29. REGIONAL ASPECTS OF DEEP SEA DRILLING IN THE GULF OF MEXICO LEG 10

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INTRODUCTION

Leg 10 extended the drilling information in the Gulf of Mexico begun on Leg 1. The summary of results for Leg 1 in the Gulf of Mexico is reported by Ewing, Worzel, and Burk, (1969, p. 624). Figure 1 (reproduced from that report) shows the most important physiographic features of the Gulf including the known regions of salt domes and the three holes drilled in the Gulf of Mexico during Leg 1. As a short resumé, Site 1, drilled to a subbottom depth of 770.5 meters near the foot of the Sigsbee Scarp, encountered only Pleistocene and Holocene sediments with abundant evidence that most, if not all, of the section drilled was slump material. Site 2 was drilled in a water depth of 3572 meters on Challenger Knoll, penetrating Miocene and post-Miocene abyssal sediments. Cap rock was encountered at a depth of 135 meters below bottom (still 45 meters above the surrounding abyssal plain). Oil, sulfur, gypsum, and calcite were present in the cap rock zone. Studies coordinated by a committee of the American Petroleum Institute indicated that the oil was a high-sulfur-content immature crude whose origin was consistent with formation from marine organic matter. Pollen grains and spores in the insoluble residues of cap rock were identified as probably Middle to Late Jurassic, and possibly Early Cretaceous in age. Site 3, drilled in the abyssal plain near Site 2, penetrated mixed abyssal sediments and abundant turbidites containing much marine organic matter in a section extending back to the mid-Miocene at 627.6 meters below bottom.

Proposed drilling sites (Figure 2) selected by the Gulf of Mexico Site Selection Panel of JOIDES were chosen to study the following: (1) the Sigsbee Abyssal Plain and its flanks (6 sites), (2) diapir tectonics (6 sites), (3) scarps of the calcareous margins of the Gulf of Mexico (4 sites), (4) possible diapirs on the calcareous margin (1 site), (5) the deep Mississippi Fan (1 site), and (6) the transition area between the Gulf of Mexico and the Florida Strait (2 sites).

Because of an increased concern for the environment, severe restrictions were imposed on the drilling program at the start of the leg and sites where oil and/or gas might have been encountered were eliminated from the drilling schedule. Despite these restrictions and the resultant cancellation of many objectives of the leg, alternate drilling sites were selected which resulted in a very productive leg. Sites that were subsequently drilled are shown in Figure 3.

Drilling equipment failures coupled with changed restrictions caused abandonment of Sites 87, 89, and 92 at shallower depths than planned. Site 88 was terminated at a shallower depth than planned due to encountering increasing amounts of gases. Beacon failure, causing loss of ability to properly control position while drilling, caused termination of Site 96 because there was only one effective beacon left, and it was deemed more important to drill Site 97 than to continue Site 96. Site 97 was most difficult because of beacon troubles and the strong currents, no doubt associated with the Gulf Stream. Although the current charts indicated we should expect strong currents from the northwest, we experienced 4- to 5-knot currents from the southwest for the 2.5 days we were on station. The thrusters were not adequate to keep the ship on station, so the computer program for position keeping had to be adapted to use the main propulsion system and rudder to assist. The scientific staff wishes to express its great appreciation to Carl Wells who was principally responsible for this successful change.

SEA LEVEL CHANGE

The most important result of Leg 10 was the discovery of the consistently shallow-water nature of the Lower Cretaceous sediments. The evidences include definitive shallow-water sediments of Albian age in Sites 94 (water depth 1793 m) and 95 (water depth 1635 m), and the probable shallow-water facies of Site 86 (water depth 1481 m) on the Campeche Scarp. Post-Albian sediments recovered were all of a deep-water nature. No post-Albian to Lower Paleocene sediments were recovered from Holes 86 and 94. Thus, it appears that shallow-water conditions prevailed, at least in Albian time, at the present 1500- to 1800-meter water depth of the Campeche Bank, becoming abyssal in a fairly short time between the end of the Albian and the beginning of the Santonian. All the subsequent periods indicate conditions similar to the present.

