BACKGROUND AND OBJECTIVES

GLORIA side-scan sonar studies, conducted during February 1982, were the first observations that showed

the presence of a sinuous channel at the apex of the middle fan area of the youngest fan lobe (Garrison et al., 1982). More detailed observations in this area were made during the precruise survey in December 1982 by Conrad. Racal-Decca, in conjunction with Louisiana State University's Coastal Studies Institute, ran a deep-towed EDO side-scan sonar high-resolution profiler over this area.

All observations unveiled a number of facts and led to several hypotheses. The sinuous channel in this area is the continuation of the large channel on the upper fan. However, on the upper fan it is only slightly sinuous and lacks major lateral overbank deposits. The change occurs at or near the base of the slope, where the gradient of the seafloor suddenly decreases. The width of the channel near Site 621 is about 3 km and its morphological depth is about 40 m. It is flanked by well-developed levees. The Sea MARC I side-scan sonar data taken during the Conrad cruise show indistinct channel-parallel lineations inside the channel and several features outside the channel that can best be interpreted as ridge and swale features. The EDO side-scan sonar, with its much higher resolution but narrower coverage in width, shows transverse bed forms on the channel bottom.

In the upper part of the channel fill, one notices on 3.5- and 4.5-kHz records reflectors that start at the inner side of the levees and dip toward the center of the channel. Penetration on those records is insufficient to follow those reflectors into the central part of the channel. Deeper-penetration seismic reflection profiles lack that type of high acoustical resolution; however, they vaguely show an asymmetric channel fill underlain by a slightly dipping set of high-amplitude reflectors. These reflectors dip away from under the present thalweg across the inner meander bend.

Several hypotheses were developed, ranging from a fluvial migratory channel concept to a debris flow interpretation to a semiconduit type channel transporting turbidity currents. Each of the hypotheses was able to explain most of the observed features but data were lacking to distinguish between them.

We drilled at Site 621 to satisfy the following objectives:

1. To obtain sedimentological, paleontological, geochemical, and geotechnical properties of the sediments that comprise a middle fan area channel fill,
2. To obtain a set of well logs to characterize this type of channel fill,
3. To obtain good paleontological dates to establish the age of the channel fill and depositional rates,
4. To identify the environments of the sediments in the source area,
5. To test if the channel was migratory in nature,
6. To integrate this data with the observations made
at Sites 622, 617, and 620, and
7. To identify the characteristics of the different acoustical reflectors with a special emphasis on the deeper high-amplitude ones.

**OPERATIONS**

Site 621 was located at the positioning beacon that had been emplaced on 17 October, concurrent with the Site 617 beacon. Two passes over the site coordinates were required to lock onto the acoustic signal. The beacon signal strength was found to be only about 10% of normal, but the pulse characteristics were satisfactory for positioning.

The hole was spudded at 2316 hr., 26 October, with a piston core that streaked to 2488.5 m. Core recovery was 3.5 m, making the water depth 2485.0 m (Table 1). Variable length piston hydraulic core (VHPHC) operations continued in clay and mud, which became sandy below 135 m sub-bottom. The amount of sand increased with depth, with loose sand strata beginning around 200 m. Zones of coarse gravel were also cored and recovered with the sand. At that depth, hole trouble began almost immediately with torque and bottom fill. As there was little chance of reaching the projected 250-m target, coring was terminated to obtain well logs before serious hole difficulties could begin.

The first logging run was with the long-spaced sonic/caliper/gamma-ray tool. The induction sonde normally run in this tool configuration was omitted in favor of the gamma-ray module at the bottom of the tool string. As usual, bridges and ledges in the washed-out hole impeded the logging tool's progress, but it was eventually worked down to just a few meters short of total depth. A good quality log was recorded and the cable was recovered to change logging sondes. The second run was made with the formation density/compensated neutron log/gamma ray (FD/CNL/GR) tool. This time more trouble was encountered in getting down the hole. It was necessary to "spud" the tool to break through a bridge, and the cable was damaged at the cable head. The damaged conductors eliminated the neutron and gamma-ray curves completely. The formation density trace was later found to be out of calibration and useless.

The logging equipment was then rigged down and the pipe was pulled. **Glomar Challenger** departed the site for a short move to Site 622 at 0115 hr., 29 October.

**SEISMIC STRATIGRAPHY AND ACOUSTIC FACES**

Site 621 is located in the most recent Mississippi Fan channel, in the thalweg of a channel bend. The channel is about 3 km wide and its floor is 15 to 35 m below the adjacent levee crests.

The channel bend was initially identified on GLORIA side-scan records (Garrison et al., 1982) and selected as a potential drill target. This area of the channel was studied in further detail as part of the December 1982 site survey (Kastens and Shor, 1985). The survey was conducted with a deep-towed instrument package, Sea MARC I side-scan sonar and 4.5-kHz acoustic profiler, a hull-mounted 3.5-kHz high-resolution profiler, and a single-channel seismic reflection profiling system with an 80-cm³ water gun acoustic source. Additional seismic lines were collected by the **Kane** (1969), the U.S. Geological Survey (1981), and the University of Texas Geophysical Institute (1974). An additional deep-towed (side-scan sonar and 3.5-kHz sub-bottom profiler) line was collected during the summer of 1982 with an EDO system.

During the site survey, 25 parallel lines were run in a northeast-southwest direction with a line spacing of about 500 m. Four northwest-southeast cross lines were also run. Ship and Sea MARC I tracks are shown in Figure 1.

**Seismic Stratigraphy**

Three distinct reflectors that separate four seismic units have been identified within the channel fill at Site 621 (Fig. 2; Table 2). No distinct lithologic change can be seen near the depth of Reflector A (see Lithostratigraphy section, this chapter). Reflector B at 135 m sub-bottom depth appears to correspond to both a gradual increase in the number and the thickness of silt laminae
and beds. The strongest reflector (C) at 185 m sub-bottom probably corresponds to an increase in sand as observed in Core 621-28.

The upper two seismic units (1 and 2) consist of clays and muds and silty muds. Seismic Unit 3 is generally coarser, with interbedded silt and sand. The high-amplitude reflectors of Seismic Unit 4 (below Reflector C) correspond to gravels and sands.

