chiasmolithus grandis | | | | 1 | 0.5, 1.0 | EMPTY | | | |
| | | | | | | | | 4 | | 5GY8/1 CHERT AND PORCELLANITE(?) Reasonably well sorted fragments (granule size mainly), produced by drilling. 5Y6/1 & N8 |
| | | | | | 2 | | | 4 | | 5GY8/1 (light greenish gray) FORAM BEARING NANNO OOZE Light greenish gray. Soupy with abundant chert fragments (mainly granule size). Ash fragments: NANNO BEARING GLASS(?) ZEOLITE ASH fragments of 5GY4/1 |
| | | N | A | P | | | | 1 | | 5GY8/1 to 5B9/1 downwards |
| | | N | A | P | | | | 1-2 | | |
| | | N | A | P | 3 | | | | | FORAM BEARING NANNO OOZE Light greenish gray and bluish white. Semilithified and mottled. 5GY8/1 |
| UNCERTAIN | 2* | N | A | P | | | | | GZ | [6% sand, 46% silt, 48% clay] |
| | | N | A | P | | | | 1-2 | CC | [76% $CaCO_3$] |
| | | F | | | | | | | | |
| | 1* | N | A | M | 4 | | | | | |
| LATE PALEOCENE | Discoaster multiradiatus | F | | | | | | | | |
| | | N | A | M | | | | | | |
| | | F N R | C A - | P M - | Core Catcher | | | | | FORAM NANNO OOZE 68% nannos, 30% forams, 1% glass, 1% glauconite |

1* = Chiasmolithus grandis
2* = Discoaster mediosus

Site 207 Hole A Core 27 Cored Interval: 291-300 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| MIDDLE PALEOCENE (TEURIAN STAGE) | Heliolithus kleinpelli | | | | 1 | 0.5, 1.0 | EMPTY | | | |
| | | | | | | | | 4 | | 5B9/1 FORAM RICH NANNO OOZE Bluish white. Creamy and semilithified. Chert fragments near top. [87% $CaCO_3$] Smear Slide at Section 1, 65 cm: 83% nannos, 15% forams, 1% glass, 1% glauconite |
| | | | | | 2 | | | 1 | CC | N8 FORAM RICH NANNO CHALK Very light gray. Lithified. Moderately burrowed (burrows medium gray-N5 and medium dark gray-N4). Chips of black chert below 145 cm. Smear Slide at Section 2, 90 cm: 88% nannos, 10% forams, 1% glass, 1% glauconite |
| | | F N R | C C - | M P - | Core Catcher | | | | | NANNO CHALK 94% nannos, 1% feldspar, 1% chlorite, 1% iron oxide, 1% glass, 1% glauconite, 1% zeolite |

Site 207 Hole A Core 28 Cored Interval: 300-309 m

| AGE | ZONE | FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| EARLY PALEOCENE (TEURIAN STAGE) | Prinsius martinii | | | | 1 | 0.5, 1.0 | EMPTY | | | |
| | Nephiolithus frequens | | | | | | | 1 | CC | PYRITE BEARING CLAY NANNO CHALK Medium light gray (N6). At very top a thin lamina with more abundant glauconite grains. [41% $CaCO_3$] Smear Slide at Section 1, 78 cm: 65% nannos, 30% clay, 2% pyrite, 1% forams, 1% glass, 1% glauconite |
| | | | | | | | | | | FORAM BEARING CLAY NANNO CHALK Olive gray (5Y4/1) to light olive gray (5Y6/1). Moderately mottled. Contains fragments (nodules, lenses) of olive black (5Y2/1) chert or porcellonite(?); up to 6 mm in length. Smear Slide at Section 1, 97 cm: 62% nannos, 30% clay, 5% forams, 1% glass, 1% glauconite |
| | | | | | Core Catcher | | PY F PY Ca | | | FORAM AND PYRITE BEARING CLAY RICH CALCIC NANNO CHALK 53% nannos, 30% calcium carbonate, 20% clay, 3% pyrite, 2% forams, 1% glauconite, 1% feldspar |

Site 207 Hole A Core 29 Cored Interval: 309-318 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | - | - | 1 | 0.5, 1.0 | EMPTY | | 1 | 5Y4/1 SLIGHTLY CALCAREOUS SILTY CLAYSTONE Olive gray. 5Y2/1 (to 5Y4/1 → dry) |
| | | | | | 2 | | Z | | | |
| | | F N R | R - - | P - - | Core Catcher | | | | | |

5Y4/1

SLIGHTLY CALCAREOUS SILTY CLAYSTONE
Olive gray.

5Y2/1 (to 5Y4/1 → dry)

SILTY CLAYSTONE
Olive black (wet); non-calcareous. Some faint mottling at base of Section 2.

*Smear Slide at Section 1, 30 cm:*
grain size distribution:
30% silt
70% clay
some recognizable minerals:
6% opaques (pyrite?)
1% iron oxide grains
5% feldspar(?)
10% quartz(?)
2% chlorite
2% glass
2% glauconite

Some sporadic sponge spicules and arenaceous forams (in Section 309 to 357 meters).

Silt and clay-size fraction in this unit (309-357 meters) consists mainly of - cristobalite. Montmorillonite is a minor constituent.

PYRITE AND ZEOLITE BEARING CLAYSTONE (noncalcareous).
grain size:
10% silt
90% clay
minerals:
5% pyrite
5% zeolites(?)

Site 207 Hole A Core 30 Cored Interval: 318-327 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | | | 1 | 5Y2/1 |
| | | | | | Core Catcher | | Z | | | |

5Y2/1

SILTY CLAYSTONE
Olive black. Homogeneous, with sporadic microfossils.

Smear Slide at Section 1, 75 cm:
grain size:
70% clay
30% silt
some constituents:
8% opaque (pyrite?)
10% quartz
10% feldspar
1% glass
1% glauconite

ZEOLITE BEARING CLAYSTONE
grain size:
90% clay
10% silt
some constituents:
2% zeolites
1% feldspar

Site 207 Hole A Core 31 Cored Interval: 330-339 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | 1 | CC | 5Y2/1 (wet) 5Y4/1 (dry) [0% $CaCO_3$] |
| | | | | | 2 | | | 1 | | |
| | | | | | 3 | | G | 1 | | |
| | | | | | 4 | | | | | |
| | | | | | Core Catcher | | | | | |

5Y2/1 (wet)
5Y4/1 (dry) [0% $CaCO_3$]

SILTY CLAYSTONE
Olive black (wet). Moderately mottled (burrows sub-parallel to bedding). White spherical sand size grains (<<1%): Sponge Spicules.

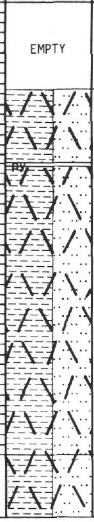
Smear Slide at Section 2, 100 cm:
grain size:
70% clay
30% silt
some constituents:
4% opaque (pyrite?)
10% quartz
10% feldspar
2% glass
2% glauconite
1% iron oxide
1% plant fossils(?)

SILTY CLAYSTONE
As above. Glauconite grains scattered throughout (<1%). From 112 to 150 cm parts with up to 5% glauconite. Moderately mottled.

SILTY CLAYSTONE
As Core 30.

Site 207 Hole A Core 33 Cored Interval: 348-357 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | 1 | CC XM |
| | | | | | 2 | | | 1 | |
| | | | | | 3 | | | | XM |
| | | N | - | - | Core Catcher | | | | |




LITHOLOGIC DESCRIPTION

5Y2/1 SILTY CLAYSTONE
Olive black. As Core 3, Section 4.

[0% $CaCO_3$]

5Y2/1 At Section 2, 10 cm of 3 mm thick seams of pyrite crystals.

X-ray - 79% amorphous, 21% crystalline:
8% qtz., 69% cris., 1% K-feld.,
4% plag., 2% mica, 4% mont.,
9% tridymite, 1% clin., 2% pyrite

SILTY CLAYSTONE
Olive black. Moderately mottled. Glauconite grains scattered throughout (<<1%).

Smear Slide at Section 3, 148 cm:
grain size:
70% clay
30% silt
some constituents:
3% opaque (pyrite?)
20% quartz
4% feldspar
1% chlorite
1% glass
1% glauconite

[X-ray - 80% amorphous, 20% crystalline:
6% qtz., 69% cris., 1% K-feld.,
2% plag., 1% mica, 3% mont.,
14% tridymite, 1% clin., 2% pyrite]

SILTY CLAYSTONE
Same as Core 32.

Site 207 Hole A Core 34 Cored Interval: 357-366 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | py | 1, 1 | |
| | | | | | 2 | | | 1 | |
| | | | | | Core Catcher | | | | |


LITHOLOGIC DESCRIPTION

5Y6/1 to 5GY2/1 SILTY CLAYSTONE AND SANDSTONE
Light olive gray to greenish black. Irregular stratification. Some layers of pyrite. Grains consist of quartz, feldspar, glauconite, etc.

various colors VITROPHYRIC RHYOLITE
Dark greenish gray (5GY4/1) to greenish black (5Y2/1) with light greenish gray (5GY8/1) to greenish gray (5GY6/1) fluidal banding. Some light brownish gray (5YR6/1) volcanic rock fragments (~2%): fine grained to glassy. Fragments are lapilli size (maximum 1 cm). Matrix contains up to 5% quartz phenocrysts. Fluidal banding dips up to 60°.

various colors FRAGMENTED VITROPHYRIC RHYOLITE
Colors vary: olive black (5Y2/1); greenish gray (5GY6/1); brownish gray (5YR4/1); light greenish gray (5GY8/1), brownish black (5YR2/1) etc. Fragments are lapilli size and make up 50% of the rock. Fragments and groundmass not always clearly distinguishable. Glassy groundmass contains up to 5% quartz phenocrysts. Perlitic texture and conchoidal fracturing are common. Fluidal banding visible at intervals 1 (93-150) and 2 (77-82). Dips vary from 60 to 90°. Fragments are subangular.

RHYOLITE LAPILLI TUFF
Colorless to brownish black (5YR2/1) perlitic fragments with quartz phenocrysts. Fragments are ash and lapilli size, and are subrounded to subangular.

NOTE: Most color given in the core summaries of these volcanics (Cores 34 to 50) are wet colors.

Site 207 Hole A Core 35 Cored Interval: 366-375 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | | |
| | | | | | 2 | | | 1 | |
| | | | | | 3 | | | 1 | |
| | | | | | Core Catcher | | | | |


LITHOLOGIC DESCRIPTION

5Y2/1
5YR2/1
FRAGMENTED VITROPHYRIC RHYOLITE (possibly LAPILLI TUFF)
Olive black and brownish black fragments in a greenish glassy groundmass (with perlitic texture and conchoidal fracturing). Some tiny green veinlets. Some scattered pyrite.

various colors
Same as Section 1. Colors: Olive black (5Y2/1); brownish black (5YR2/1) when wet. Greenish gray (5GY6/1) when dry. Matrix darker than fragments (5GY6/1) to 5GY4/1).
110-117 cm: nearly all grayish black perlitic glass, without fragments (PITCHSTONE). Refr. index of glass ≈1.500 (very acid).

various colors FRAGMENTED VITROPHYRIC RHYOLITE (Similar to Section 2)
Glassy fragments (10-20% of rock) in a glassy groundmass. Groundmass is borwnish gray, black, and greenish gray; shows fluidal banding, perlitic texture, and conchoidal fracturing. From 0-47 cm abundant (10%) sanidine and quartz phenocrysts. From 47-150 cm, as Section 2; fluidal banding dipping 40-60°; no visible feldspar phenocrysts.

FRAGMENTED VITROPHYRIC RHYOLITE
Fragments are brownish gray, greenish gray, and black. Perlitic glassy groundmass with quartz phenocrysts. Possibly a tuff.

Site 207 Hole A Core 36 Cored Interval: 375-384 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | | 1 | various colors<br>FRAGMENTED VITROPHYRIC RHYOLITE<br>No fluidal banding. Has several percent feldspar phenocrysts. |
| | | | | | Core Catcher | | | | | VITROPHYRIC RHYOLITE<br>Brownish gray (5YR4/1). Glass has perlitic texture. Pyrite lines perlitic cracks. |

Site 207 Hole A Core 37 Cored Interval: 384-393 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Core Catcher | | | | | FRAGMENTED VITROPHYRIC RHYOLITE<br>Fragments show fluidal banding. |

Site 207 Hole A Core 38 Cored Interval: 393-402 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Core Catcher | | | | | FRAGMENTED VITROPHYRIC RHYOLITE<br>Black, brownish gray, and greenish gray fragments. |

Site 207 Hole A Core 39 Cored Interval: 402-411 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | 1 | | 10YR4/2<br>RHYOLITE PUMICE (TUFF?)<br>Dark yellowish brown. Contains quartz phenocrysts (bipyramidal) and pockets (up to 3 cm) filled with black glass. Some rare fragments of glassy rhyolite. |
| | | | | | | | | 1 | | 5GY4/1<br>PUMICEOUS LAPILLI TUFF<br>Dark greenish gray. Fragments are mainly pumice (5-7 mm; up to 80% of rock) and some black glass and olive black laminated glass, with occasional quartz bipyramids and feldspar phenocrysts (∿15%). No fluidal banding and little matrix.<br>115-120 cm: band of olive black fine-grained, non-pumiceous volcanics. |
| | | | | | Core Catcher | | | | | RHYOLITIC LAPILLI TUFF<br>Fragments of pumice and of vitrophyric rhyolite. Some secondary hematite. Fragments have sizes up to 8 mm. |

Site 207 Hole A Core 40 Cored Interval: 411-420 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | 1 | | 5Y2/1 ↓ 5Y4/1<br>PUMICEOUS LAPILLI TUFF<br>Olive gray to olive black. Predominantly pumice fragments, but 5-10% glassy (some black) fragments. Pumice has cellular texture. Groundmass contains quartz and feldspar phenocrysts and some fine ash. (Fluidal) banding (?) dips 50-60°. |
| | | | | | Core Catcher | | | | | RHYOLITIC LAPILLI TUFF<br>Fragments (up to 4 cm) of black glass with fluidal banding. Some secondary hematite. |

Site 207 Hole A Core 41 Cored Interval: 420-429 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Core Catcher | | | | | RHYOLITIC LAPILLI TUFF<br>Fragments of vitrophyric rhyolite (up to 15 mm). |

Site 207 Hole A Core 42 Cored Interval: 432-441 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5, 1.0 | EMPTY | 1 | | RHYOLITIC LAPILLI TUFF<br>Greenish gray (5GY6/1) and moderate brown (5YR4/4). Fine-grained to glassy. Brown color from Fe-oxide. |
| | | | | | | | | 1 | | various colors<br>SPHERULITIC VITROPHYRIC RHYOLITE<br>Dusky brown (5YR2/2) and light greenish gray (5GY8/1). Quartz and feldspar phenocrysts in a groundmass of partly devitrified glass. Spherulites, in centers of perlitic fragments, give the rock a 'salt-and-pepper' appearance. Contact at 1/130 is gradational, color becoming olive black (5Y2/1): RHYOLITIC PITCHSTONE. Groundmass glassy with abundant vesicles, filled with chalcedony and chlorite(?). Quartz and feldspar phenocrysts present. Perlitic texture. |
| | | | | | 2 | | | 1 | | Fluidal banding in entire Section 1. |
| | | | | | | | | 1 | XM | 5GY4/1 to 5GY6/1<br>X-ray - 58% amorphous, 42% crystalline: 1% qtz., 6% cris., 5% plag., 89% mont.<br>ARGILLIZED RHYOLITE<br>Dark greenish gray to greenish gray. Glassy groundmass has altered to calcium-rich montmorillonite. Contact with overlying pitchstone is gradational. No structures visible. |

Site 207 Hole A Core 43 Cored Interval: 441-450 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5<br>1.0 | EMPTY | | | | |
| | | | | | | | | | 1 | 5GY6/1 | ARGILLIZED RHYOLITE<br>Greenish gray. Faint fluidal banding, dipping 60°. Glassy groundmass altered to clay (probably montmorillonite and halloysite). |
| | | | | | Core Catcher | | | | | | ARGILLIZED RHYOLITE<br>Greenish gray. Alteration product mainly halloysite, with some montmorillonite. |

Site 207 Hole A Core 44 Cored Interval: 450-459 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5 | | 1 | 1 | 5YR3/4 | SPHERULITIC VITROPHYRIC RHYOLITE<br>Grayish red (5R4/2). Quartz and feldspar phenocrysts in a Fe-oxide rich glass (devitrified?). Abundant vesicles, filled with chalcedony. |
| | | | | | | | | | | | SPHERNLITIC VITROPHYRIC RHYOLITE<br>Moderate brown. Vesicles filled with chalcedony. Fluidal banding, dipping 60°. |
| | | | | | | 1.0 | | 1 | 1 | various colors | SPHERULITIC VITROPHYRIC RHYOLITE<br>Dark reddish brown (10R3/4). Boundary at 62 cm is gradational. |
| | | | | | Core Catcher | | | | | | Same as between 11 and 62 cm. |
| | | | | | | | | | | | SPHERULITIC VITROPHYRIC RHYOLITE<br>Light greenish gray (5GY8/1) and pale greenish yellow (10Y8/2), and pale red (10R6/2). Some fragmentation, especially in lower part. Fragments up to 1 cm.<br>Note: May mark contact of discrete flows. |
| | | | | | | | | | | | SPHERULITIC VITROPHYRIC RHYOLITE<br>Fluidal banding in various colors: dark greenish gray (5GY4/1), dark reddish brown (10R3/4), and light greenish gray (5GY8/1). Banding dips 60°. |
| | | | | | | | | | | | SPHERULITIC VITROPHYRIC RHYOLITE<br>Thin (few mm) fluidal banding. Phenocrysts of quartz. |

Site 207 Hole A Core 45 Cored Interval: 459-468 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5 | | | 1 | 5G4/1 and 5YR4/3 | SPHERULITIC VITROPHYRIC RHYOLITE<br>Altered (argillized) pale green glass with wavy fluidal banding. A black unaltered glass lamina dips 45°. |
| | | | | | | 1.0 | | 1 | | | SPHERULITIC VITROPHYRIC RHYOLITE<br>Dark greenish gray and brownish gray fluidal banding. Quartz and feldspar phenocrysts. Groundmass partly altered (zeolitized) and devitrified (chalcedony? and spherulites). Spherulites give rock a 'salt-and-pepper' appearance. Spherulites are in centers of perlitic fragments. |
| | | | | | 2 | | | 1 | | various colors | FRAGMENTED VITROPHYRIC RHYOLITE<br>Fragments of argillized rhyolite (up to 3 cm). Fluidal banding still visible in fragments. Mosaic of colors, from light greenish gray (5GY8/1) to moderate reddish brown (10R4/6). Fragmentation may be due to autobrecciation. Alteration products: montmorillonite and halloysite. |
| | | | | | | | | 1 | | | ARGILLIZED VITROPHYRIC RHYOLITE<br>(looks like top of core)<br>Some parts are brecciated, containing fragments of altered rhyolite. Fluidal banding dips from 0° to 45°. |
| | | | | | 3 | | | 1 | | various colors | SPHERULITIC VITROPHYRIC RHYOLITE<br>Partly argillized. Colors vary, from dark greenish gray (5GY4/1) to light greenish gray (5GY8/1) to shades of grayish red (5R4/2). Phenocrysts of quartz and feldspar. Groundmass exists of altered perlitic glass with spherulites. Fluidal banding dips 60°. |
| | | | | | Core Catcher | | | | | | SPHERULITIC VITROPHYRIC RHYOLITE |