These conditions could have resulted from a fairly constant sea level stand followed by a foundering of the Campeche Bank with very little tilting over a short period of time (about 20 million years). Following this subsidence, a long period of near stillstand, extending at least 80 million years, would have prevailed.

It is more reasonable to think that the water level in the Gulf was about 1600 meters lower in Albian time, changing to about the present level by the Santonian. This would, of course, have closed the Florida Strait, leaving only a narrow and shallow entry for seawater through the Yucatan Strait. Coupled with a strong evaporative climate, these conditions would have provided for the precipitation of evaporites throughout the Gulf basin, thereby providing, a possible source for the ubiquitous Louann Salt.

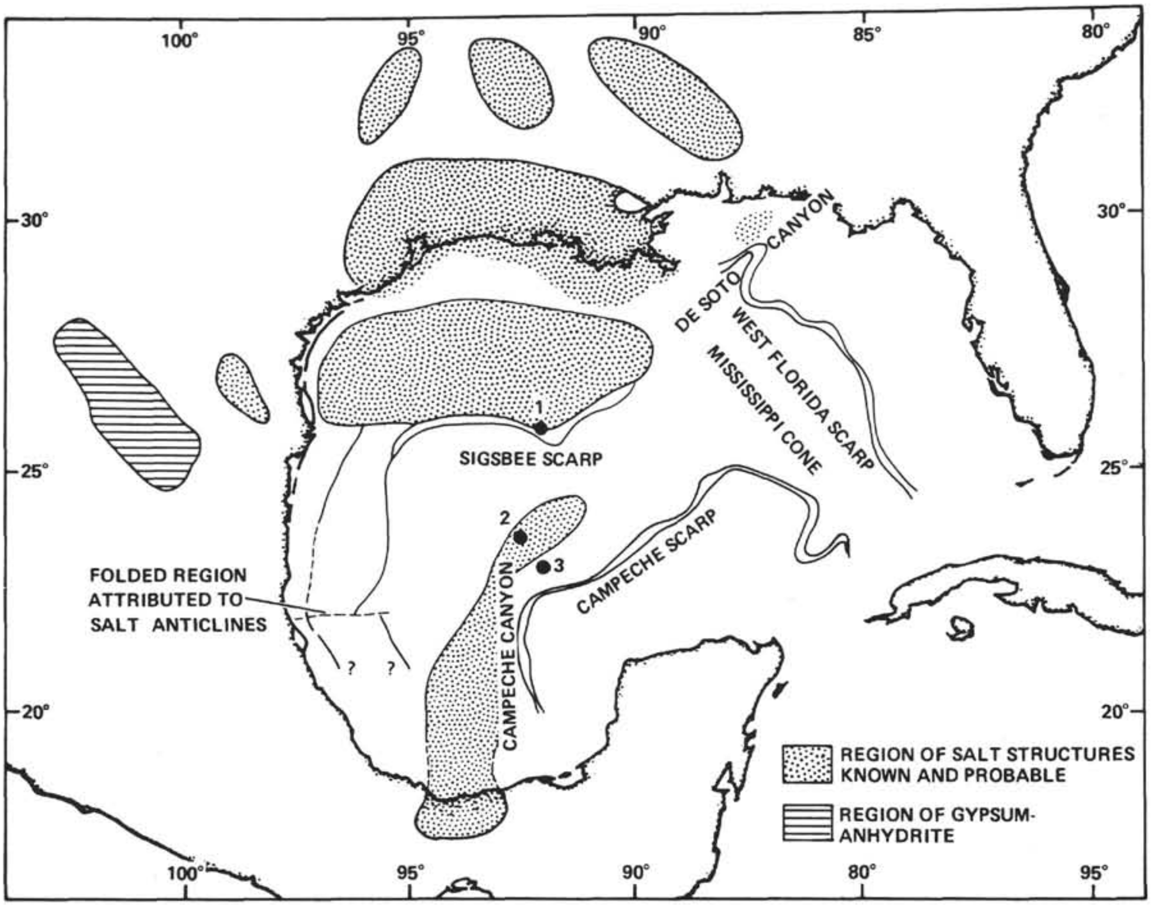

Figure 1. *The most important physiographic provinces of the Gulf of Mexico are shown along with the three drill holes from Leg 1 of the Deep Sea Drilling Project.*