**Acoustic Facies**

The Conrad 3.5-kHz profiles and the deep-tow 4.5-kHz profiles (Fig. 3) show that the channel is filled with at least 40 m of acoustically transparent material. On some profiles, the western channel floor has a few areas of slightly hyperbolic echo returns. The exception to this uniform character of the reflectors is a single reflector that originates on the channel edges, roughly parallel to the channel surface but at a slightly steeper angle. The reflector dies out before reaching Site 621. If its position is extrapolated to the site, it would be located near 38 m sub-bottom. No lithologic change was encountered in the upper 50 m of the hole.

**BIOSTRATIGRAPHY AND SEDIMENTATION RATES**

**Biostratigraphy**

The section penetrated in Hole 621 is Quaternary, correlating with the planktonic foraminifer Zone N23 and the calcareous nannofossil Zone NN21. The interval includes the Holocene Epoch (Ericson Zone Z; Ericson and Wollin, 1968) and the late Wisconsin glacial (Ericson Zone Y) (Fig. 4). The warm interstadial of the Wisconsin glacial (Ericson Zone X or *Globorotalia flexuosa* Zone) was not encountered to a depth of 214.8 m (see Explanatory Notes, this volume).

Zone Y contains a mixed displaced fauna with common shallow neritic and rare upper bathyal benthic foraminifers. This interval includes predominantly reworked Cretaceous calcareous nannofossils and a poorly devel-
Figure 2. Water-gun reflection profile (Conrad, Line 2003) near Site 621 showing major channel-fill Reflectors A, B, and C that separate Seismic Units 1–4. Seismic Horizon “30” is visible on the record while seismic Horizon “20” was cut by the channel. (See Introduction and Principal Results chapter, this volume, for an explanation of seismic horizons.) Location of water gun profile shown in Figure 1.

Table 2. Reflectors and seismic units observed at Site 621.

<table>
<thead>
<tr>
<th>Sub-bottom depth (m)</th>
<th>Sub-bottom depth (ms)</th>
<th>Reflector</th>
<th>Seismic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–110</td>
<td>0–140</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>110</td>
<td>140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110–135</td>
<td>140–171</td>
<td>B</td>
<td>2</td>
</tr>
<tr>
<td>135</td>
<td>171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135–185</td>
<td>171–232</td>
<td>C</td>
<td>3</td>
</tr>
<tr>
<td>185</td>
<td>232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;185</td>
<td>&gt;232</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Reflectors and seismic units are shown on Figure 2.

Foraminifers

Foraminifers from Site 621 are Quaternary, Zone N23 (Blow, 1969). A warm-water, high-diversity planktonic foraminiferal ooze occurs in the upper portion of Section 621-1-1. This Holocene (Ericson Zone Z) fauna contains abundant Globorotalia menardii and common G. tumida, along with the associated bathyal foraminifers Cibicides wuellerstorfi and C. kullenbergi.

The remainder of the hole is late Wisconsin glacial (Zone Y) and is composed of homogeneous muds with fine sand and silt laminae (Cores 621-1 through 621-32). The foraminiferal fauna is dominated by common shallow-water benthic ones such as Ammonia brevicaii, Hanzawaia concentrica, Elphidium spp., Florilus spp., and miliolids. Planktonic foraminifers are rare, indicating a very high deposition rate for this interval.

The tests of many of the shallow-water benthic taxa are abraded, which suggests a high energy environment for the origin of the sediments. The occurrence of rare bathyal species, Oridorsalis umbonatus, Bulimina aculeata, and Gyroidinoides soldani, indicates transport of mixed upper bathyal and neritic sediments into the abyssal environment.
The diverse neritic benthic fauna is well developed in Core 621-2 through Sample 621-17, CC and decreases in abundance from Cores 621-18 to 621-32. Core 621-33 contains coarse sand and gravel with only rare reworked Cretaceous foraminifers.

The Wisconsin interstadial (Ericson Zone X) was not reached at the total depth of 214.8 m.

**Calcareaous Nannofossils**

All cores recovered from this site are interpreted to be in the *Emiliania huxleyi* Zone (NN21) of Martini (1971). The marly foraminiferal ooze of Holocene age contains very abundant, well-preserved Quaternary calcareous nannofossils. Reworked Cretaceous nannofossils are either absent or very rare. Small coccoliths that are tentatively identified as *E. huxleyi* dominate this nannofossil assemblage. Below the ooze, the sediment contains few calcareous nannofossils and the assemblage is dominated by reworked Cretaceous species. Pleistocene species, when present, are rare to the total depth of this hole at 214.8 m.

**Sedimentation Rates**

The sedimentation rates are based on two datums. An age of 0.012 Ma is used for the Holocene/Pleistocene boundary (Z/Y zonal boundary) and 0.085 Ma for the Y/X zonal boundary (see Explanatory Notes, this volume).

A sedimentation rate of 12.5 cm/1000 yr. is calculated for the Holocene. This is a minimum rate assuming complete Holocene recovery (Fig. 5). By using a seismic projection to the top of the X Zone (781 m for seismic Horizon “30”; see introductory chapter, this volume), a projected minimum sedimentation rate of 1068 cm/1000 yr. is computed for the Y Zone. These calculations are based on nondecompacted sediment thicknesses.

**LITHOSTRATIGRAPHY**

The cores collected from Site 621 show a generally fining-upward sequence of sediments ranging from graveliferous at the bottom to fine clay near the top. The coarser material may represent a lag deposit left behind during an active period of sediment transport, whereas the very fine material represents a more or less passive fill.

Core recovery at Site 621 was approximately 95%. Two lithologic units are recognized in the 214.8 m of section drilled (Fig. 4, Table 3).
Lithologic Unit I: Muddy Ooze

A 25-cm-thick brown to dark brown muddy ooze occurs from 0 to 25 cm sub-bottom depth. Texturally, the ooze is composed of 30% sand, 20% silt, and 50% clay. Foraminifers form as much as 40% of the unit and comprise the entire sand fraction and part of the silt fraction. The rest of the silt fraction is angular-to-subangular quartz.

Lithologic Unit II: Muds, Silts, Sands, and Gravels

This unit forms about 99% of the drilled section at Site 621 and contains four facies: (1) clays and muds, (2) silt-laminated muds, (3) sands and silts, and (4) gravels.