Site 207 Hole A Core 46 Cored Interval: 468-477 m

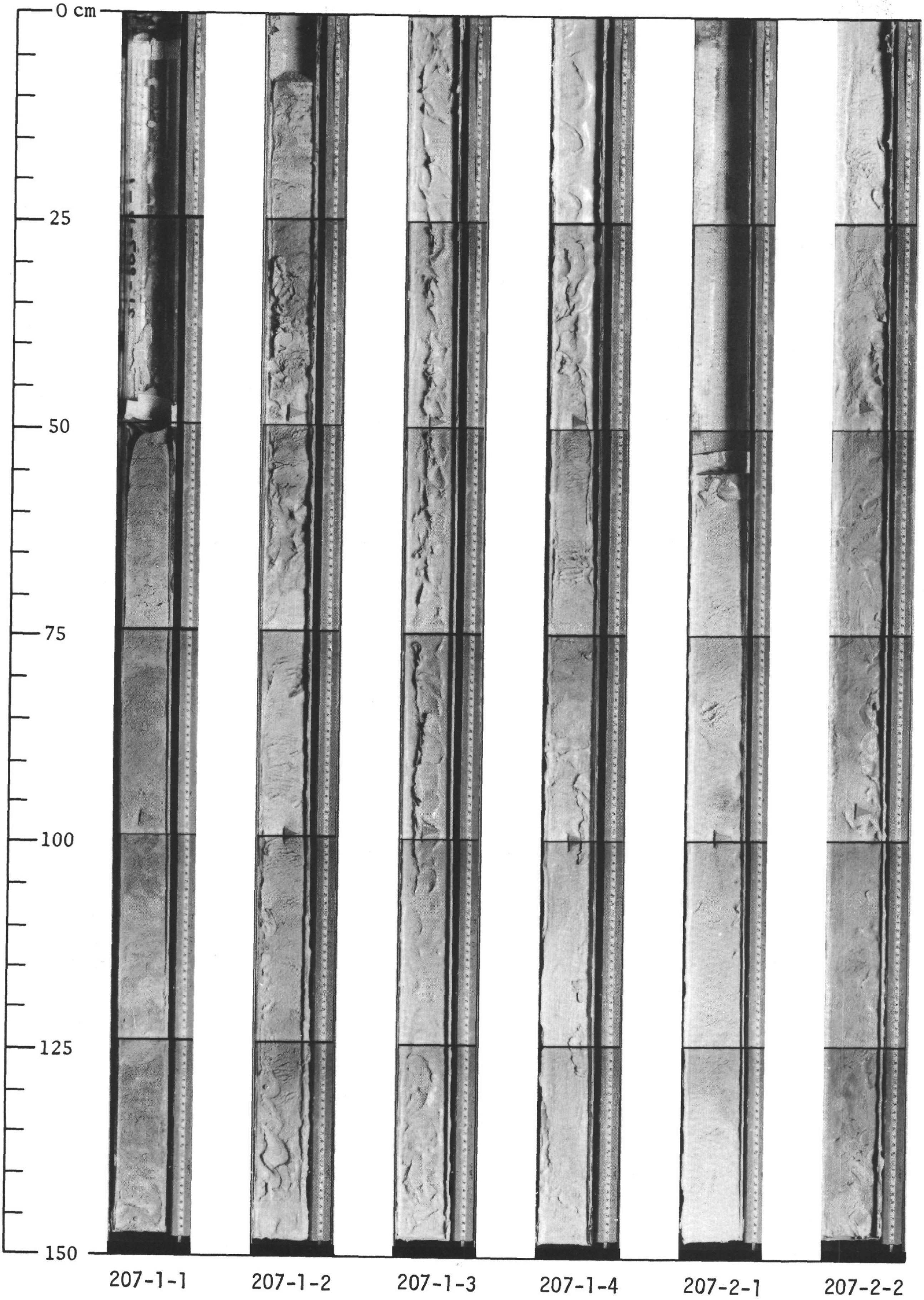
| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5 1.0 | | | | 5GY4/1 | SPHERULITIC VITROPHYRIC RHYOLITE<br>Dark greenish gray. Altered parts and fragmented parts. The latter especially at intervals 0-60 and 80-110 cm. Fluidal banding is especially well developed in lower half of section (dipping 30°-60°). Secondary Fe-oxide colors local areas red (10R4/6). |
| | | | | | 2 | | | 1 | | | Section 2 is similar to Section 1, but less fragmentation. Veinlets of quartz, chalcedony, and pale green to white soft minerals. Trace amounts of pyrite and Fe-oxide. Most glass devitrified. Fluidal banding dips 10°-50°. |
| | | | | | 3 | | | | XM | | Section 3 is similar to Section 2. Quartz and feldspar phenocrysts. Black glassy bands at 93-95 and 120 cm. Fluidal banding dips 0°-15°.<br>[X-ray - 73% amorphous, 27% crystalline: 8% qtz., 39% cris., 20% plag. 33% mont.] |
| | | | | | 4 | | | | | | Same as above. Some fragmentation at 30-70 cm and 105-115 cm. Fluidal banding dips 10°-45°. |
| | | | | | Core Catcher | | | | | | FRAGMENTED VITROPHYRIC RHYOLITE<br>Large fragment of black perlitic rhyolite (>7 cm). |

Site 207 Hole A Core 47 Cored Interval: 477-486 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | ABUND. | PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5 1.0 | EMPTY | | | | |
| | | | | | | | | 1 | | | VITROPHYRIC RHYOLITE<br>Black, vesicular. With parts of altered fragmented rhyolite. |
| | | | | | 2 | | | 1 | | various colors | SPHERULITIC VITROPHYRIC RHYOLITE<br>Vesicular. Altered and fragmented from 65 cm downwards. Groundmass of altered glass contains phenocrysts of quartz and feldspar (<5%). At 45 cm and at 135 cm some relatively unaltered glass that is vesicular (amygdaloidal). Vesicules filled with opal. Fluidal banding dips 25°-35°. Banding disrupted by Fe-oxide and chalcedony veinlets. |
| | | | | | 3 | | | 1 | | various colors | ARGILLIZED SPHERULITIC VITROPHYRIC RHYOLITE<br>Mottled layers of light greenish gray (5GY8/1), black (N2), and moderate brown (5YR3/4). Glassy groundmass is argillized. Quartz and feldspar phenocrysts. From 45 to 150 cm: light greenish gray (5GY8/1) and grayish red (5R4/2). At 75 cm a veinlet, containing quartz.<br>Fluidal banding in whole section (dipping 15° to 90°). Fragmentation from 3/140 to 3/150. |
| | | | | | Core Catcher | | | | | | ARGILLIZED SPHERULITIC VITROPHYRIC RHYOLITE<br>Some veinlets with secondary hematite. |

Site 207 Hole A Core 48 Cored Interval: 486-495 m

| AGE | ZONE | FOSSIL CHARACTER: FOSSIL | FOSSIL CHARACTER: ABUND. | FOSSIL CHARACTER: PRES. | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 0.5<br>1.0 | EMPTY | | | various colors | ARGILLIZED SPHERULITIC VITROPHYRIC RHYOLITE<br>Mottled coloring: moderate yellow green (5GY7/4) and dark yellowish orange (10YR6/6). Groundmass altered. No apparent fragmentation. Quartz and feldspar phenocrysts (<2%). From 115 to 150 cm different coloring: dusky red (5R3/4) and pale olive (10Y6/2). At base of section some fluidal banding (dipping 50°). |
| | | | | | 2 | | | | | various colors | SIMILAR TO SECTION 1.<br>Groundmass is altered to montmorillonite. Colors are: dusky red (5R3/4), moderate red (5R5/4), light greenish gray (5G8/1), and greenish gray (different shades). Remnants of perlitic glass gives rock a 'salt-and-pepper' texture. Fluidal banding dips 60° to 70°. |
| | | | | | 3 | | | 1 | | various colors | SIMILAR TO SECTION 2.<br>Colors are:<br>0-40 cm: dark greenish gray (5G4/1)<br>40-90 cm: pale yellowish green (10GY7/1)<br>90-150 cm: dark greenish gray.<br>Some veinlets of reddish Fe-oxide.<br>Fluidal banding dips 60°-90°. |
| | | | | | 4 | | | | | various colors | AS SECTION 3.<br>Colors are:<br>0-55; 75-100; 120-133; 143-150: dark greenish gray (5G4/1). 55-75; 100-120; 133-143: light greenish gray (5GY8/1). Fluidal banding dips 45°-70°. |
| | | | | | 5 | | | | | various colors | AS SECTION 4.<br>Colors are:<br>From 0-110 cm: greenish gray (5GY6/1) to dark greenish gray (5GY4/1), and some dusky red (5R3/4) mottles and veins (Fe-oxide).<br>110-150 cm: light greenish gray (5GY8/1) with mottles of grayish orange pink (10R8/2) and moderate real (5R4/6). Fluidal banding dips 50°-60°. |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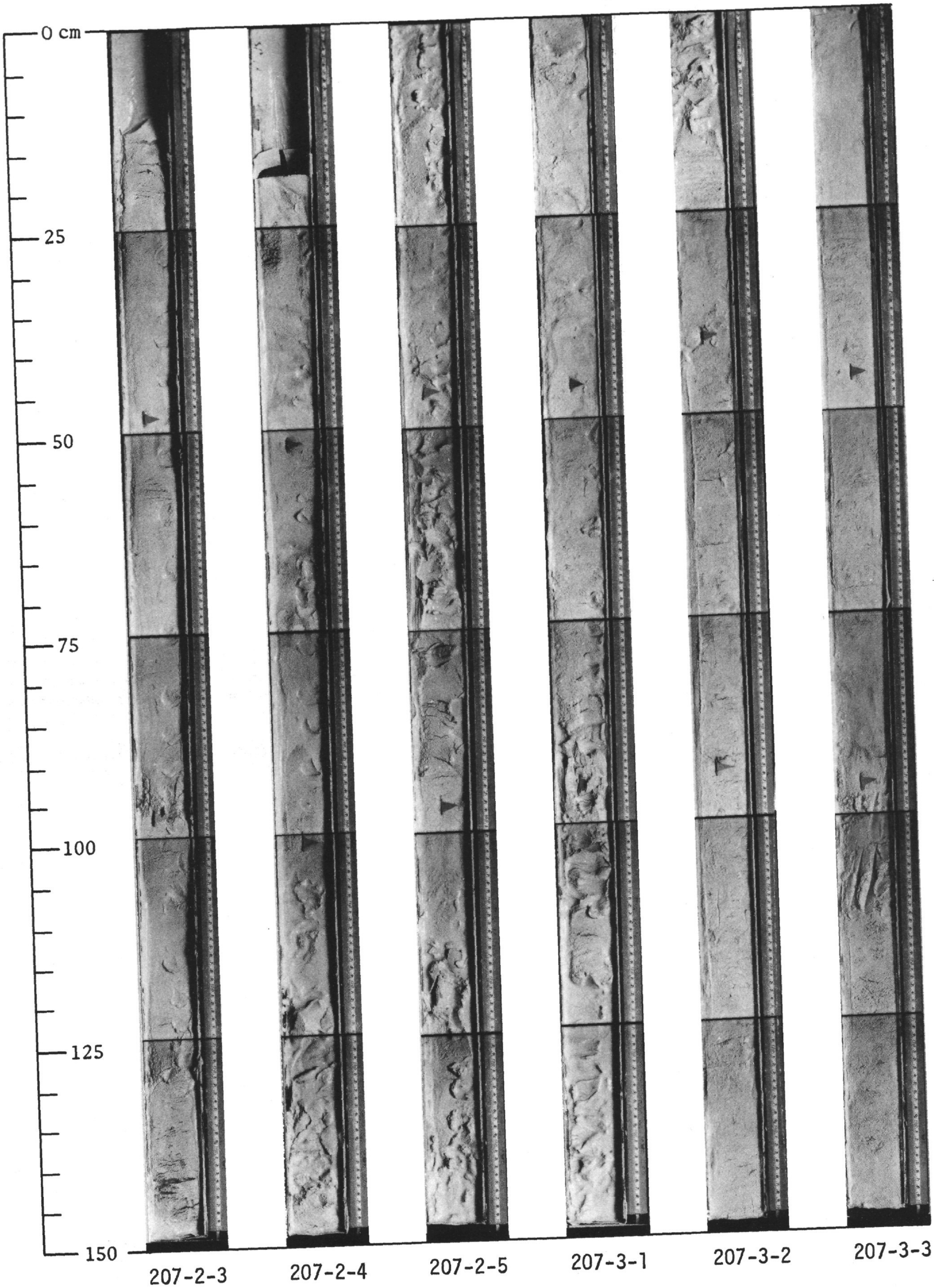