This latter interpretation would fit if the Louann Salt is Jurrassic-Cretaceous, a prevalent view today (see, for example, Davis and Bray, 1969), and the crustal levels in the Florida Strait and the Yucatan Strait remained at essentially their present levels. Further investigation of the sediment that has accumulated in these channels and possible crustal movements will be required to properly evaluate this interpretation. The pebbly mudstones of Cenomanian age, found in Site 97, and the abundant evidence of slumping and gullying (see the discussion and interpretation section, Site 93) along the Campeche Scarp add some small measure of corroboration to this hypothesis.

The removal of at least half the Cretaceous and all the Tertiary sediments and the concomitant isostatic adjustments, coupled with a sea level lowering by about 1600 meters, would have relegated the Louann Salt deposition predominantly to the Sigsbee Basin and beneath the continental margins of Texas, Louisiana and Mississippi. Deep drilling beneath the Mississippi Cone in the eastern Gulf of Mexico, east of about 88°, should discover Louann Salt at depth if this hypothesis is correct.

This hypothesis would also provide a basis for the explanation of the great difference between the "calcareous province" and the "clastic province" of the Gulf of Mexico which are separated by a line approximately from the De Soto Canyon to the Campeche Bank near Campeche Canyon (see Chapter 1).

PLEISTOCENE DEPOSITS IN THE SIGSBEE BASIN

The Pleistocene deposits in the Sigsbee Basin vary greatly in thickness. At Site 89 they are about 150 meters thick, in Site 90 about 150 meters thick, in Site 91 about 500 meters thick, and in Site 3 about 300 meters thick. This is consistent with predominant sources of land-derived sediments during the Pleistocene and the Holocene from the north and east (Fisk and McFarlan, Jr., 1955). Examination of the profiler records reproduced for each hole indicates that the section is represented by multiple layers of varying echo intensity extending into the Upper Pliocene. This is consistent with the numerous turbidites (laminates) interspersed with abyssal sediments described from the cores of these holes.

Two profiler record sections (Figures 4 and 5) were taken on VEMA 26 from north of Site 91 to the vicinity of the Sigsbee Scarp (see Figure 2 for profiler locations). They show that the above described section contains four minor angular unconformities within the Pleistocene and Upper Pliocene section. In the vicinity of the Sigsbee Scarp (section AA′), the upper part of the section loses its layered character and becomes a "jumbled mass of