Clay and Mud Facies

This facies consists of dark gray, nearly structureless muds with rare, very thin silt laminae. Despite some gas disruption, microscopic evaluation indicates that this facies is laminated on a millimeter scale. Locally, individual horizontal brown, red brown, and olive green-gray color banding is developed, with individual bands up to a few centimeters thick.

This facies appears to be poorly sorted, with silt content typically from 30 to 50% and clay content from 50 to 70%. Quartz, mica, and carbonate are the main silt-sized components. Displaced, diverse, neritic benthic foraminifers predominate over planktonic foraminifers.

Silt-Laminated Mud Facies

This facies consists of mud with abundant silt laminae and silt beds up to 5 cm thick. Some horizons of silt lenses are present. This facies accounts for approximately 90% of the section between 147 and 187 m sub-bottom and constitutes the entire section from 199 to 203 m sub-bottom. The silt laminae are normally graded. Parallel and low-angle cross-lamination is commonly visible above a scoured and loaded base. Individual silt laminae within beds are generally less than 1 mm thick.

The silt-laminated muds contain 2-10% very fine-grained sand, 45-88% silt, and as much as 65% clay. Quartz is the main constituent, and lignite is common (1-3%) in the sand fraction in clasts up to 0.5 cm in diameter. Microfauna are considerably less abundant than in the clays and muds, and displaced neritic shelf faunas seem to predominate over planktonic faunas.

Sand and Silt Facies

Sands and silts account for approximately 50% from 166 to 175 m sub-bottom (Section 621-26-1), 60% between 175 and 187 m sub-bottom (Section 621-27-1 through Sample 621-28,CC), and 80% from 211 to 214 m sub-bottom (Sections 621-33-1 through 621-33-2). Medium to fine-grained sands and silts occur in units up to 60 cm thick and appear structureless.

The non-clay part of the sediment consists of 95% sand-sized quartz and about 5% silt. The grains generally are rounded to subrounded.

Gravel and Pebbley Mud Facies

Gravel-sized clasts occur in a unit at least 4 m thick of pebbly mud (Sections 621-29-1 through 621-29-3), and about 60 cm of pebbles and granules were retrieved from below 214 m sub-bottom (Section 621-33-2). Cores 29 through 33 correspond to the upper part of the acoustic-
al high-amplitude zone and it may be assumed that this entire zone is high in sand and pebble content.

The pebbly mud (Core 621-29) is very poorly sorted with clasts up to 3.4 cm in dimension (Fig. 6A). The pebble and granule fraction makes up from 5 to 20% of the sediment. The clasts are matrix-supported in a mud consisting of 45% silt and 55% clay.

The underlying pebbly zone (Core 621-33) contains little or no sand, which may have been washed out during core retrieval. The pebbles and granules range in size from about 2 mm to 2.5 cm (Fig. 6B, C). Clasts are rounded to subrounded, and show an abrupt grading over a few centimeters into the overlying silt and sand facies. Clast composition is approximately 45% brown chert, 25% black chert, 15% monocrystalline quartz, 5% mudstone, 3% jasper, 2% shell fragments, and 5% miscellaneous minor components.

Vertical Succession

From the lithologic and wireline logging one generally fining-upward interval is observed (Fig. 4). The fining-upward sequence contains the following main facies distribution from the bottom to the top: (1) gravel and pebbly mud facies (214.8–206 m sub-bottom); (2) sand and silt facies, silty mud facies, silt-laminated mud facies, and some gravel and pebbly mud facies (206–155 m sub-bottom), and (3) clay and mud facies, silty mud and silt-laminated mud facies (156 m–25 cm sub-bottom).

**GEOCHEMISTRY**

Organic Geochemistry

The scientific goals of the organic geochemistry program for Deep Sea Drilling Project (DSDP) Leg 96 are multifaceted. The areas of investigation addressed in the second part of this volume include: (1) the geochemistry and distribution of gaseous (C$_1$/C$_2$), liquid (C$_5$/C$_3$O), and higher molecular weight organic compounds in marine sediments, (2) the effect of glacial events on sedimentary organic geochemistry, (3) the early diagenesis of organic matter in marine sediments in general; (4) the study of standard organic geochemical parameters in deep-sea fans and intraslope basin sediments (with particular reference to the type and amount of organic matter, its maturity, and its petroleum-generating potential), (5) a comparative study of the sedimentary organic geochemistry of an anoxic basin (Orca) versus that of an oxic basin (Pigmy) in the intraslope region, (6) the detection of microbial activity in recent marine sediments; and (7) the chemistry of pore water in relation to the surrounding mineral matrix and early cementation and diagenesis of sediments.

The analytical nature of the geochemistry program, the complexity of the sampling, and time and personnel constraints dictated primarily shore-based analytical effort. As such, only obvious gas shows (collected in vacutainers and analyzed by standard DSDP methods; see Explanatory Notes, this volume) were analyzed on board the *Glomar Challenger*.

Gulf of Mexico slope and continental shelf sediments obtained by standard shallow piston cores are often very gassy because of shallow microbial production of methane (and possibly other light hydrocarbon gases) and the upward migration of deeper sourced and reservoired petrogenic or thermogenic gases. In shallow marine sediments it has also been suggested that small amounts of
low-molecular-weight hydrocarbon gases can be generated during the early diagenesis of sedimentary organic matter (less than 50°C). The absence or near absence of gaseous hydrocarbons in most of the cores recovered at the Mississippi Fan sites may result from several factors:

1. Rapid rates of sedimentation could dilute nonrefractory (biodegradable) organic matter (from overlying water or riverine inputs) with clays or refractory organic matter (derived from slumped or continentally derived organic matter).

Figure 6. Photographs of characteristic facies in Lithologic Unit II. A. Pebbly mud (Core 621-29-1, 33-75 cm). B. Gradation from sand to gravel (Core 621-33-2, 0-38 cm). C. Basal part of pebble interval with clasts up to 3.5 cm in size (Core 621-33, CC).
2. The coarse-grained sediments encountered near the sediment/water interface at the time of deposition could permit the rapid loss of any produced methane to the overlying water column.