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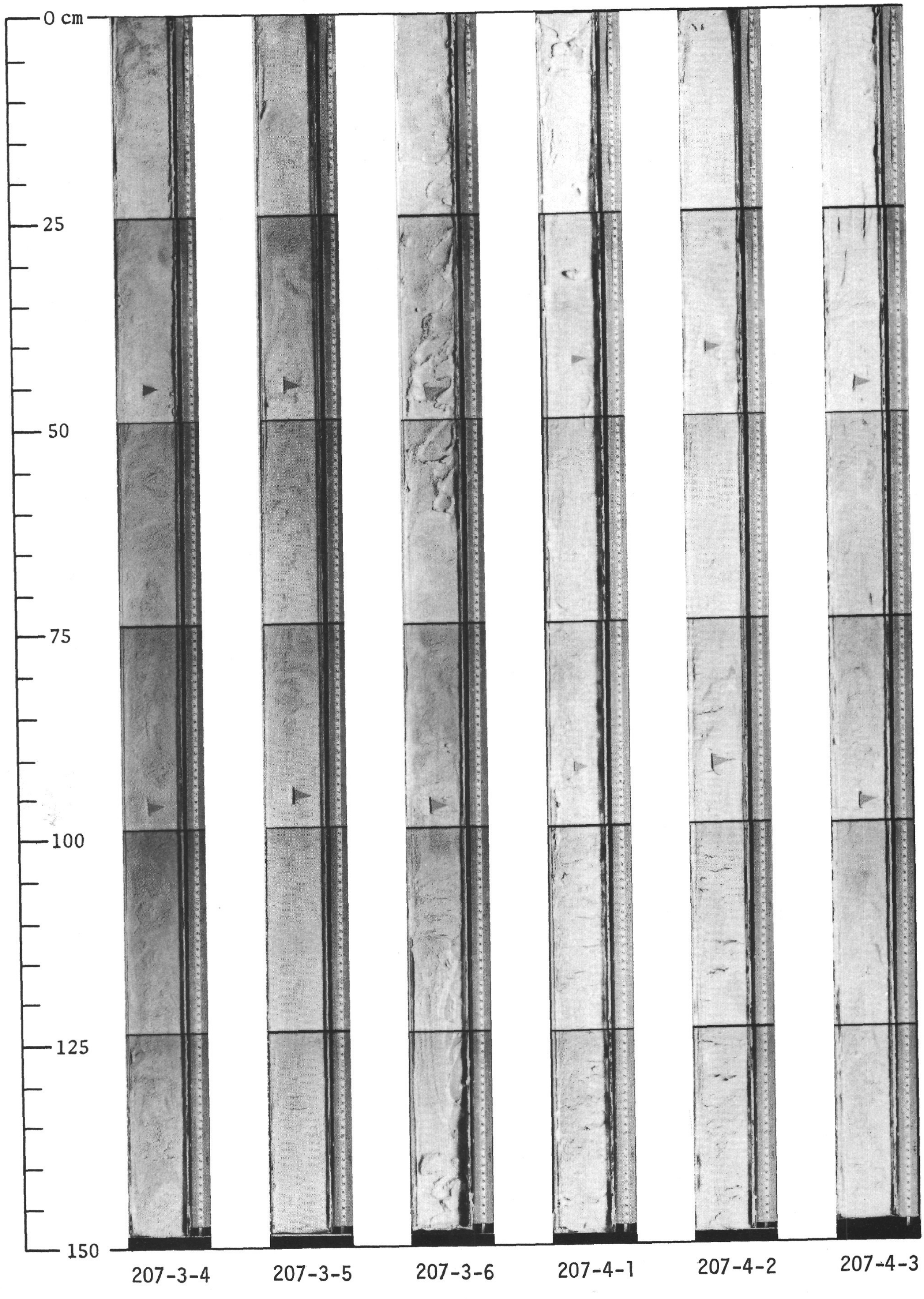
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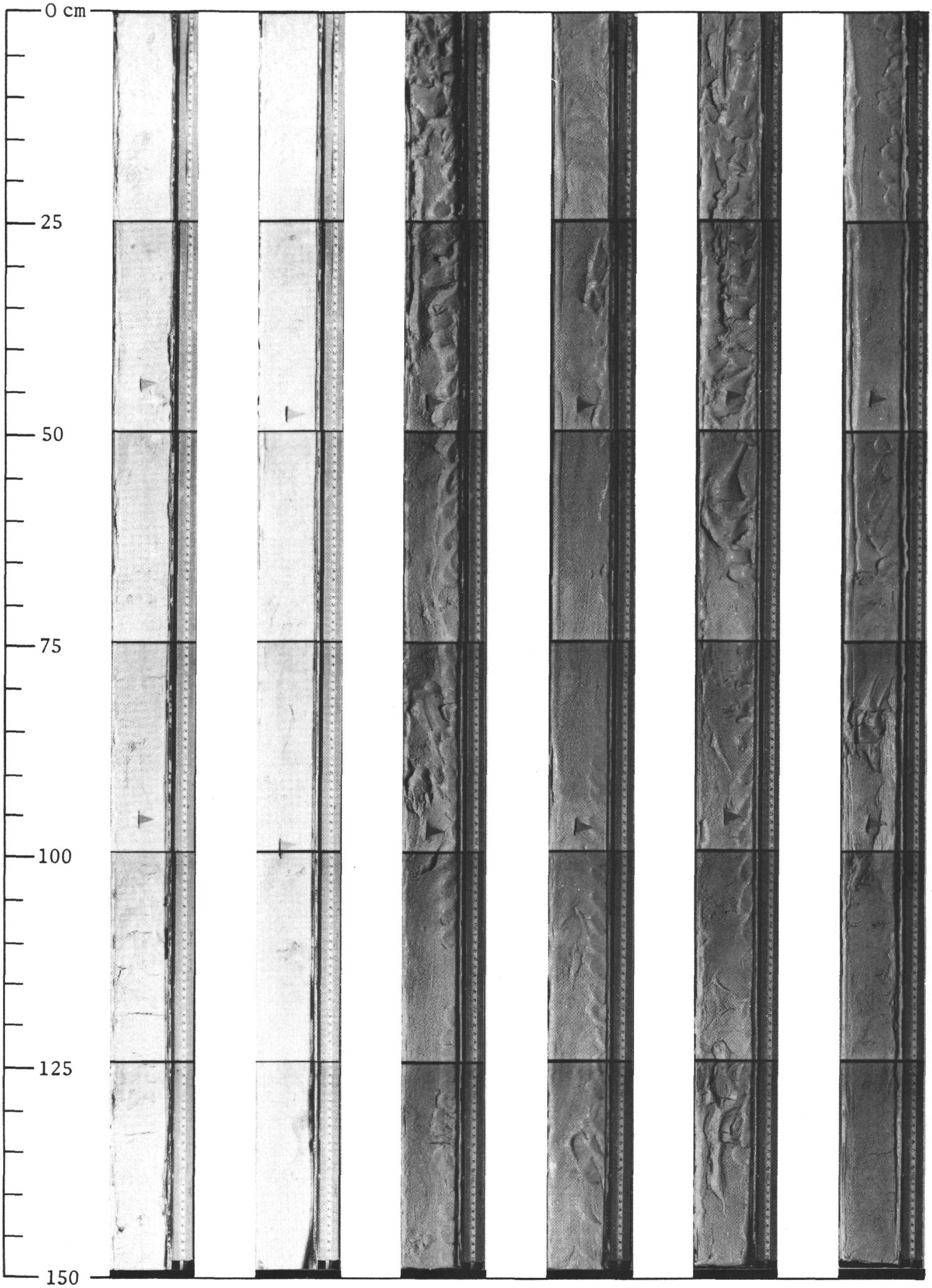
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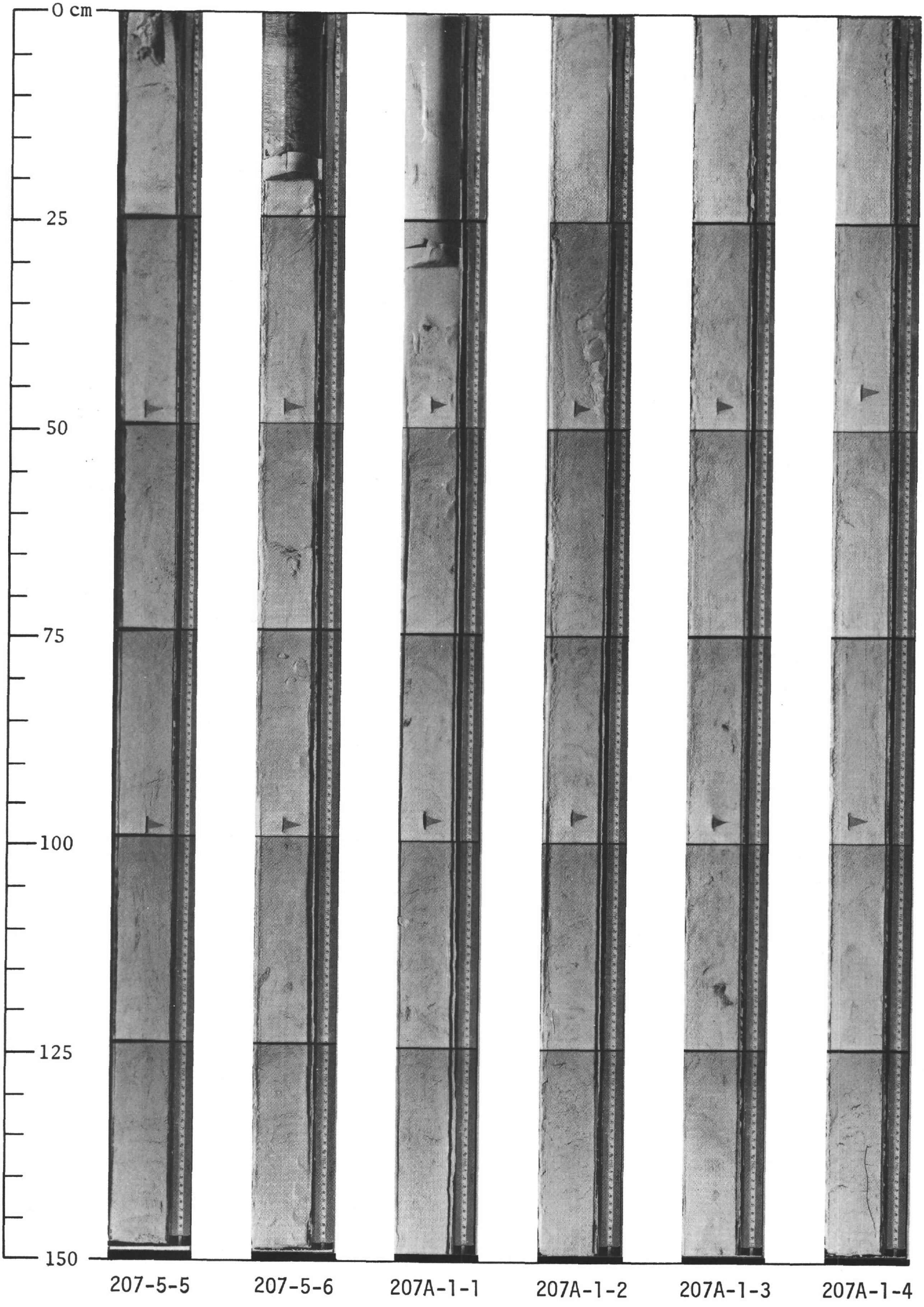
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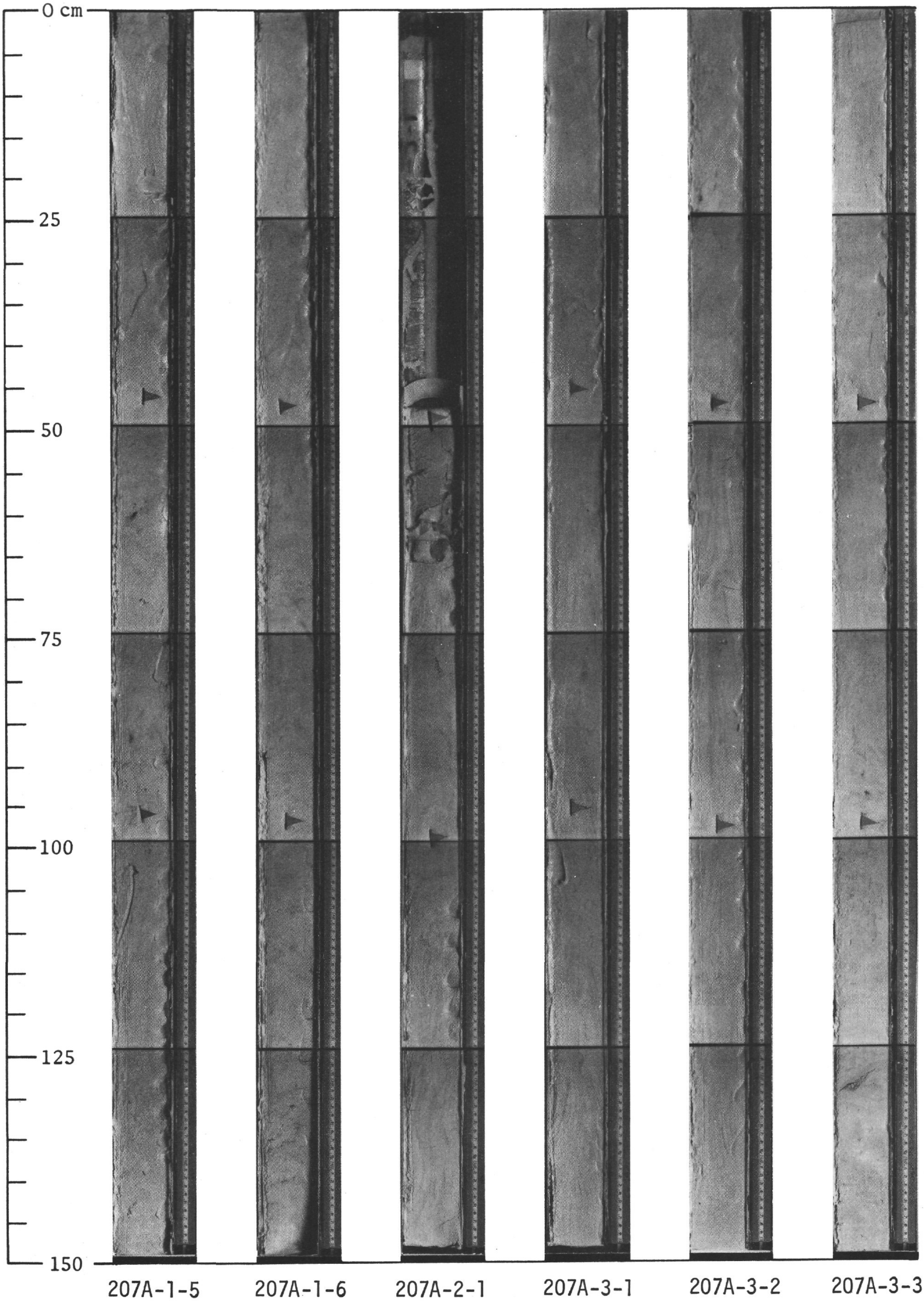
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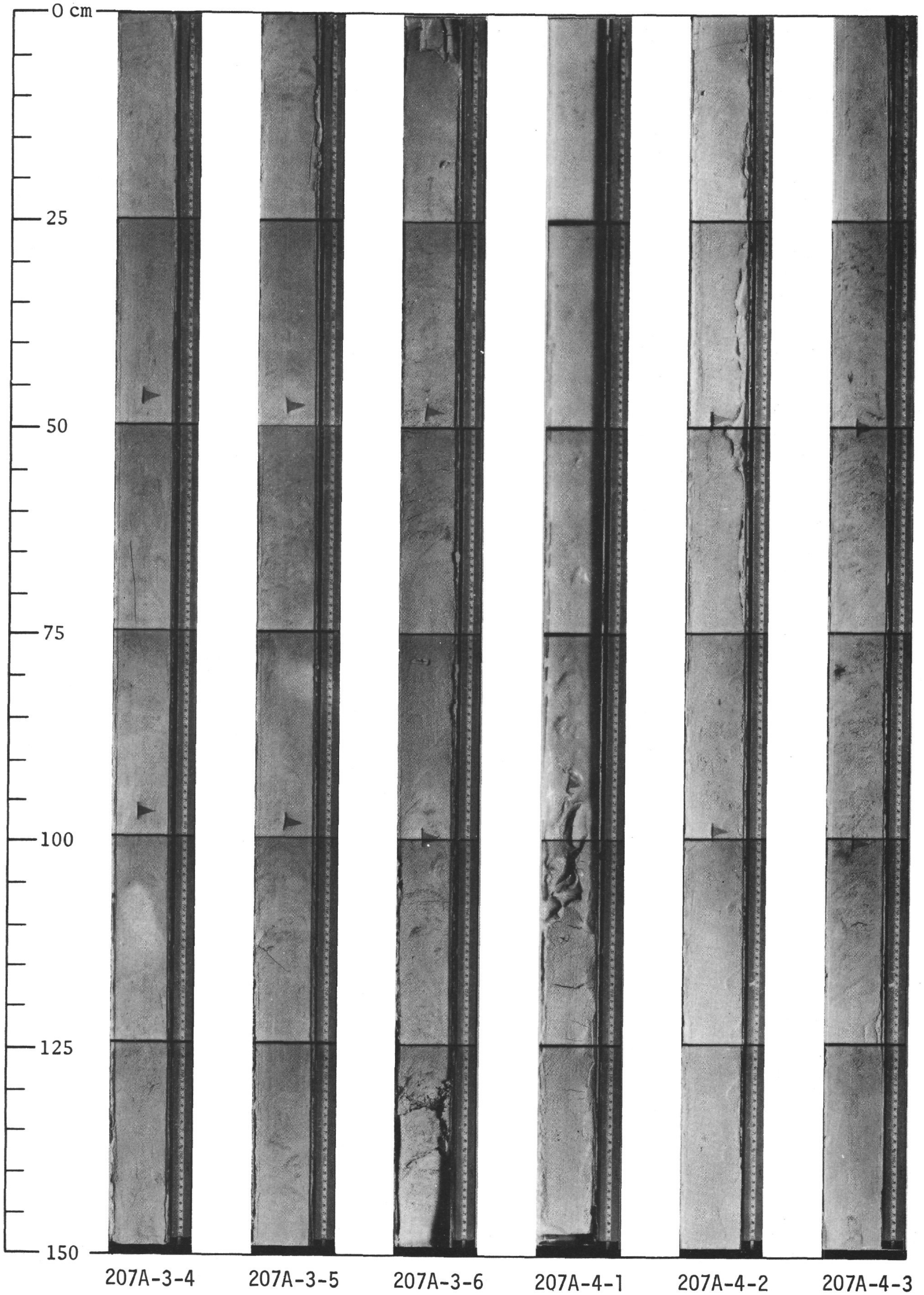
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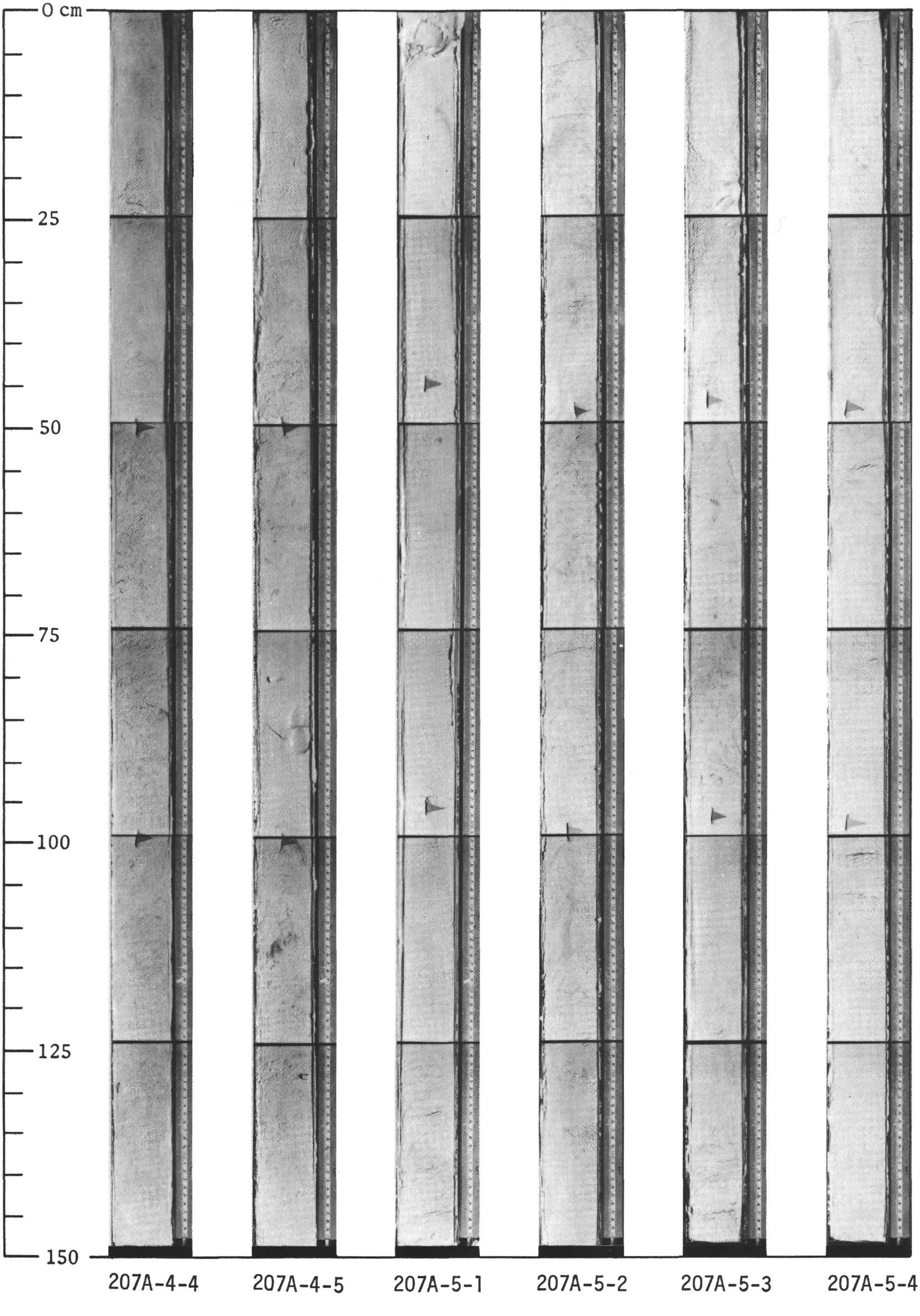
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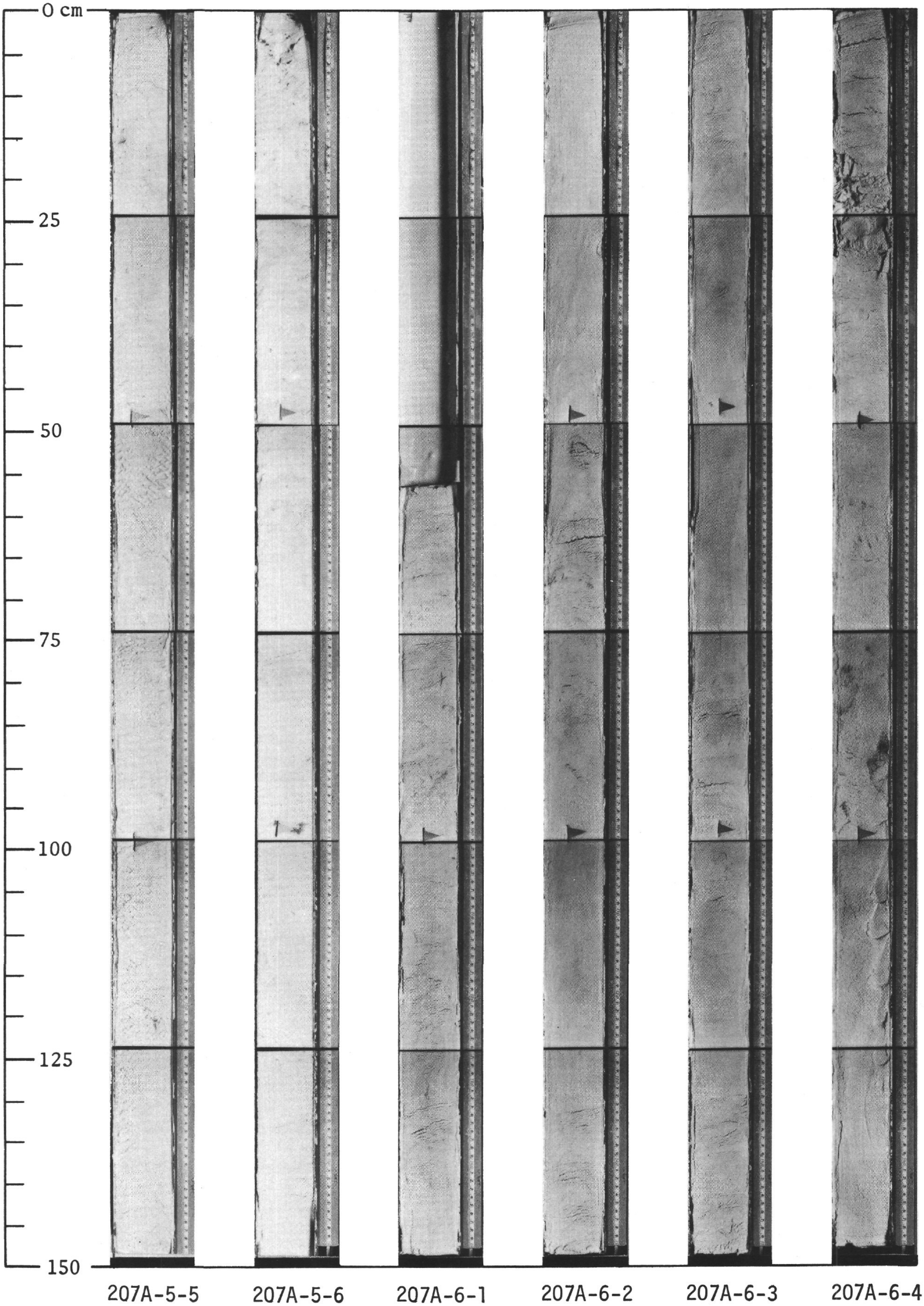
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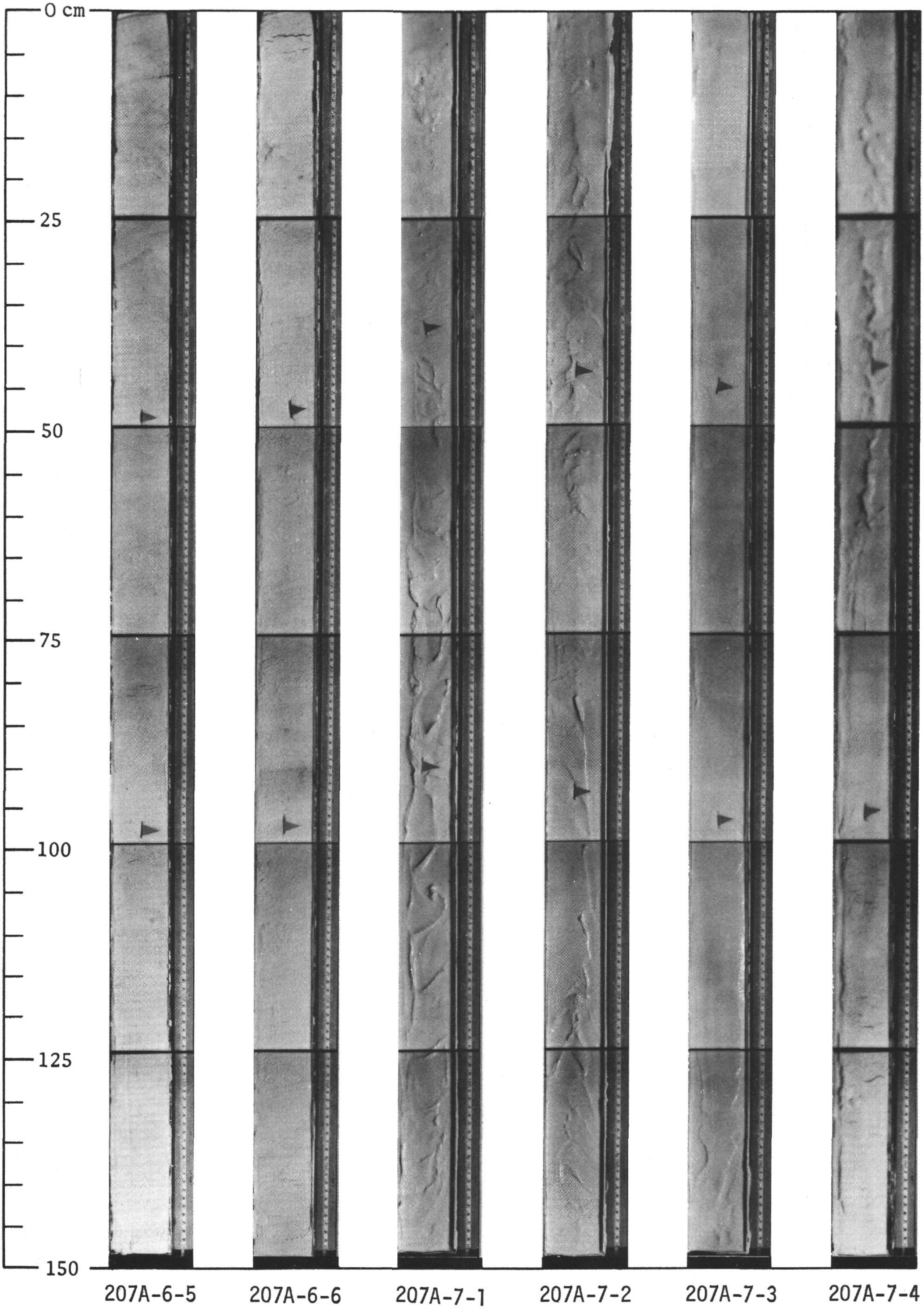