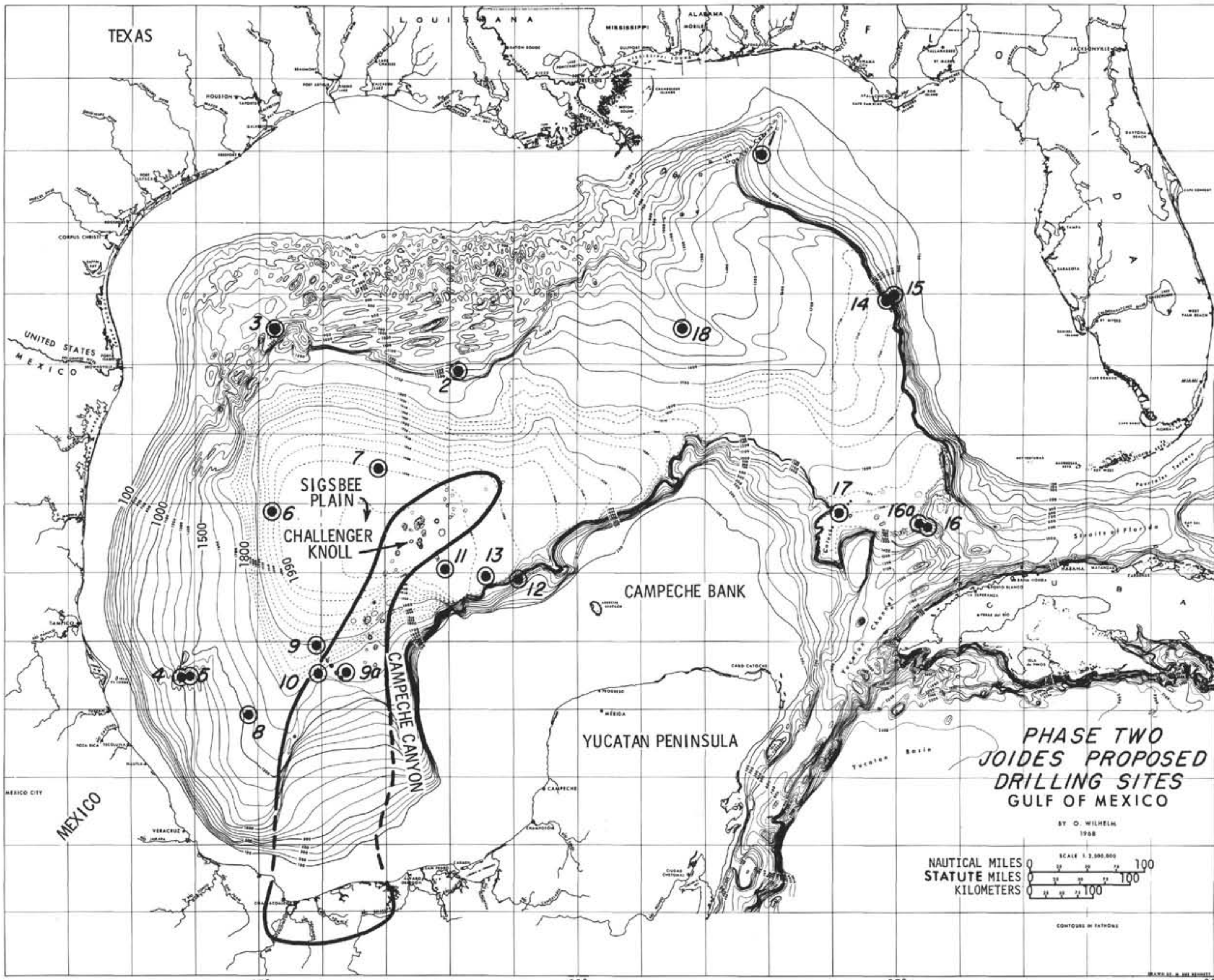

Figure 2. *Proposed drilling sites of the Gulf of Mexico, selected by the Site Selection Panel of JOIDES.*