3. The temperature and pressure regime at these holes could cause a suppression of the metabolic activity of microorganisms that produce methane as compared to shallower and warmer intraslope and continental margin sediments.

4. The supply of organic matter may be too low or too refractory to support microorganisms.

5. Early thermal diagenesis of organic matter producing gaseous hydrocarbons could be low level because of the relatively low temperature and low geothermal gradient in this area.

6. No significant deeper reservoired petroleum-condensate-gas occurs in this vicinity or no adequate pathway or conduit to surface sediments is available.

7. The presence of microbial sulfate reduction, which has been widely observed to preclude the large microbiological methane production that occurs in the sulfate-free zone.

One, or more likely a combination, of these parameters could result in the low level of gaseous hydrocarbons observed at Site 621 and at other sites examined on this leg that show little or no gas. Slow deposition rates that can cause aerobic microbial degradation of organic matter at the time of sediment deposition were not observed at any Leg 96 sites.Interstitial water sulfate levels remained near seawater values (see Presley et al., Ishizuka, Kawahata, et al.; and Ishizuka, Ittekkot, et al., all this volume) throughout this hole, so that a sulfate-free zone where methanogenic bacterial activity might have occurred was never observed.

Gas pressure in end caps of sectioned cores collected at Site 621 began in Core 621-3 and continued through Core 621-7 (Table 4). Only traces of methane and carbon dioxide (454 and 377 ppm, respectively) were present in Core 621-3. The remaining gas is either nitrogen (caused by nitrate-reducing microorganisms) or, more probably, air (presumably caused by degassing of air dissolved in pore space). The shipboard gas chromatograph did not separate nitrogen from oxygen to distinguish between these two possibilities.

No sulfide odor was observed when the cores were brought on deck, although black sediments (iron sulfides) were common. A strong hydrogen sulfide odor was observed later, when the cores were squeezed to obtain gas samples. The percentage of methane in the core gas increases with depth and reaches a maximum (70%) in Section 621-5-2, followed by a decrease to 7 and 9% in Sections 621-6-2 and 621-7-2, respectively (Table 4). In all cases, the amount of gas present was insufficient to cause extrusion of cores from the liners, although numerous gas cracks were observed in the split cores. In Cores 621-3 through 621-6, which are all muds, gas expansion cracks were so small that the gas was difficult to sample without clogging the sampler. A good gas pocket, indicating the presence of more gas than in Cores 3-6, was found in Core 621-7.

Gas pressures high enough to cause bulging of end caps in sectioned cores were observed only sporadically in the rest of the hole: once in Section 621-19-1 (123.7 m sub-bottom depth; 37% methane) and once again in Section 621-27-1 (175.9 m sub-bottom depth; 14% methane) (Table 4). In both of these cases, methane was associated with cores containing sand or silt layers, so that biogenic methane may have migrated into these two sections.

Note that the depth of the gas sample from Section 621-5-2 (~35 m sub-bottom), which showed a methane maximum, corresponds to a mysterious "bright spot" on the seismic record which is not explicable by any lithologic change. However, the quantities of gas detected in this core appear insufficient to have caused bubble formation at subsurface in situ pressures. No evidence for clathrates was observed in the core. It is possible that the seismic bright spot is caused by other localized areas of higher biogenic gas content in the surrounding sediments. In this area of very high deposition rates, it is likely that localized small pockets of biogenic methane that have not yet had time to diffuse out of the fine-grained muds may form.

The higher C1/C2 ratio, the low interstitial water sulfate levels (<5 mM below 10 m sub-bottom), and the relatively high alkalinites (about 10-20 mEq/L) from 10 to 100 m sub-bottom (Ishizuka, Kawahata, et al., this volume) are all consistent with a microbiological source for the methane.

### Inorganic Geochemistry

Black sediments occur at this site from Cores 621-3 to 621-14. These sediments had a strong hydrogen sulfide odor at the time they were squeezed to obtain interstitial water. The black color changed to dark brown after exposure to air for some time. These observations suggest that there is greigite and mackinawite in the sediments of those core sections. These minerals are iron sulfides and are very unstable.

Results of interstitial water analyses can be summarized as follows:

1. The pH value ranges between 6.7 and 7.7 and averages 7.2.

2. Total alkalinity shows highest value in Core 621-2 (22.4 mEq/L), decreases with depth to Core 621-5 (8.1 mEq/L), then increases with depth to Core 621-10 (16.0 mEq/L), then again decreases with depth to Core 621-17 (8.8 mEq/L). Total alkalinity value is constant (5.0 mEq/L) between Cores 621-19 and 621-27 (fine sand).

---

Table 4. Site 621 Carle gas data from gas pressure in end caps.

<table>
<thead>
<tr>
<th>Core 3H</th>
<th>Section Methane (%) Ethane (%) C1/C2</th>
<th>CO2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3H 6</td>
<td>0.045 &gt;0.02</td>
<td>(377 ppm)</td>
</tr>
<tr>
<td>4H 2</td>
<td>26.0 &lt;0.02</td>
<td>0.20</td>
</tr>
<tr>
<td>5H 2</td>
<td>6.0 &gt;0.02</td>
<td>&lt;3500</td>
</tr>
<tr>
<td>6H 7</td>
<td>7.2 &lt;0.02</td>
<td>0.40</td>
</tr>
<tr>
<td>7H 2</td>
<td>8.9 &lt;0.02</td>
<td>0.43</td>
</tr>
<tr>
<td>19H 1</td>
<td>36.7 &gt;0.02</td>
<td>1800</td>
</tr>
<tr>
<td>27H 1</td>
<td>14.0 &gt;0.02</td>
<td>0.076</td>
</tr>
</tbody>
</table>

*H following core number indicates hydraulic piston core.*
3. Salinity, as a whole, decreases with depth from 33.9 to 31.0‰.

Interstitial water results are discussed more fully in other chapters of this volume (Presley et al.; Ishizuka, Kawahata, et al.; Ishizuka, Ittekkot, et al., this volume).

**PHYSICAL PROPERTIES**

The sediments at Site 621 suffered from core disturbance because of gas expansion with depths of 10 and 50 m and below 90 m sub-bottom. Furthermore, scattering of data results from changes in the amount of sand and silt present. Sections containing gravel and coarse sand were not sampled.