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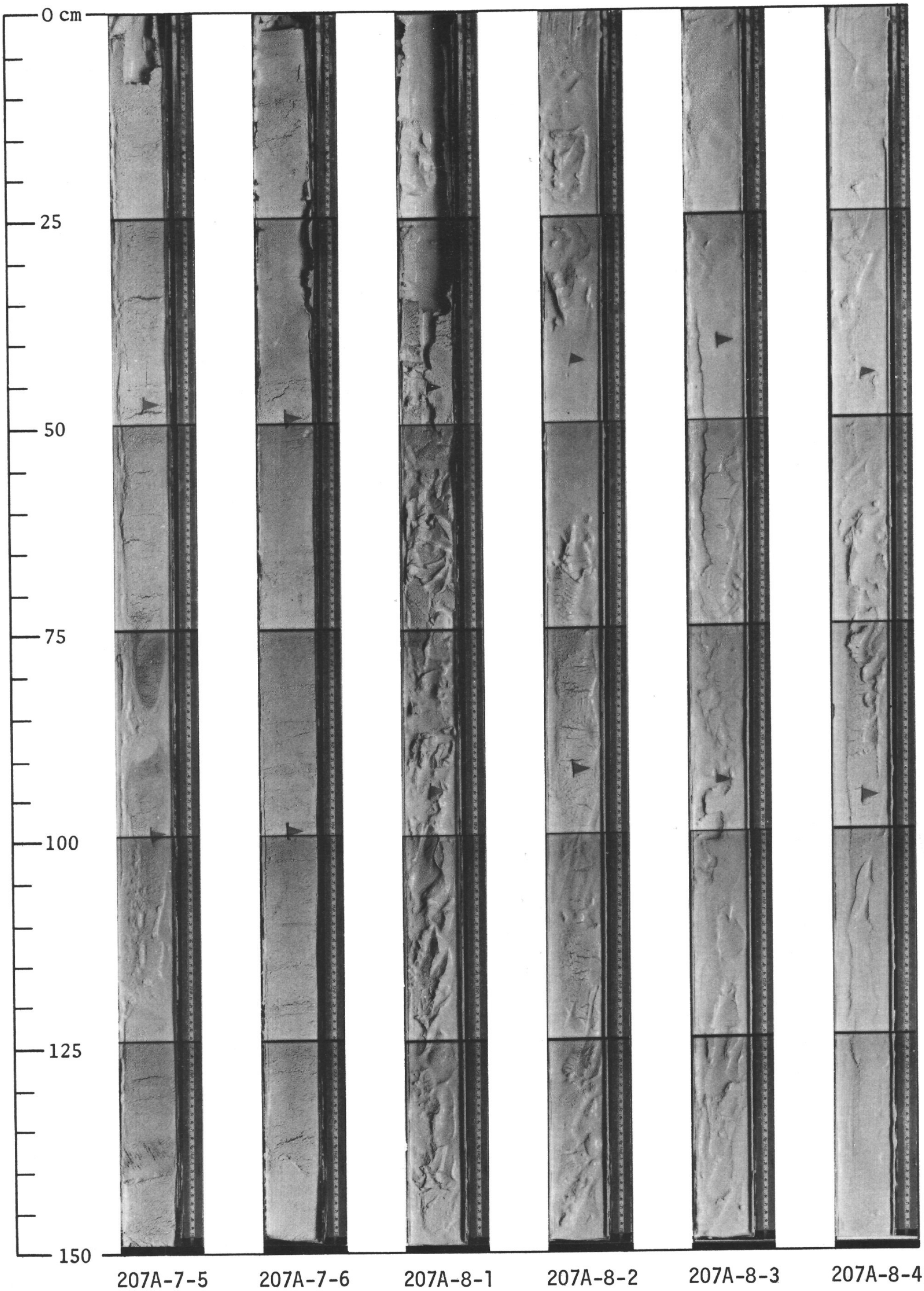
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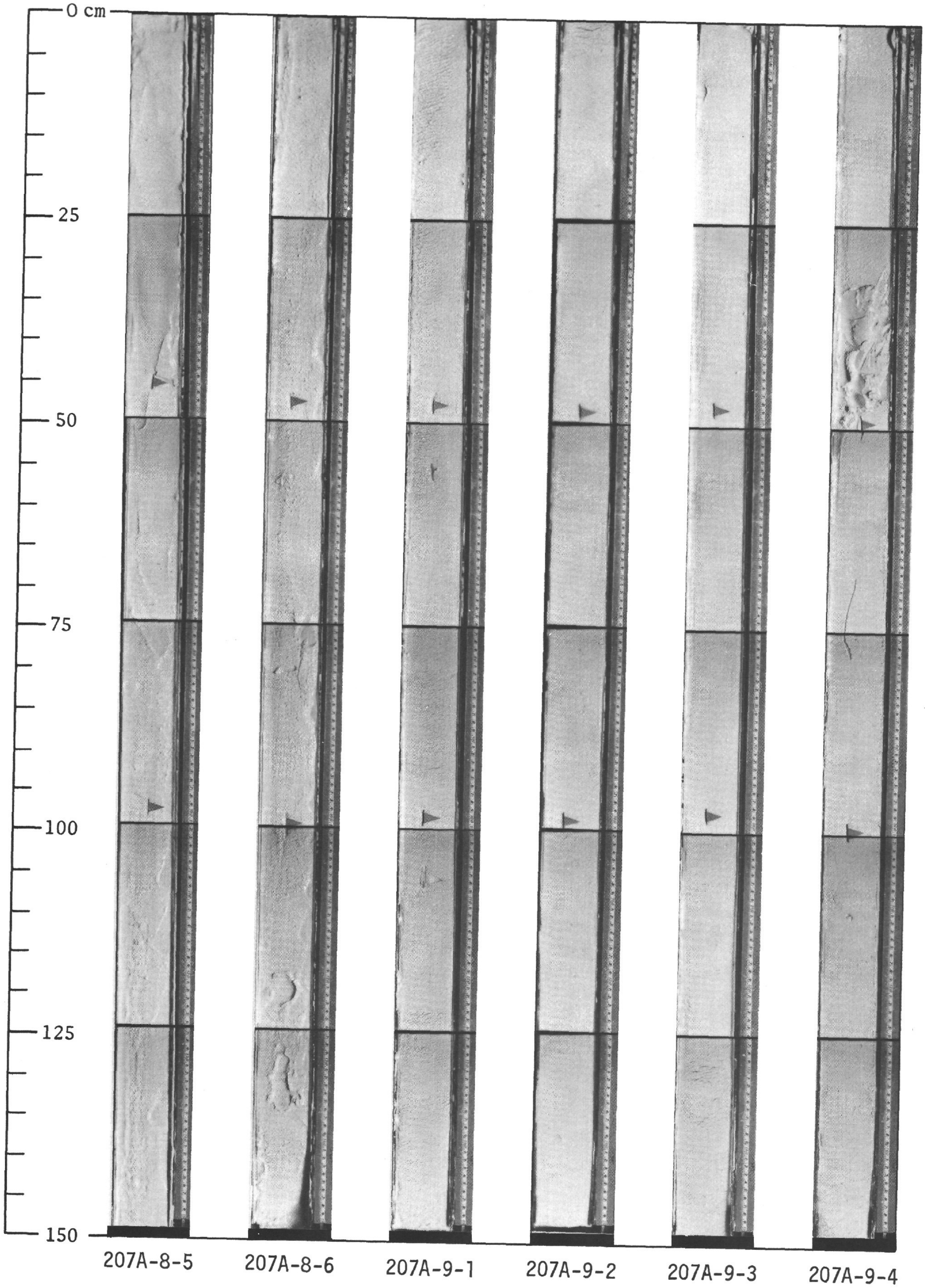
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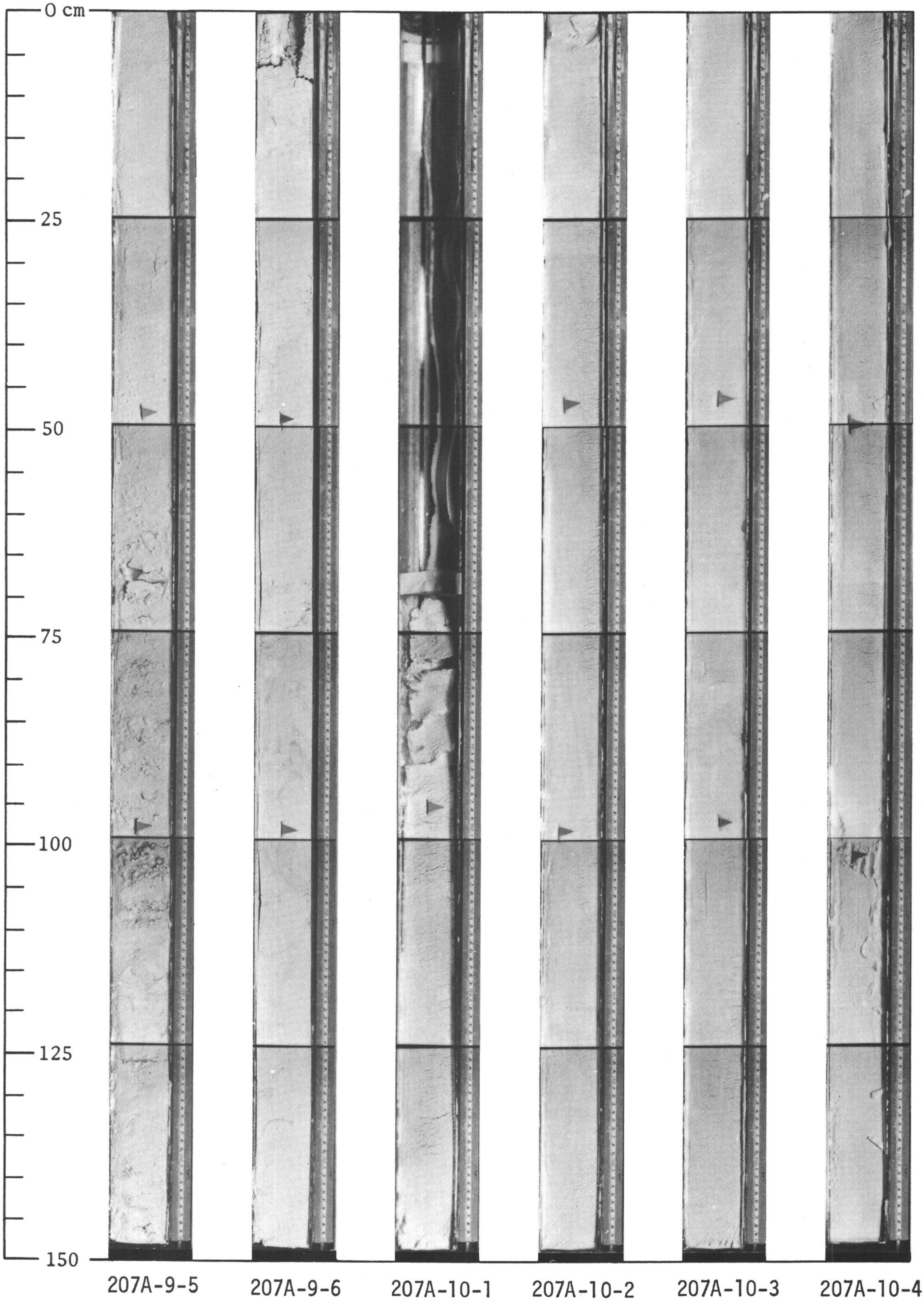
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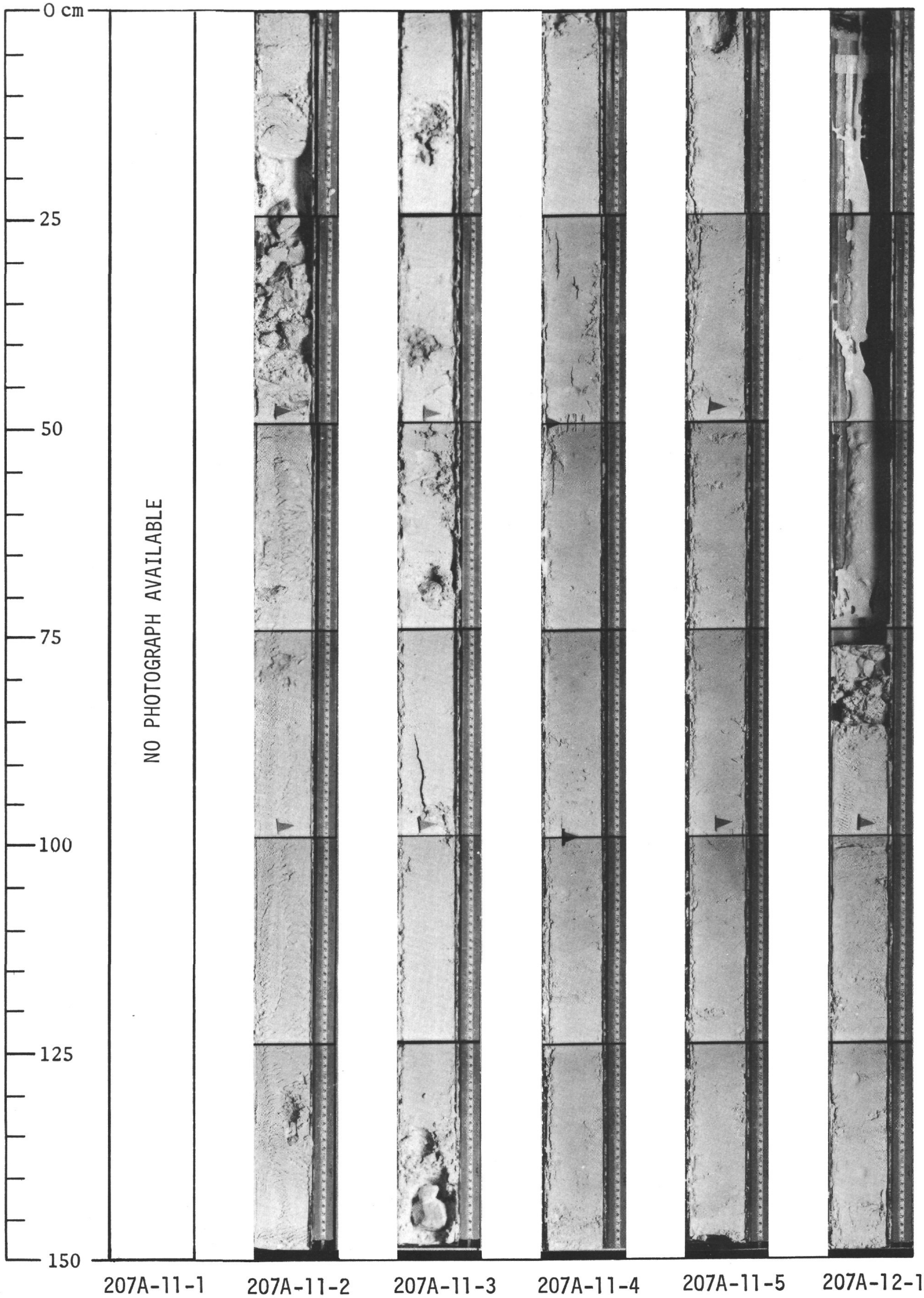
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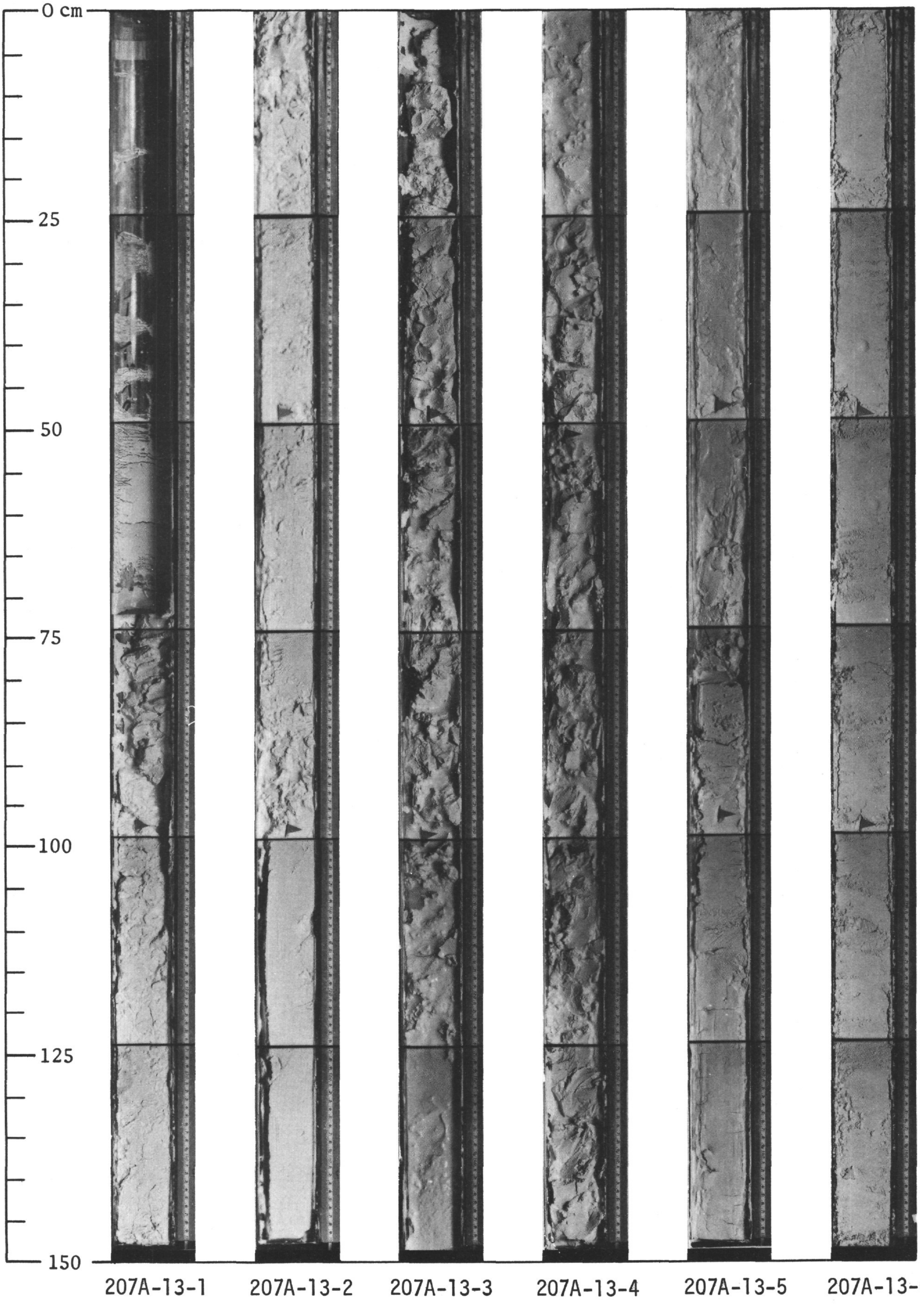
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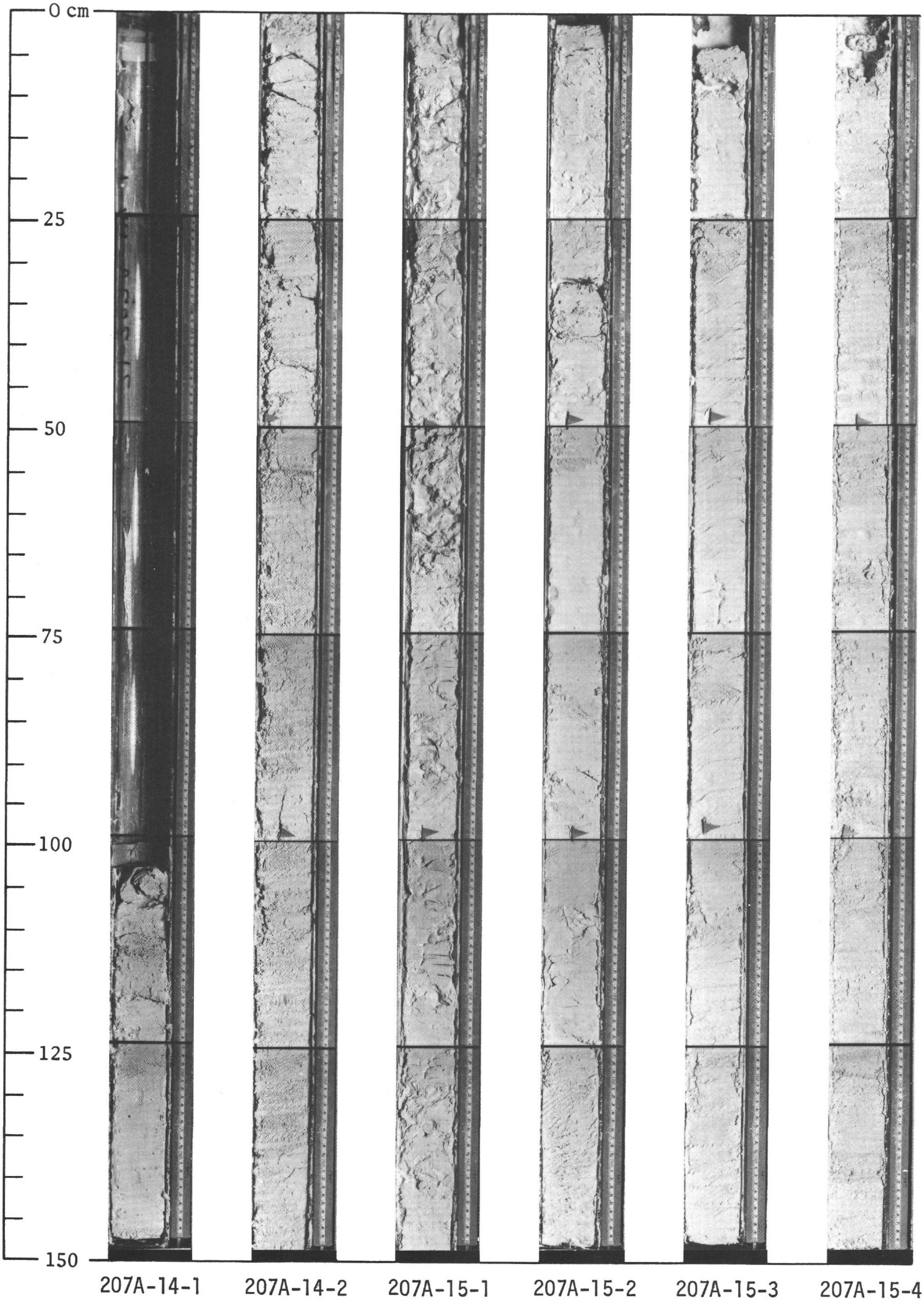
207A-13-6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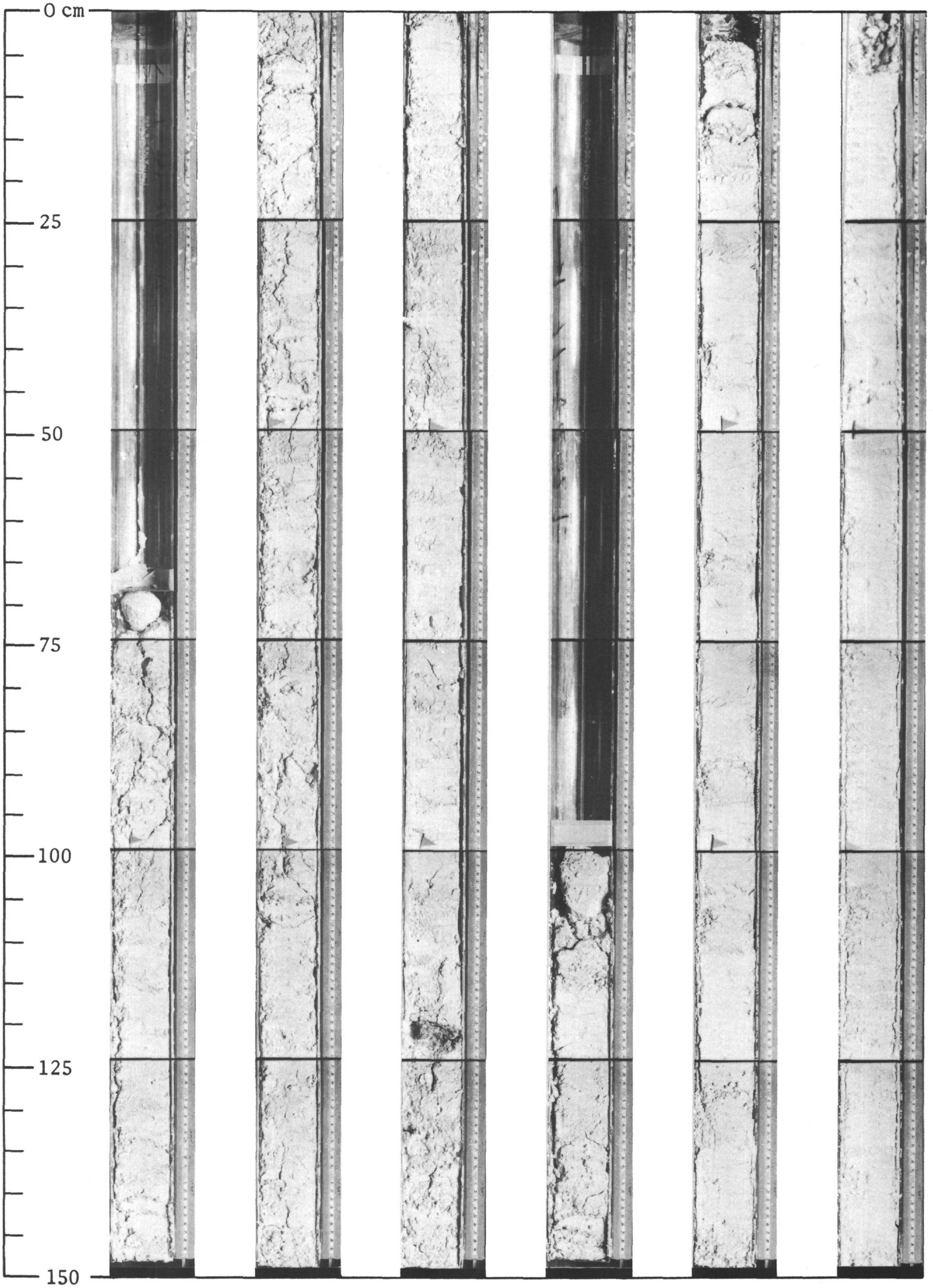
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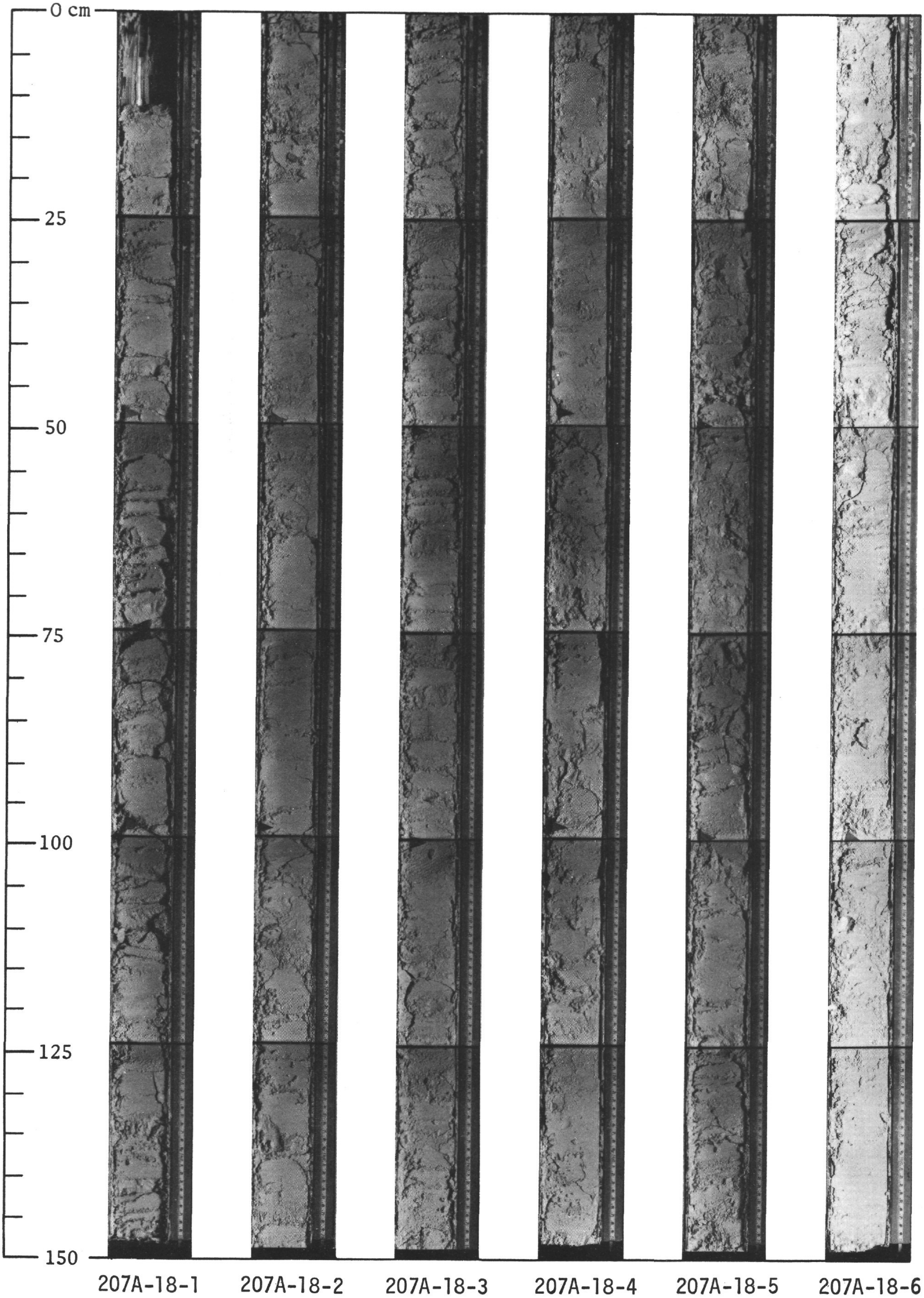
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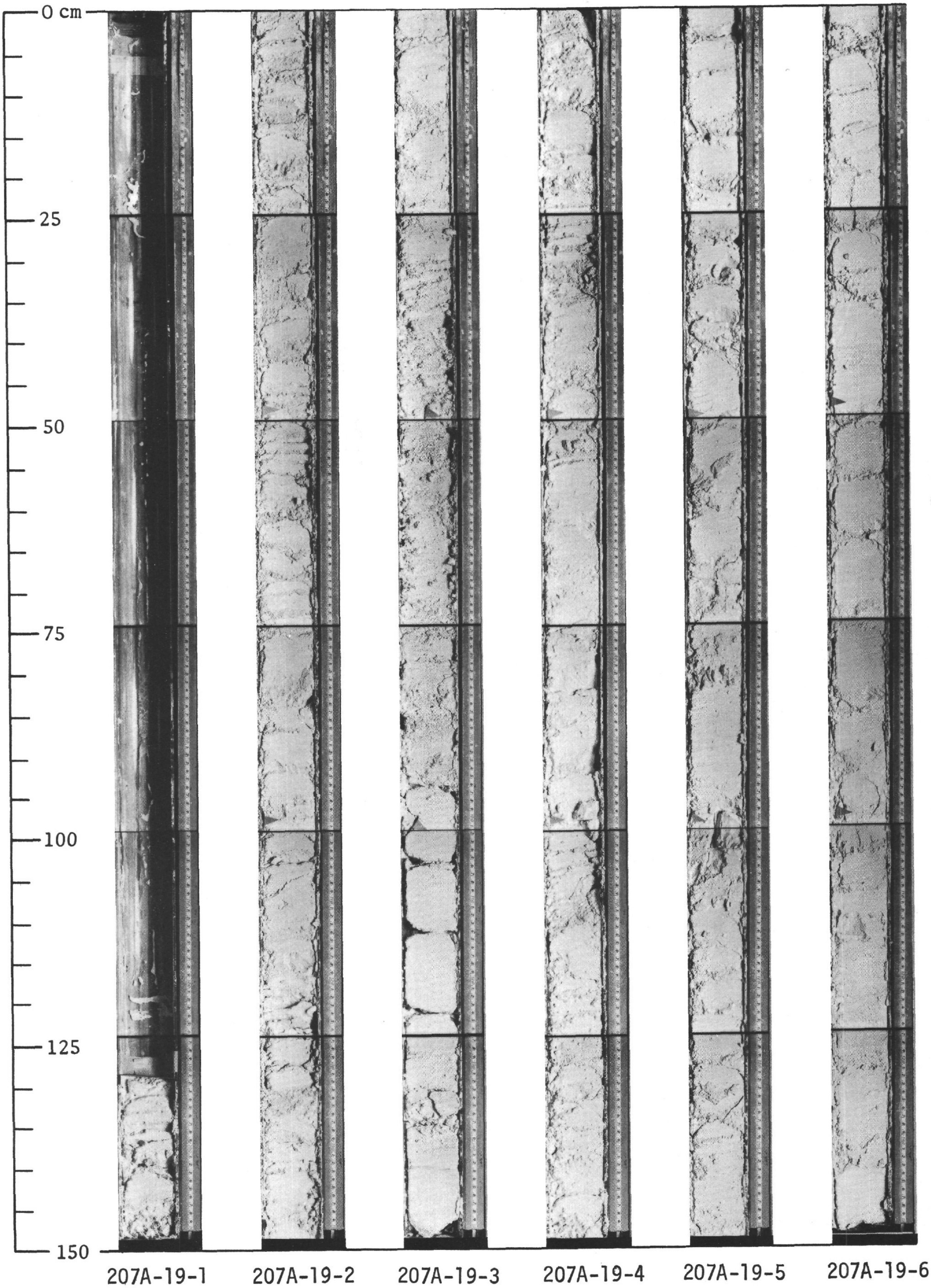