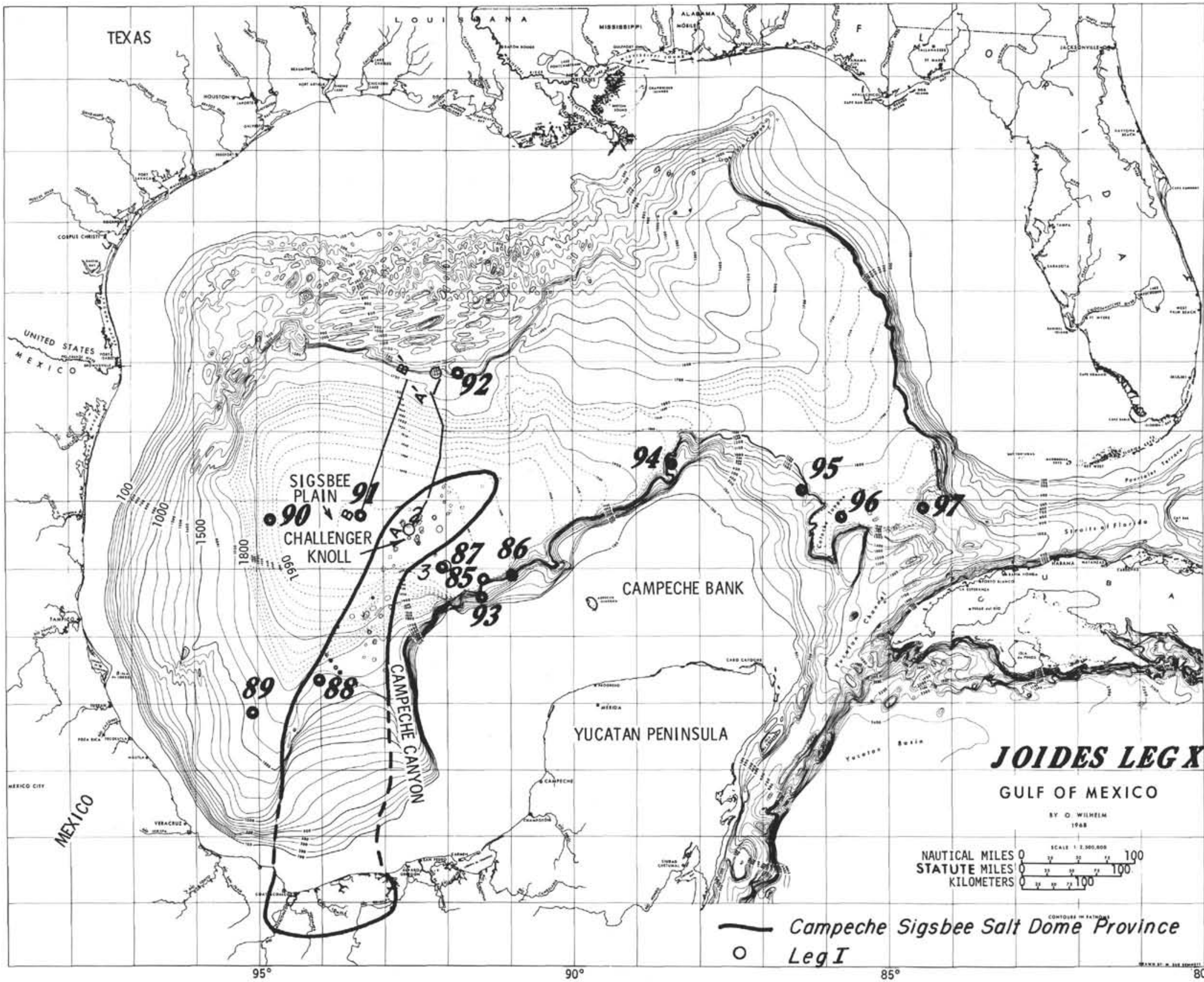

Figure 3. *The holes drilled on Leg 10 of the Phase 2 drilling operation. The locations of Sections AA'. and BB' illustrated in Figures 4 and 5 are shown in the upper center portion of the diagram.*