Wet-bulk density increases from a low of 1.54 g/cm³ at the seafloor to a high of 2.03 g/cm³ at the 199-m interval (Fig. 7A). The gradient of bulk density increase with depth ranges from 0.002 g/cm³ · m in the upper portions of Site 621 to 0.0007 g/cm³ · m in the section below 70 m sub-bottom depth. The low gradient observed in the upper sediment sections is the result of disturbance and the presence of free gas in the pore spaces.

Porosity of the seafloor sediments is approximately 72%. Porosity decreases downhole at a steady rate of 0.0667%/m. In general, no large gradients in porosity near the seafloor are present, except in a limited number of samples (Fig. 7D).

The gradient of void ratio with depth is 0.0052 units/m. The lowest void ratio determined was 0.63 at 212 m sub-bottom depth.

Grain density varies from an average of 2.66 g/cm³ in the upper 60 m to 2.73 g/cm³ in the lower 140 m. Since the majority of sediments at Site 621 sampled for physical properties were clays, the grain density measured in the upper section appears to be low. This could be attributed to either gas in the pore spaces, coring disturbance, or an increase in silt content.

Undrained shear strength increases at a rate of 1.29 kPa/m in the upper 70 m and 1.15 kPa/m in the interval between 70 and 212 m. Zones of high shear strength are found at the 80 to 95 m interval and at the 199 to 212 m interval (Fig. 7E). A calculation of the relationship between undrained shear strength and overburden pressure indicates that most sediments of Site 621 are very likely highly underconsolidated except for one interval at 80 to 95 m sub-bottom depth.

The lowest good sonic velocity value measured was 1.451 km/s and the highest was 1.778 km/s (Fig. 7F). It was impossible to obtain velocities of the sediment in the 9 to 53 m interval and in most of the 91 to 199 m interval because of gas in the pore spaces. The velocities obtained exhibited a large range over a fairly short interval with a large and conflicting acoustic anisotropy.

**SUMMARY AND CONCLUSIONS**

Hole 621 was drilled in the thalweg of the middle fan channel in a water depth of 2481 m. The channel-levee complex on the youngest fan lobe consists of a 3-km-wide sinuous, asymmetrical channel bounded by prominent levees that have relief of up to 35 m above the present channel floor. The sinuosity of the channel is well developed in this area. This channel extends from the mouth of the Mississippi Canyon at the shelf edge to a water depth of about 3400 m, a distance of over 600 km.

The coring was completed to a depth of 214.8 m with the hydraulic piston corer; recovery was excellent and the cores displayed little disturbance until near the bottom of the hole. The hole bottomed within channel fill deposits but the base of the youngest fan lobe was not penetrated; seismically the base of the fan lobe can be projected to the site and is located at a depth of 317 m. The channel sequence displays a fining-upward trend, commencing with coarse gravel at total penetration depth and ending with fine-grained clays capped by a thin marly foraminiferal ooze. The coarser-grained sediments (sands and gravel) extend upward from the bottom of the hole to a depth of 182 m, which comprises a minimum of 32-m thickness. The sandy units vary in thickness from 2 to 5 m and generally display sharp bases. A few thin silty muds, generally less than 1 m thick, are present. These coarser-grained sediments grade upward into interbedded sands and silts with the sands rarely exceeding 1-m thickness. The silty units are poorly sorted and often exhibit little internal structure; they range in thickness from 1 to over 4 m. The interbedded sands and silts extend to a penetration of 150 m (a thickness of 32 m) and grade upward into silty and sandy muds that contain a few silt beds. Laminated and structureless muds up to 10 m thick are present without any apparent silt interbeds. At approximately 94-m penetration, the sediments grade into dark gray homogeneous muds containing only a few color laminations and abundant transported organic debris. Most of these sediments are structureless and most are slightly disturbed by the presence of methane gas. These muds continue to near the seafloor where they are capped by the marly foraminiferal ooze. A few alternating thin black and red bands are present beneath the ooze. The mud section is approximately 94 m thick.

This fining-upward channel sequence represents deposits that were laid down both during the active channel phase and during the waning or passive filling stage. According to seismic data, the base of the channel is located at a sub-bottom depth of 317 m. It is highly probable that the coarser sediments were laid down during or directly after low sea level, when the channel was acting as a major conduit to deliver sediments downslope, and that the upper finer-grained sediments represent the abandonment stage during the subsequent rise of sea level.

The major conclusions are

1. The channel fill sequence displays a fining-upward trend, commencing with gravel (of unknown thickness as the base was not penetrated) grading upward into alternating sands, silts, and thin-bedded muds, and finally into thick-bedded muds. The channel fill is capped by a thin foraminiferal ooze.

2. The sediments comprising the channel fill contain few fauna consisting predominantly of reworked shallow-water microfauna; bathyal benthic and planktonic fauna are very sparse.
Figure 7. Mass physical properties of Site 621 sediments. A. Wet-bulk density. B. Water content related to weight of wet sediment. C. Water content related to weight of dry sediment. D. Porosity. E. Undrained shear strength. F. Sound velocity.
3. Interpreting the lower coarser-grained sediments to represent the active phase of the channel results in a minimum channel depth (from levee crest to thalweg) of 221 m. Such channel relief must have been sufficient to contain the coarse material of the sediment flows within the channel and allowed the finer-grained components to be transported over the levee to form the marginal overbank deposits.

4. The finer-grained upper part of the channel fill must have been deposited rapidly, since few bathyal benthic fauna are present and displaced shallow-water forms are rare. The thinly laminated clays are probably deposited by low-concentration density flows carrying only fine-grained sediments.

5. Computed sedimentation rates were 12.5 cm/1000 yr. for the Holocene (Ericson Zone Z) and 1068.0 cm/1000 yr. for the late Wisconsin glacial period (Zone Y), using a laterally correlated seismic reflector for the base of this zone.

6. Although only 34 m of the coarser-grained channel fill was cored, seismic data (high-amplitude reflectors) indicate that the base of the channel fill lies at a depth of 317 m. Thus, the interpreted coarser-grained channel deposits could be as thick as 136 m.