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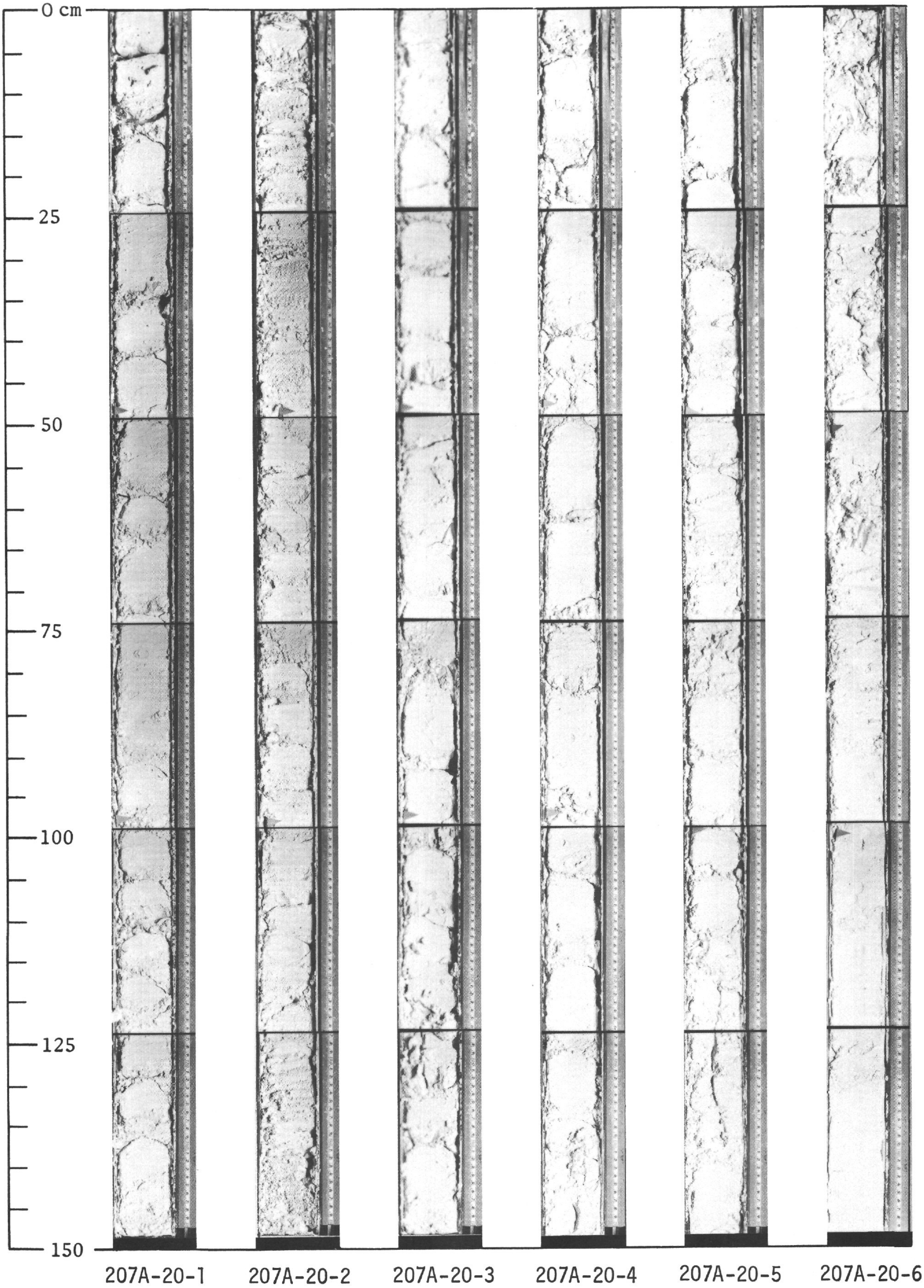
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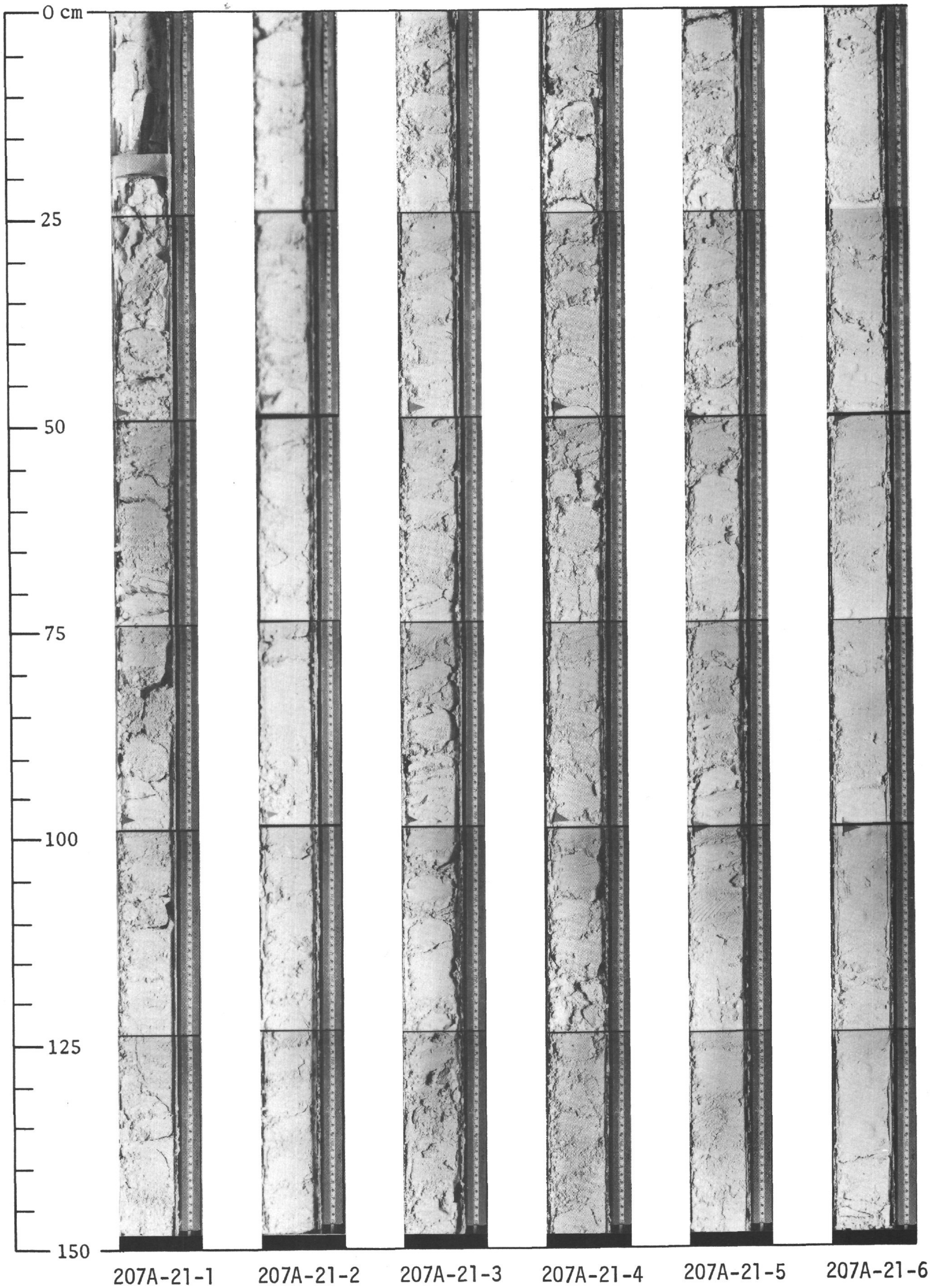
207A-20-6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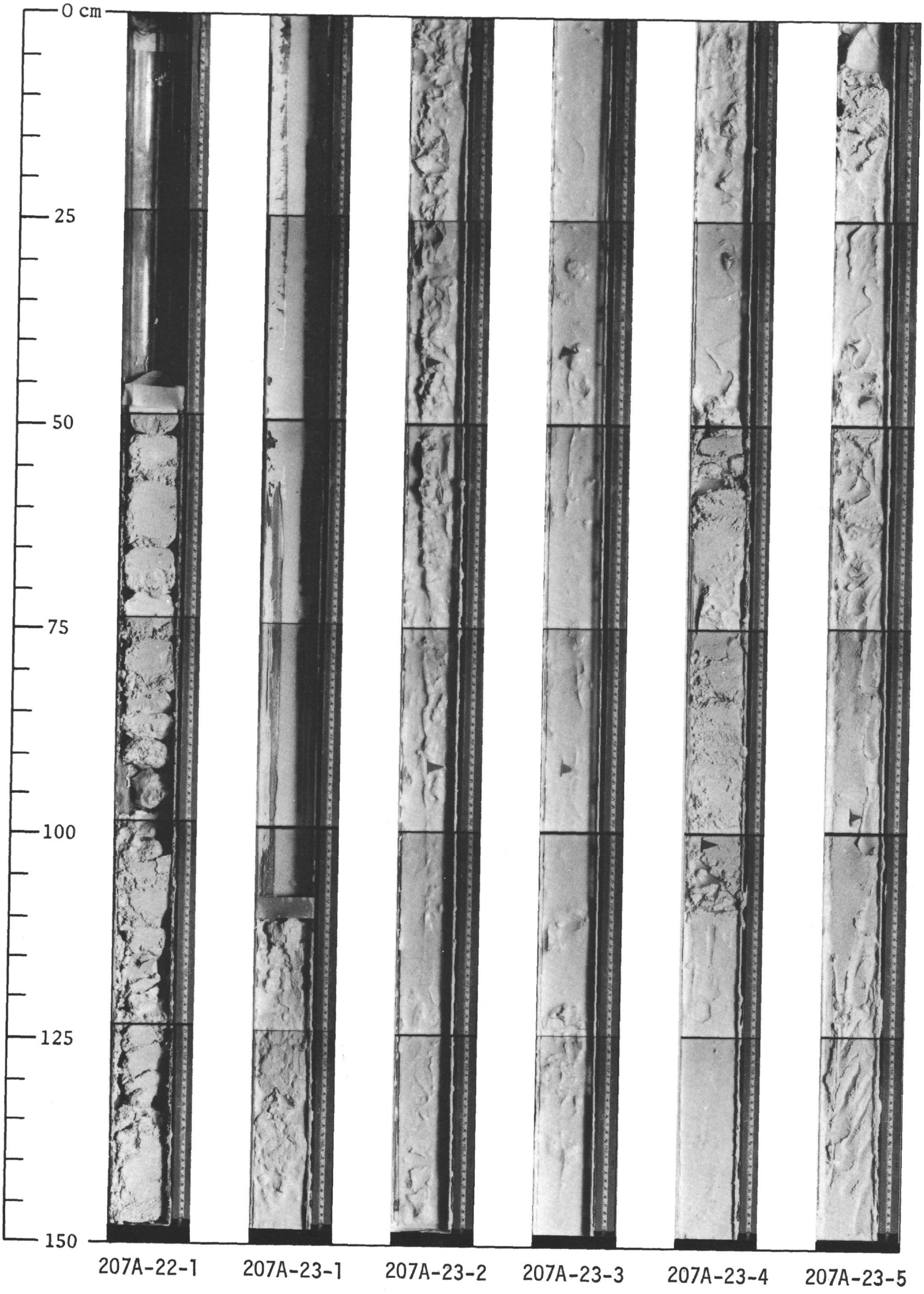
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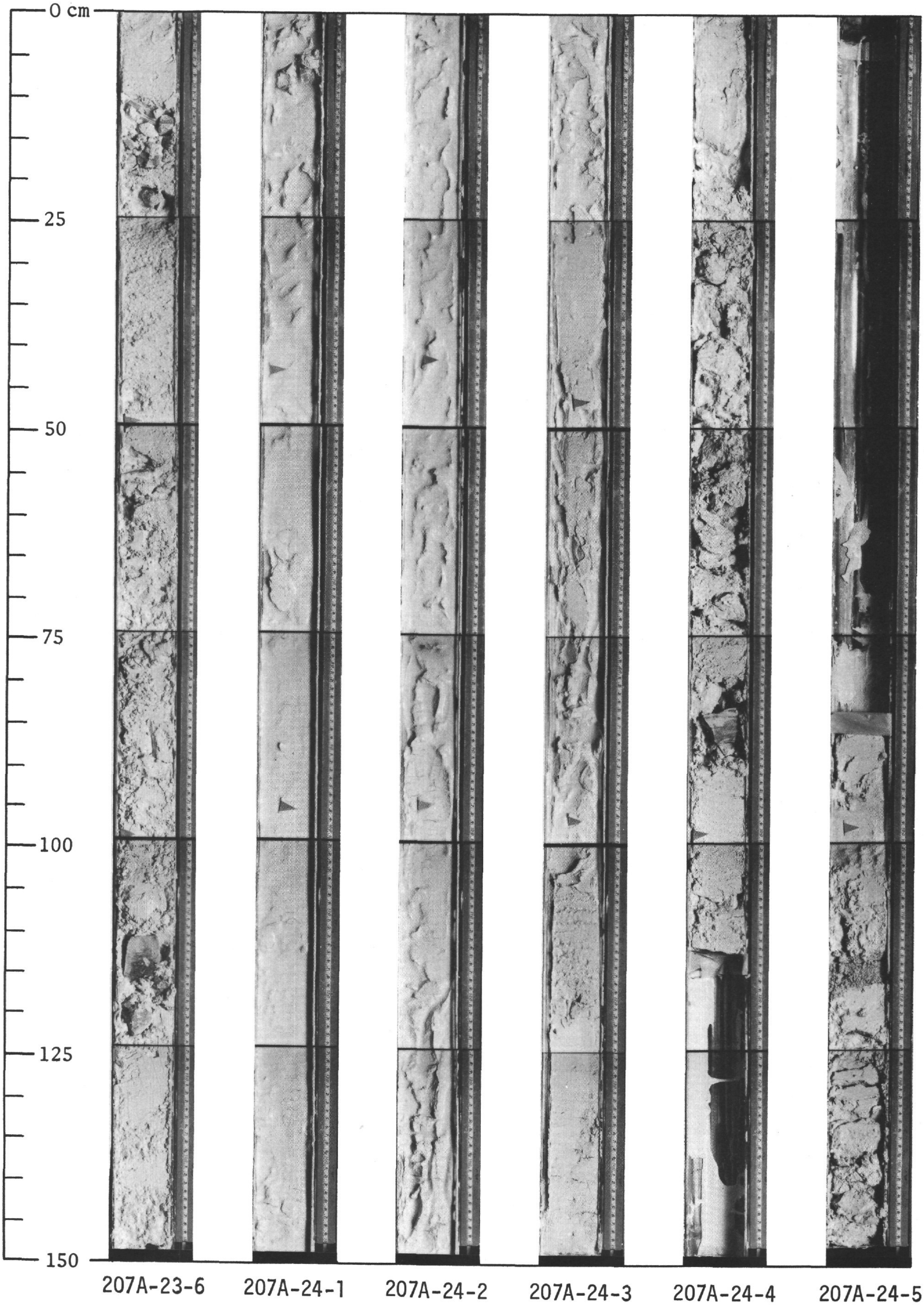
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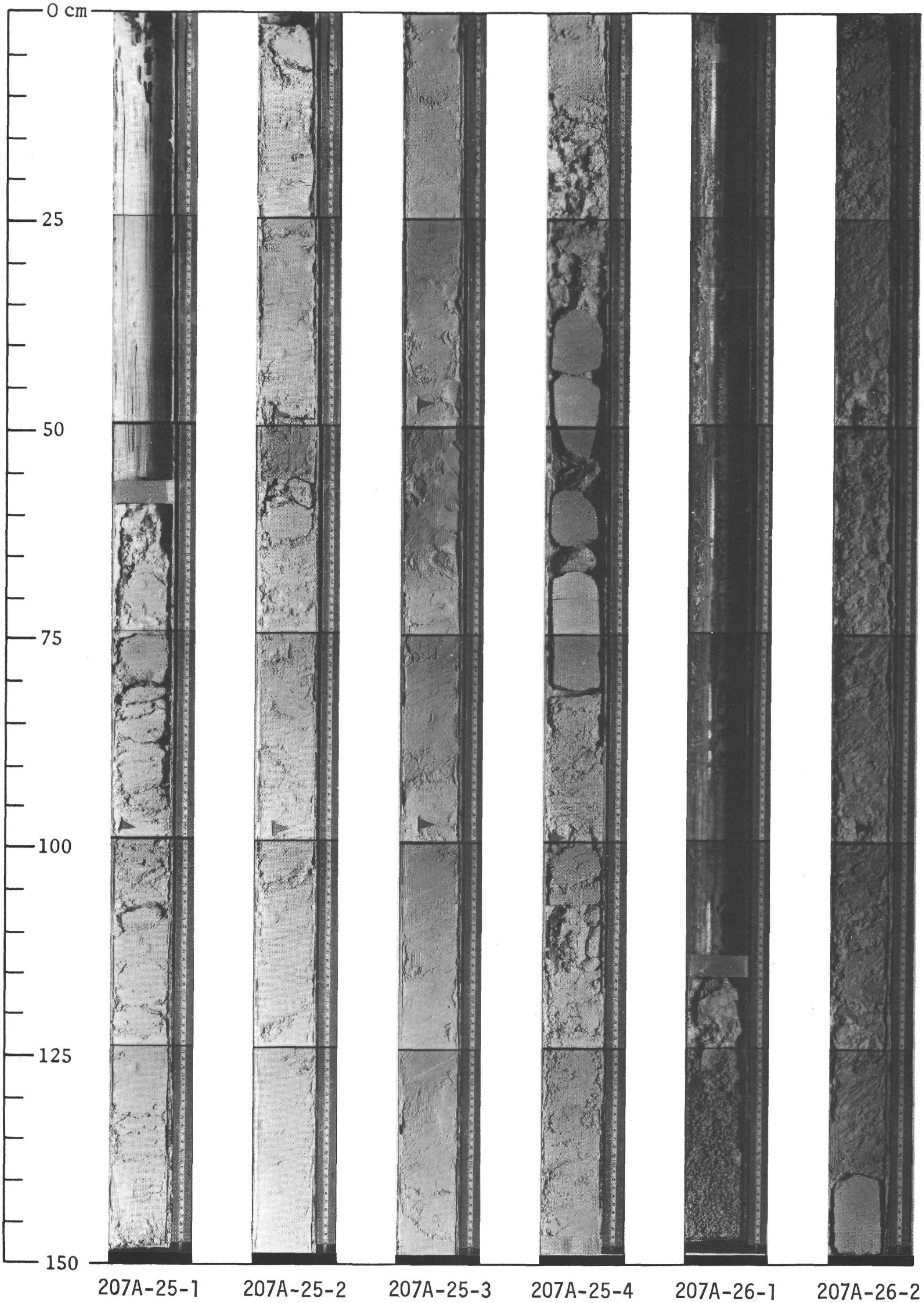
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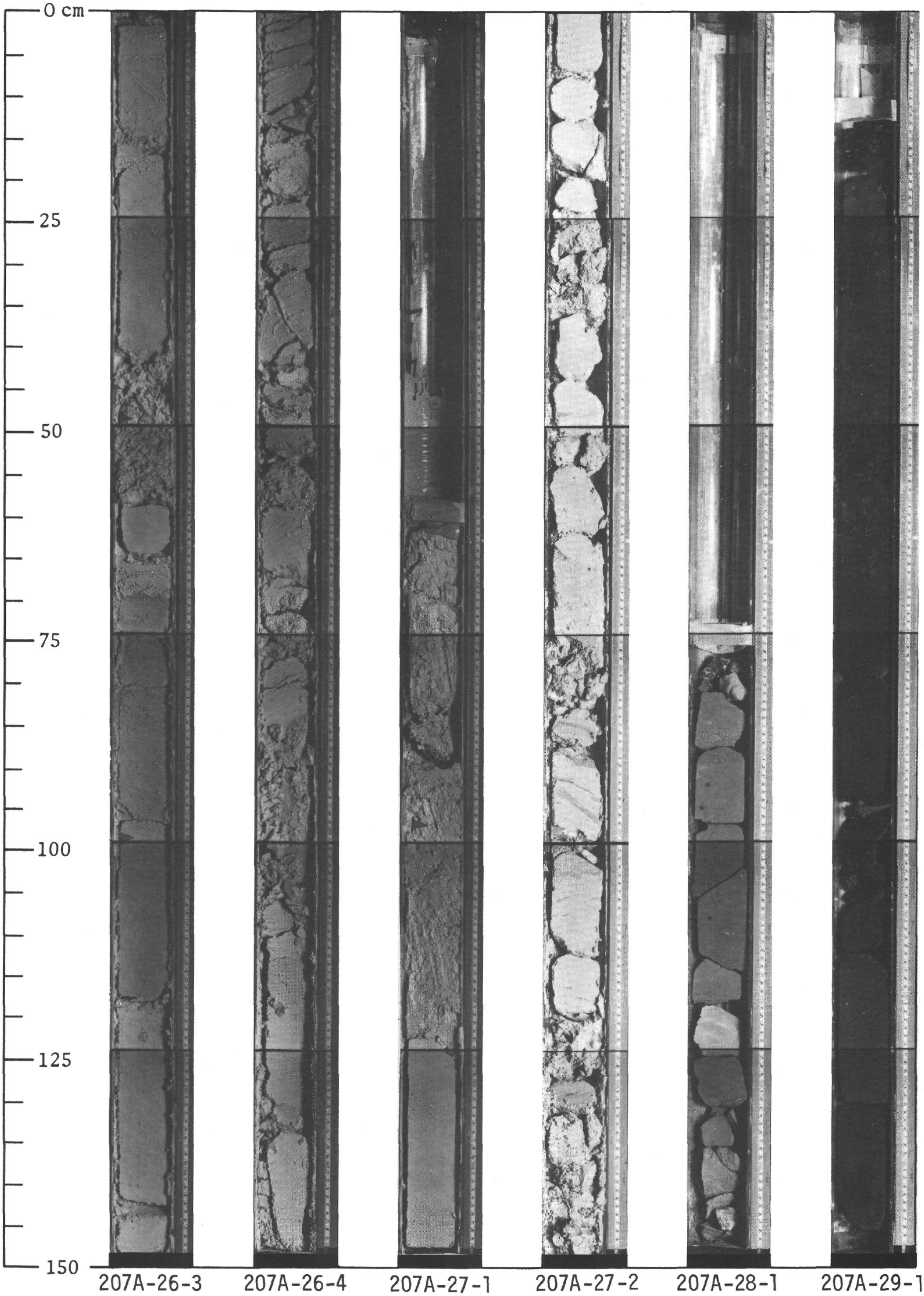
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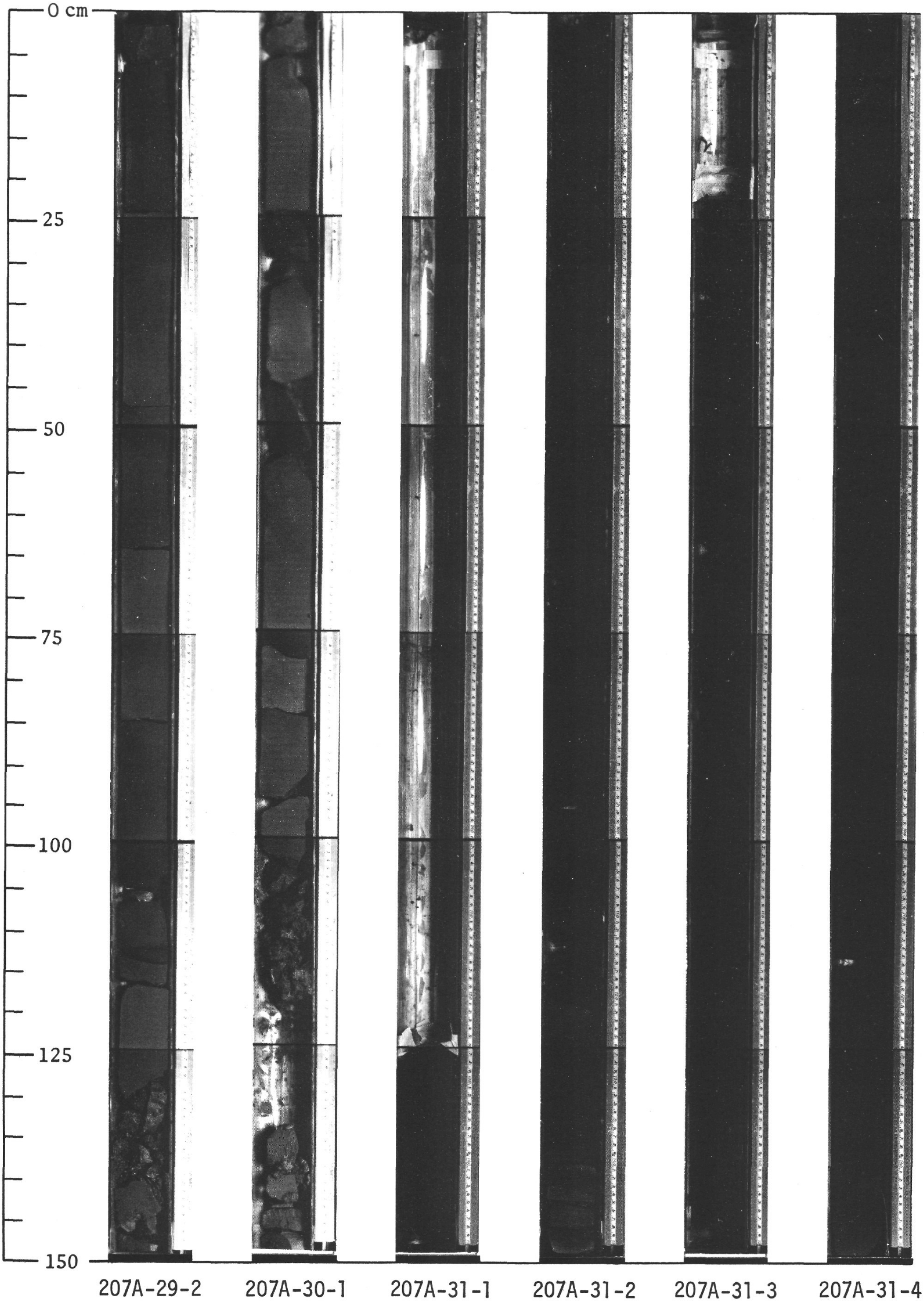
207A-29-1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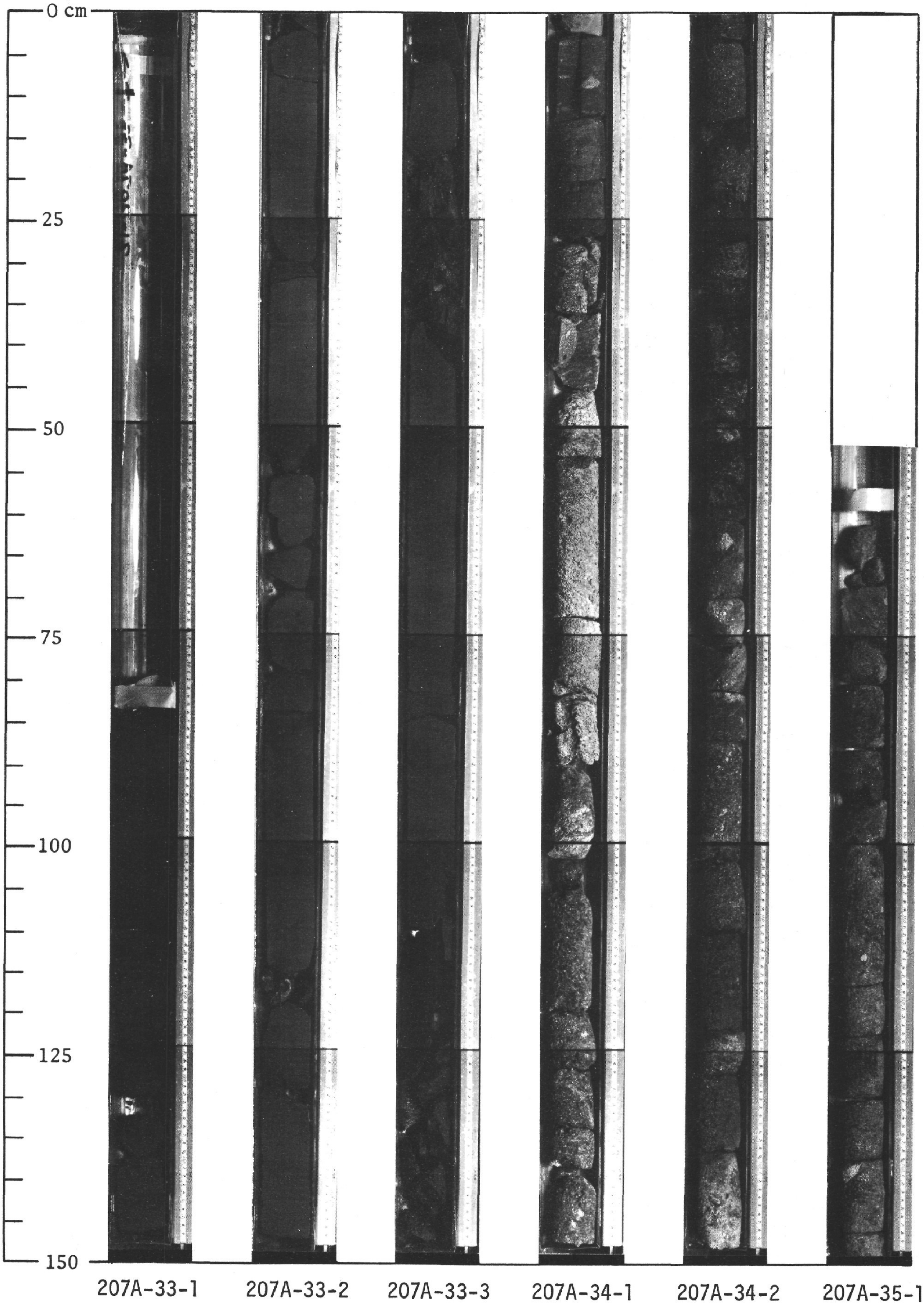
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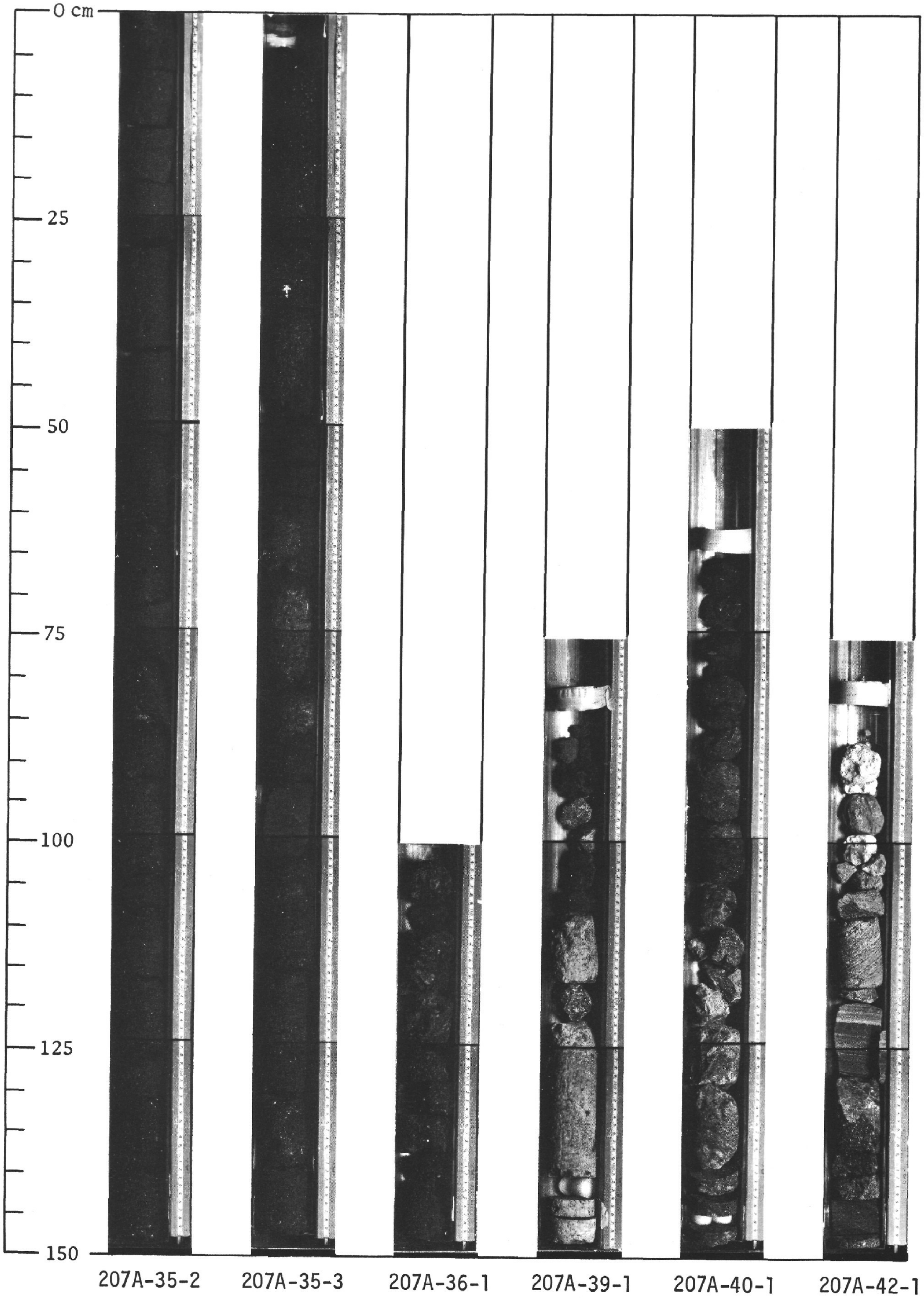
207A-33-2
207A-33-3
207A-34-1
207A-34-2
207A-35-1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207A-35-3
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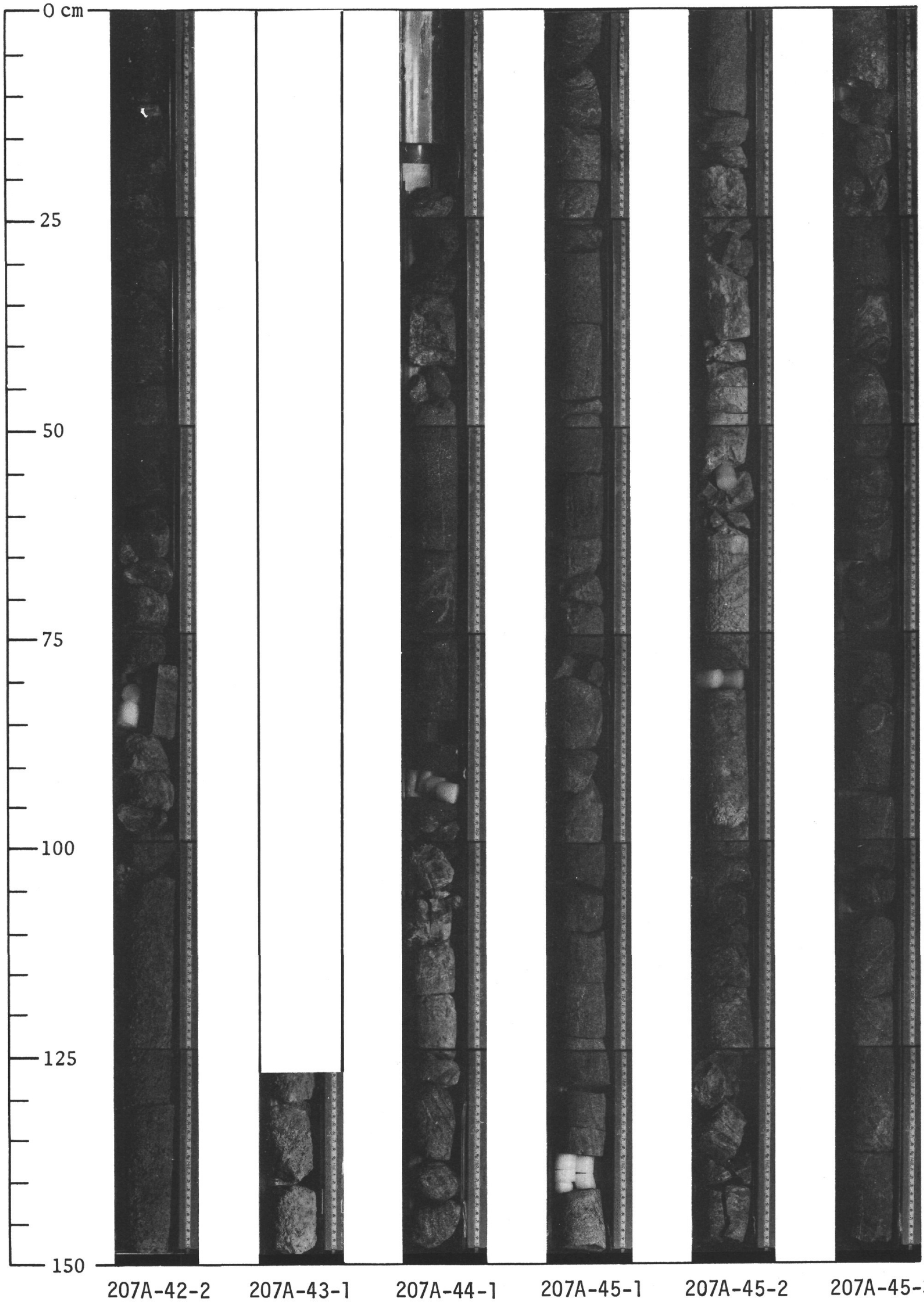
207A-39-1
207A-40-1
207A-42-1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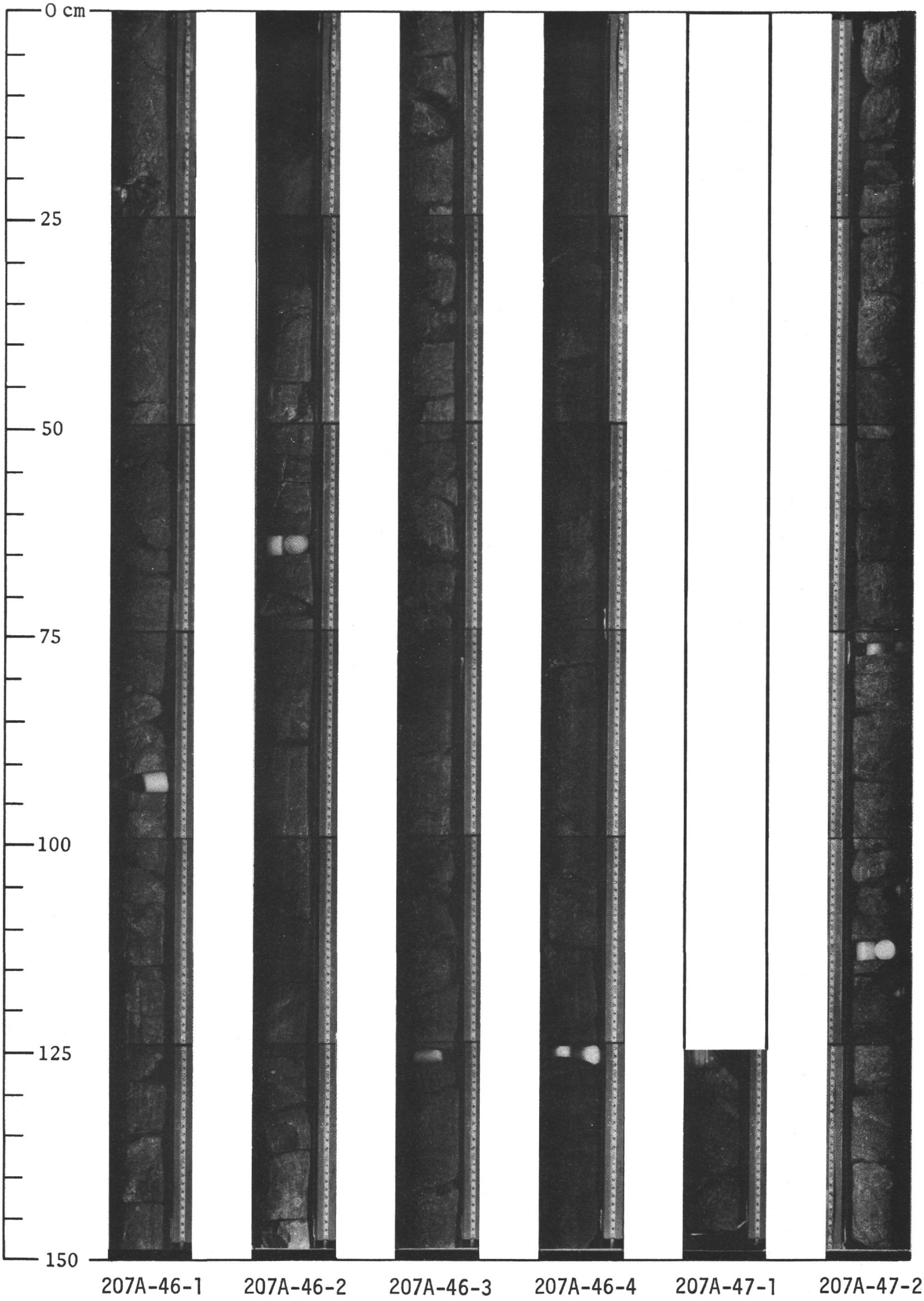
207A-45-3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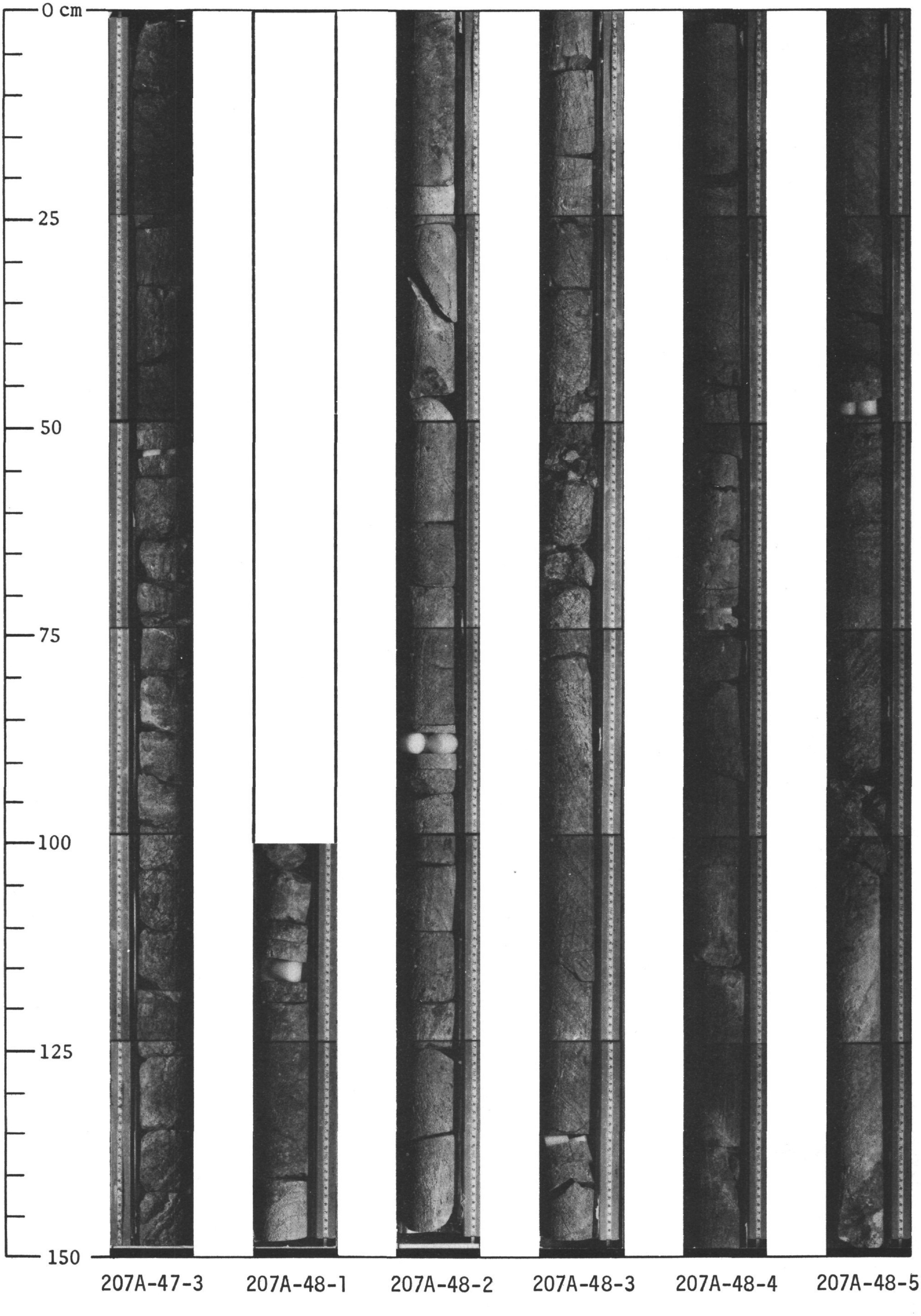
207A-47-1
207A-47-2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207A-48-1
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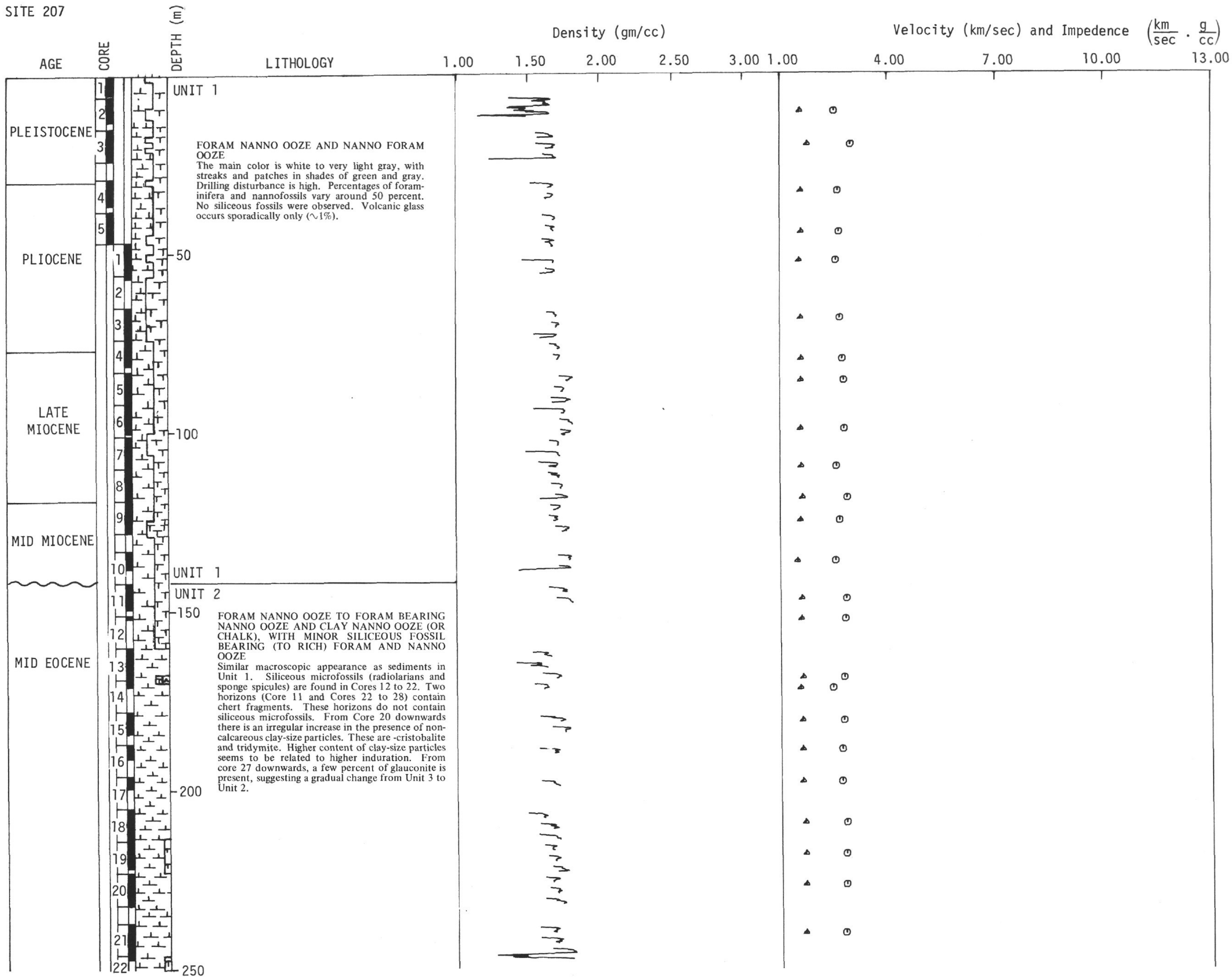
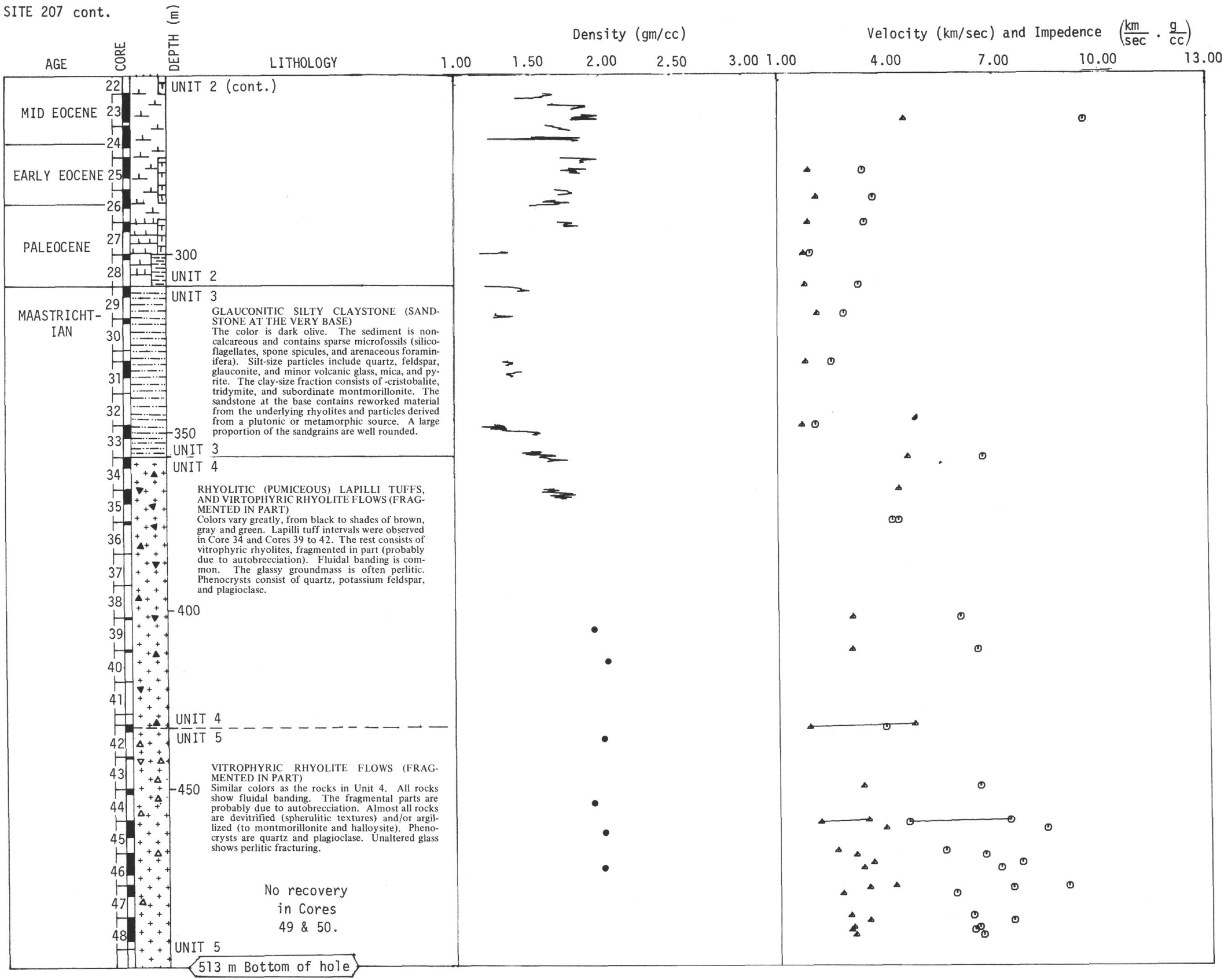
207A-48-5