7. The sands on the gamma log generally display sharp bases and rather abrupt tops.

8. The nearest source of graveliferous deposits is on the shelf near the head of the present Mississippi Canyon. These deposits are late Pleistocene in age. Coring and seismic studies from the area near the head of the canyon show that the base of the canyon floor lies below the graveliferous deposits, indicating a high probability that the coarser-grained material was derived from this shelf region. The transport distance from the source to Site 621 is approximately 220 km.

REFERENCES


Information on core description sheets, for all sites, represents field notes taken aboard ship under time pressure. Some of this information has been refined in accord with post-cruise findings, but production schedules prohibit definitive correlation of these sheets with subsequent findings. Thus the reader should be alert to the occasional ambiguity or discrepancy.
**SITE 621 HOLE 2H CORED INTERVAL 2498.1-2507.7 mbsl; 13.1-22.7 mbsf**

### LITHOLOGIC DESCRIPTION

**Section 1 and Core Catcher are very dark gray (5Y 3/1).**

**Section 2 is dark gray (2.5Y 4/0).**

**Sections 2-6 are dominantly dark olive gray (5Y 3/2) with dark gray (5Y 4/1) color bands.**

The MUD is faintly laminated to homogeneous; gas dissemination is extensive.

Section 4 contains one very thin SLT laminate at 78 cm.

### SUEAR SLIDE SUMMARY (IN)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CARBONATE BOMB DATA:

**OC, 15-13 cm = 3%**

---

**SITE 621 HOLE 2H CORED INTERVAL 2507.7-2517.3 mbsl; 22.7-32.3 mbsf**

### LITHOLOGIC DESCRIPTION

**Section 2, 0-90 cm contains inclined color band MUD.**

### SUEAR SLIDE SUMMARY (IN)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CARBONATE BOMB DATA:

**OC, 15-13 cm = 3%**
**Lithologic Description**

MUD: Extremely dark gray (5Y 2.5/1) to Section 5, 24 cm dark olive gray (5Y 3/2) from Section 5, 24 cm—Core Catcher: MUD is homogenous. Section 1, 26-38 cm contains some inclined color-banded MUD. Section 2 contains possible FLOW-IN from 9-30 cm. Planktonic debris and wood fragments occur in Section 2 and 3. Sections 1 and 2, 38-105 cm contain very nearly color-banded MUD. Section 3, 47-80 cm and 127-136 cm are expected.

**SMEAR SLIDE SUMMARY (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

**Composition**

<table>
<thead>
<tr>
<th>Component</th>
<th>Quartz</th>
<th>Feldspar</th>
<th>Mica</th>
<th>Heavy minerals</th>
<th>Volcanic glass</th>
<th>Carbonate unspec.</th>
<th>Foraminifers</th>
<th>Calc. nannofossils</th>
<th>Plant debris</th>
<th>Altered minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>27</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**Additional Notes**

- Carbonate content: *CC, 21-23 cm ~ 2%*
**SITE 621 HOLE CORE 7H CORED INTERVAL 2531.2-2540.7 mbsl; 46.2-55.7 mbsf**

**LITHOLOGIC DESCRIPTION**

MUD. Dark olive gray (5Y 3/2) in Sections 1-2, very dark gray (5Y 2.5/1) in Section 4, and Core Catcher. MUD is homogeneous and contains gas bubbles "pockets" and fractures.

**SMEAR SLIDE SUMMARY**

<table>
<thead>
<tr>
<th>Composition</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt</td>
<td>30</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
</tr>
<tr>
<td>Quartz</td>
<td>10</td>
</tr>
<tr>
<td>Volcanic glass</td>
<td>10</td>
</tr>
<tr>
<td>Heavy minerals</td>
<td>10</td>
</tr>
<tr>
<td>Altered minerals</td>
<td>10</td>
</tr>
</tbody>
</table>

**SITE 621 HOLE CORE 8H CORED INTERVAL 2540.7-2545.2 mbsl; 55.7-60.2 mbsf**

**LITHOLOGIC DESCRIPTION**

MUD. Extremely dark gray (5Y 2.5/1) and homogeneous.

**SMEAR SLIDE SUMMARY**

<table>
<thead>
<tr>
<th>Composition</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz</td>
<td>30</td>
</tr>
<tr>
<td>Feldspar</td>
<td>30</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
</tr>
<tr>
<td>Volcanic glass</td>
<td>30</td>
</tr>
<tr>
<td>Heavy minerals</td>
<td>30</td>
</tr>
<tr>
<td>Altered minerals</td>
<td>30</td>
</tr>
</tbody>
</table>

**SITE 621 HOLE CORE 9H CORED INTERVAL 2545.2-2550.2 mbsl; 60.2-65.2 mbsf**

**LITHOLOGIC DESCRIPTION**

MUD. Extremely dark gray (5Y 2.5/1) and homogeneous.

**SMEAR SLIDE SUMMARY**

<table>
<thead>
<tr>
<th>Composition</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textures:</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>50</td>
</tr>
<tr>
<td>Silt</td>
<td>50</td>
</tr>
<tr>
<td>Clay</td>
<td>50</td>
</tr>
<tr>
<td>Volcanic glass</td>
<td>50</td>
</tr>
<tr>
<td>Heavy minerals</td>
<td>50</td>
</tr>
<tr>
<td>Calcite needles</td>
<td>50</td>
</tr>
<tr>
<td>Altered minerals</td>
<td>50</td>
</tr>
</tbody>
</table>

**CARBONATE (ROM) DATA:**

*OC, 11±1 cm = 3%*
SITE 621 HOLE CORE 1M
CORED INTERVAL 2563.2-2566.8 mbsf; 76.2-79.4 mbsf

LITHOLOGIC DESCRIPTION

MUD. Extremely dark gray (BY 2.5/1) and homogeneous.

SLIDE SLIDE SUMMARY (%):
2, 80

Texture:
Sand 0
Silt 35
Clay 65
Quartz 24
Heavy minerals 5
Carbonate 27
Fossiliferous 1
Glaucophane 7
Plant debris 4
Fish remains 1
Altered minerals 3

SITE 621 HOLE CORE 1M
CORED INTERVAL 2565.4-2568.2 mbsf; 76.4-77.8 mbsf

LITHOLOGIC DESCRIPTION

MUD. Extremely dark gray (BY 2.5/1) and homogeneous. Dark gray—very dark gray (BY 3.5/1) MUD color bands occur at Sections 4, 80-85 cm and Section 5, 35 cm.