SITE 207
AGE
CORE
DEPTH (m)
LITHOLOGY
Density (gm/cc)
1.00 1.50 2.00 2.50 3.00
Velocity (km/sec) and Impedence (km/sec · g/cc)
1.00 4.00 7.00 10.00 13.00
PLEISTOCENE
PLIOCENE
LATE MIOCENE
MID MIOCENE
MID EOCENE
1 2 3 4 5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
50
100
150
200
250
UNIT 1
FORAM NANNO OOZE AND NANNO FORAM OOZE
The main color is white to very light gray, with streaks and patches in shades of green and gray. Drilling disturbance is high. Percentages of foraminifera and nannofossils vary around 50 percent. No siliceous fossils were observed. Volcanic glass occurs sporadically only (∿1%).
UNIT 1
UNIT 2
FORAM NANNO OOZE TO FORAM BEARING NANNO OOZE AND CLAY NANNO OOZE (OR CHALK), WITH MINOR SILICEOUS FOSSIL BEARING (TO RICH) FORAM AND NANNO OOZE
Similar macroscopic appearance as sediments in Unit 1. Siliceous microfossils (radiolarians and sponge spicules) are found in Cores 12 to 22. Two horizons (Core 11 and Cores 22 to 28) contain chert fragments. These horizons do not contain siliceous microfossils. From Core 20 downwards there is an irregular increase in the presence of non-calcareous clay-size particles. These are -cristobalite and tridymite. Higher content of clay-size particles seems to be related to higher induration. From core 27 downwards, a few percent of glauconite is present, suggesting a gradual change from Unit 3 to Unit 2.