SLIDE SLIDE SUMMARY (%):
1, 15

Texture:
Sand 0
Silt 40
Clay 55
Composition:
Quartz 23
Feldspar 21
Heavy minerals 4
Olive 60
Volcanic glass 7
Carbonate 1
Pyrite 1
Calcite 7
Cherts 7
Fossil debris 5
Altered minerals 5

SITE 621 HOLE CORE 1M
CORED INTERVAL 2568.4-2571.2 mbsf; 77.4-77.8 mbsf

LITHOLOGIC DESCRIPTION

MUD. Extremely dark gray (BY 2.5/1) and homogeneous. Dark gray—very dark gray (BY 3.5/1) MUD color bands occur at Sections 4, 80-85 cm and Section 5, 35 cm.
### Lithologic Description

**SITE 621 HOLE CORE 15H CORED INTERVAL 2579.2-2584.7 mbsl; 94.2-99.7 mbsf**

<table>
<thead>
<tr>
<th>Section</th>
<th>Meter</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
<td>MUD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LITHOLOGIC DESCRIPTION**

MUD. Extremely dark gray (2.5Y 3/1) and homogeneous with lots of gas bubble "pockets" and cracks. Gas has exited, minor color banding, locations of color bands shown in "Subsamples Barney" column.

**SPLASH SLIDE SUMMARY (%)**

- CC: 14:80
- Texture: Sand 0, C 0
- Clay: 50, 50
- Composition: Quartz 40, 35
- Mesic 2, 2
- Heavy minerals 2, 1
- C 1, 2
- Carbonates 3, 2
- Plant debris 3, 1

---

**SITE 621 HOLE CORE 16H CORED INTERVAL 2584.7-2589.7 mbsl; 99.7-104.7 mbsf**

<table>
<thead>
<tr>
<th>Section</th>
<th>Meter</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
<td>MUD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LITHOLOGIC DESCRIPTION**

MUD. Very dark gray (2.5Y 3/1) and homogeneous. Entire core contains tiny gas cavities. Section 2 has rare dispersed coarse silt and very fine sand grains. Very faint laminae and layers > 1 cm thick are visible in slab cut at Section 1, 88-116 cm. These are not observable in the archive core half.

**SPLASH SLIDE SUMMARY (%)**

- CC: 70
- Texture: Sand T
- Mica 3
- Clay 60
- Composition: Quartz 20
- Mica 3
- Heavy minerals T
- C 50
- Pyrite and sparry 3
- Carbonates 5
- Calcareous ooids 2
- Plant debris 1

---

**SITE 621 HOLE CORE 17H CORED INTERVAL 2589.7-2599.2 mbsl; 104.7-114.2 mbsf**

<table>
<thead>
<tr>
<th>Section</th>
<th>Meter</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
<th>Fossil Character</th>
<th>Graphic Lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
<td>MUD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LITHOLOGIC DESCRIPTION**

MUD. Section 1 is very dark gray (2.5Y 3/3); Section 2 is dark olive gray (2.5Y 3/2). Core section is dark olive gray (2.5Y 2/2). MUD is homogeneous with some gas bubbles "pockets" and cracks.

**SPLASH SLIDE SUMMARY (%)**

- CC: 1-3 cm
- Texture: Sand 0, C 0
- Clay 50, 50
- Composition: Quartz 20, 40
- Feldspar 3
- Mica 2, 3
- Heavy minerals T 1
- Clay 50, 50
- Pyrite 1
- Carbonates 3
- Foraminifers T
- Calc. nannofossils T
- Plant debris 1

**CARBONATE BULK DATA**

- CC: 1-3 cm - 6%
### SITE 621 HOLE CORE 22H CORED INTERVAL 2618.7–2622.5 mbsl; 133.7–137.5 mbsf

<table>
<thead>
<tr>
<th>TIME (h)</th>
<th>ROCK (cm)</th>
<th>FOSSIL CHARACTER</th>
<th>LITHOLOGY</th>
<th>GRAPHIC LITHOLOGY</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1.0</td>
<td></td>
<td></td>
<td>SILTY MUD. Very dark gray (5Y 3/1), homogeneous, and very deformed by drilling, shows of the original sediment [1.5(0.5) cm at Section 1, 27–32, 81–93, and 156 cm, Section 2, 38, 116–118 cm, and Section 3, 10 and 19 cm].</td>
<td><strong>SILTY MUD.</strong> Very dark gray (5Y 3/1), homogeneous, and very deformed by drilling, shows of the original sediment [1.5(0.5) cm at Section 1, 27–32, 81–93, and 156 cm, Section 2, 38, 116–118 cm, and Section 3, 10 and 19 cm]. <strong>SMAR SLIDE SUMMARY (%):</strong> Clay 10, 20, 50, 80. Composition: Clay 50, Silt 30, Sand 20. <strong>Clay</strong>: Clay 50, Silt 30, Sand 20. <strong>Texture:</strong> Sand 50, Silt 20, Clay 30.</td>
</tr>
<tr>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SITE 621 HOLE CORE 23H CORED INTERVAL 2622.5–2625.0 mbsl; 137.5–140.0 mbsf

<table>
<thead>
<tr>
<th>TIME (h)</th>
<th>ROCK (cm)</th>
<th>FOSSIL CHARACTER</th>
<th>LITHOLOGY</th>
<th>GRAPHIC LITHOLOGY</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SITE 621 HOLE CORE 24H CORED INTERVAL 2632.1–2634.6 mbsl; 147.1–149.6 mbsf

<table>
<thead>
<tr>
<th>TIME (h)</th>
<th>ROCK (cm)</th>
<th>FOSSIL CHARACTER</th>
<th>LITHOLOGY</th>
<th>GRAPHIC LITHOLOGY</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SITE 621 HOLE CORE 25H CORED INTERVAL 2641.7–2644.7 mbsl; 156.7–159.7 mbsf

<table>
<thead>
<tr>
<th>TIME (h)</th>
<th>ROCK (cm)</th>
<th>FOSSIL CHARACTER</th>
<th>LITHOLOGY</th>
<th>GRAPHIC LITHOLOGY</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SITE 621 HOLE

**CORE 26H CORED INTERVAL** 2651.3–2654.3 mbsl; 166.3–169.3 mbsf

#### LITHOLOGIC DESCRIPTION

- **Section 1:** MUD with SANDY SILT interbeds. MUD is very dark gray (5Y 3/1). Oxidized, very dark grayish brown (10YR 3/1). MUD intervals occur in Section 1, 100–110 and 115–130 cm. SANDY SILT "loans" are very dark gray (5Y 3/2). Inclined and deformed.

- **Section 2:** and Core Catcher: SILTY MUD with SILT laminae. SILTY MUD is very dark gray (5Y 3/1–5Y 4/1). SILT laminae are dark gray to very dark gray (5Y 4/1–5Y 3/1), deformed, and inclined. Rare SAND blebs.

#### SMEAR SLIDE SUMMARY (%):

- **Texture:**
  - Sand: 40
  - Silt: 30
  - Clay: 30

- **Composition:**
  - Quartz: 60
  - Feldspar: 20
  - Mica: 10
  - Heavy minerals: 2
  - Clay: 10
  - Carbonate: 2
  - Opaques: 1

#### CARBONATE BOMB DATA:

- **Compositional data:**
  - Calc. nannofossils: 2
  - Calc. nannofossils: 2

### SITE 621 HOLE

**CORE 27H CORED INTERVAL** 2660.5–2663.0 mbsl; 175.9–178.0 mbsf

#### LITHOLOGIC DESCRIPTION

- **Section 1:** MUD with interbedded MUDDY SAND beds and SILT laminae and blebs. MUD is very dark gray (5Y 3/1); MUDDY SAND is very dark gray (5Y 3/1); SILT is very dark gray to olive gray (5Y 3/1–5Y 4/2). MUDDY SAND beds and SILT laminae are inclined and contorted.

- **Section 2:** MUDDY SAND/SANDY MUD. Very dark gray (5Y 3/1) and very dark grayish brown (10YR 3/2). Minor beds of deformed MUD or SILTY MUD at Section 2, 10–16 cm.

#### SMEAR SLIDE SUMMARY (%):

- **Texture:**
  - Sand: 20
  - Silt: 25
  - Clay: 55

- **Composition:**
  - Quartz: 40
  - Feldspar: 20
  - Mica: 20
  - Heavy minerals: 2
  - Clay: 2
  - Carbonate: 2
  - Opaques: 1

#### CARBONATE BOMB DATA:

- **Compositional data:**
  - Calc. nannofossils: 2
  - Calc. nannofossils: 2

### SITE 621 HOLE

**CORE 29H CORED INTERVAL** 2680.1–2684.2 mbsl; 195.1–199.2 mbsf

#### LITHOLOGIC DESCRIPTION

- **Section 1:** MUD with interbedded MUDDY SAND beds and SANDY MUD matrix. MUD is very dark gray (5Y 3/1). MUD intervals occur in Section 1, 50–120 cm. Section 1, very finely laminated.

- **Section 2:** MUD, very dark gray (5Y 3/1) to olive gray (5Y 3/2). MUD intervals are inclined and deformed.

#### SMEAR SLIDE SUMMARY (%):

- **Texture:**
  - Sand: 20
  - Silt: 25
  - Clay: 55

- **Composition:**
  - Quartz: 40
  - Feldspar: 20
  - Mica: 20
  - Heavy minerals: 2
  - Clay: 2
  - Carbonate: 2
  - Opaques: 1

#### CARBONATE BOMB DATA:

- **Compositional data:**
  - Calc. nannofossils: 2
  - Calc. nannofossils: 2
### SITE 621 HOLE 3H CORED INTERVAL 2686.2-2688.3 mbsl; 211.3-214.8 mbsf

**LITHOLOGIC DESCRIPTION**

MUD with SILT laminae, very dark gray (5Y 3/1) and interbedded by thin MUD laminae at Section 1, 20-22 cm.

**SMEAR SLIDE SUMMARY (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Comp</th>
<th>Quartz</th>
<th>Clay</th>
<th>Carbonate</th>
<th>Foraminifera</th>
<th>Other</th>
<th>Altered minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>0</td>
<td>30</td>
<td>70</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

### SITE 621 HOLE 3N CORED INTERVAL 2696.3-2699.8 mbsl; 211.3-214.8 mbsf

**LITHOLOGIC DESCRIPTION**

- **Section 1, 0-79 cm**: SAND. Olive gray (5Y 4/2) and structureless, medium-grained.
- **Section 1, 79-105 cm**: MUD with SILT laminae. Dark gray (5Y 4/1).

**SMEAR SLIDE SUMMARY (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Comp</th>
<th>Quartz</th>
<th>Clay</th>
<th>Carbonate</th>
<th>Foraminifera</th>
<th>Other</th>
<th>Altered minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

### SITE 621 HOLE 3K CORED INTERVAL 2684.2-2686.3 mbsl; 199.2-202.3 mbsf

**LITHOLOGIC DESCRIPTION**

MUD, dominantly very dark gray, with numerous subtle color bands. Whole core is very deformed by drilling. Section 1, 20-22 cm.

**SMEAR SLIDE SUMMARY (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Comp</th>
<th>Quartz</th>
<th>Clay</th>
<th>Carbonate</th>
<th>Foraminifera</th>
<th>Other</th>
<th>Altered minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>0</td>
<td>30</td>
<td>70</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

### SITE 621 HOLE 3H CORED INTERVAL 2693.5-2696.8 mbsl; 201.3-203.3 mbsf

**LITHOLOGIC DESCRIPTION**

LAMINATED MUD, dominantly very dark gray (5Y 3/1) and interbedded by thin MUD laminae. Folds are defined by laminae at Section 1, 79-105 cm, and core catcher contains thin MUD laminae. BILAMINATE MUD with dark gray (5Y 4/1).

**SMEAR SLIDE SUMMARY (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Comp</th>
<th>Quartz</th>
<th>Clay</th>
<th>Carbonate</th>
<th>Foraminifera</th>
<th>Other</th>
<th>Altered minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
SITE 621 (HOLE 621)