SITE 207 cont.
AGE
CORE
DEPTH (m)
LITHOLOGY
Density (gm/cc)
1.00 1.50 2.00 2.50 3.00
Velocity (km/sec) and Impedence (km/sec · g/cc)
1.00 4.00 7.00 10.00 13.00
MID EOCENE
EARLY EOCENE
PALEOCENE
MAASTRICHT-IAN
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
300
350
400
450
UNIT 2 (cont.)
UNIT 2
UNIT 3
GLAUCONITIC SILTY CLAYSTONE (SANDSTONE AT THE VERY BASE)
The color is dark olive. The sediment is non-calcareous and contains sparse microfossils (silicoflagellates, spone spicules, and arenaceous foraminifera). Silt-size particles include quartz, feldspar, glauconite, and minor volcanic glass, mica, and pyrite. The clay-size fraction consists of -cristobalite, tridymite, and subordinate montmorillonite. The sandstone at the base contains reworked material from the underlying rhyolites and particles derived from a plutonic or metamorphic source. A large proportion of the sandgrains are well rounded.
UNIT 3
UNIT 4
RHYOLITIC (PUMICEOUS) LAPILLI TUFFS, AND VIRTOPHYRIC RHYOLITE FLOWS (FRAGMENTED IN PART)
Colors vary greatly, from black to shades of brown, gray and green. Lapilli tuff intervals were observed in Core 34 and Cores 39 to 42. The rest consists of vitrophyric rhyolites, fragmented in part (probably due to autobrecciation). Fluidal banding is common. The glassy groundmass is often perlitic. Phenocrysts consist of quartz, potassium feldspar, and plagioclase.
UNIT 4
UNIT 5
VITROPHYRIC RHYOLITE FLOWS (FRAGMENTED IN PART)
Similar colors as the rocks in Unit 4. All rocks show fluidal banding. The fragmental parts are probably due to autobrecciation. Almost all rocks are devitrified (spherulitic textures) and/or argillized (to montmorillonite and halloysite). Phenocrysts are quartz and plagioclase. Unaltered glass shows perlitic fracturing.
No recovery in Cores 49 & 50.
UNIT 5
513 m Bottom of hole