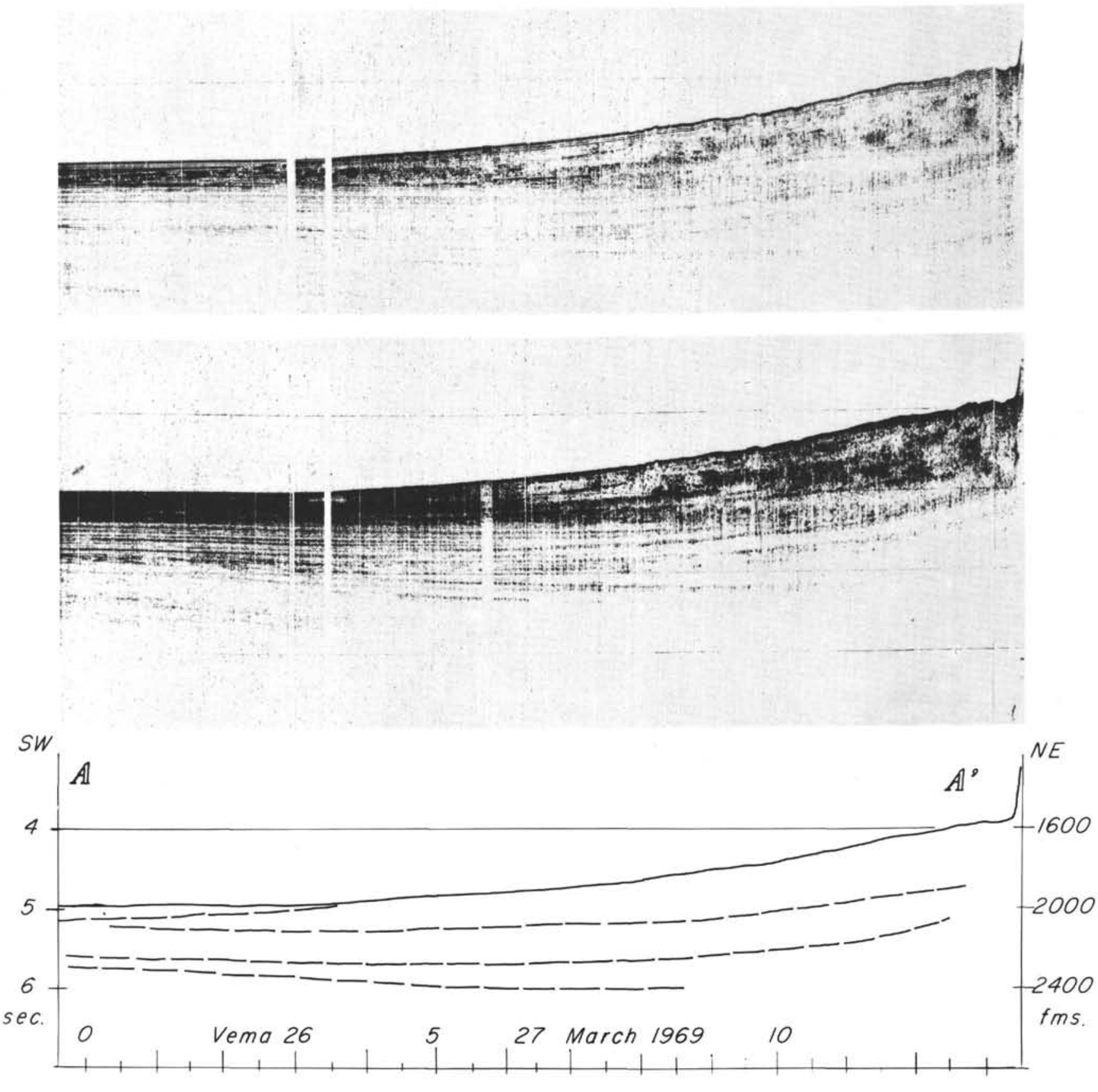

Figure 4. *Profile of Section from Vema 24 approximately northeast and a little bit east of Hole 91.*

echoes". In contrast, the section recorded in BB' maintains its layered character right up to the Sigsbee Scarp where the layers apparently terminate abruptly. While it cannot be said with absolute certainty because of possible sound energy losses in the section, the abrupt termination of the echoes is most likely the result of the termination of layers against the scarp. The nature of the scarp has been considered by numerous investigators, but additional work will be required to provide a definitive interpretation. The "jumbled mass of echoes," however, strongly suggests the presence of a slumped section in that region.

The layering is very nearly horizontal above the first angular unconformity in both sections. This is consistent with the near horizontal aspect of the surface layers deposited predominantly as the distal fringes of the Mississippi Cone. Beneath this unconformity the layers dip moderately and thin basinwards, strongly suggesting a source to the north prior to the development of the present Mississippi Cone.

Beneath the second unconformity the layers are again nearly horizontal, suggesting that the main depositional regime closely resembled that presently in existence.

Beneath the third unconformity the layers once again dip and thin basinwards, which suggests a sedimentary regime similar to that beneath the first unconformity. Within this wedge, the dip changes gradually from basinwards to landwards with depth, most probably a post-deposition reversal of dip due to isostatic adjustment of

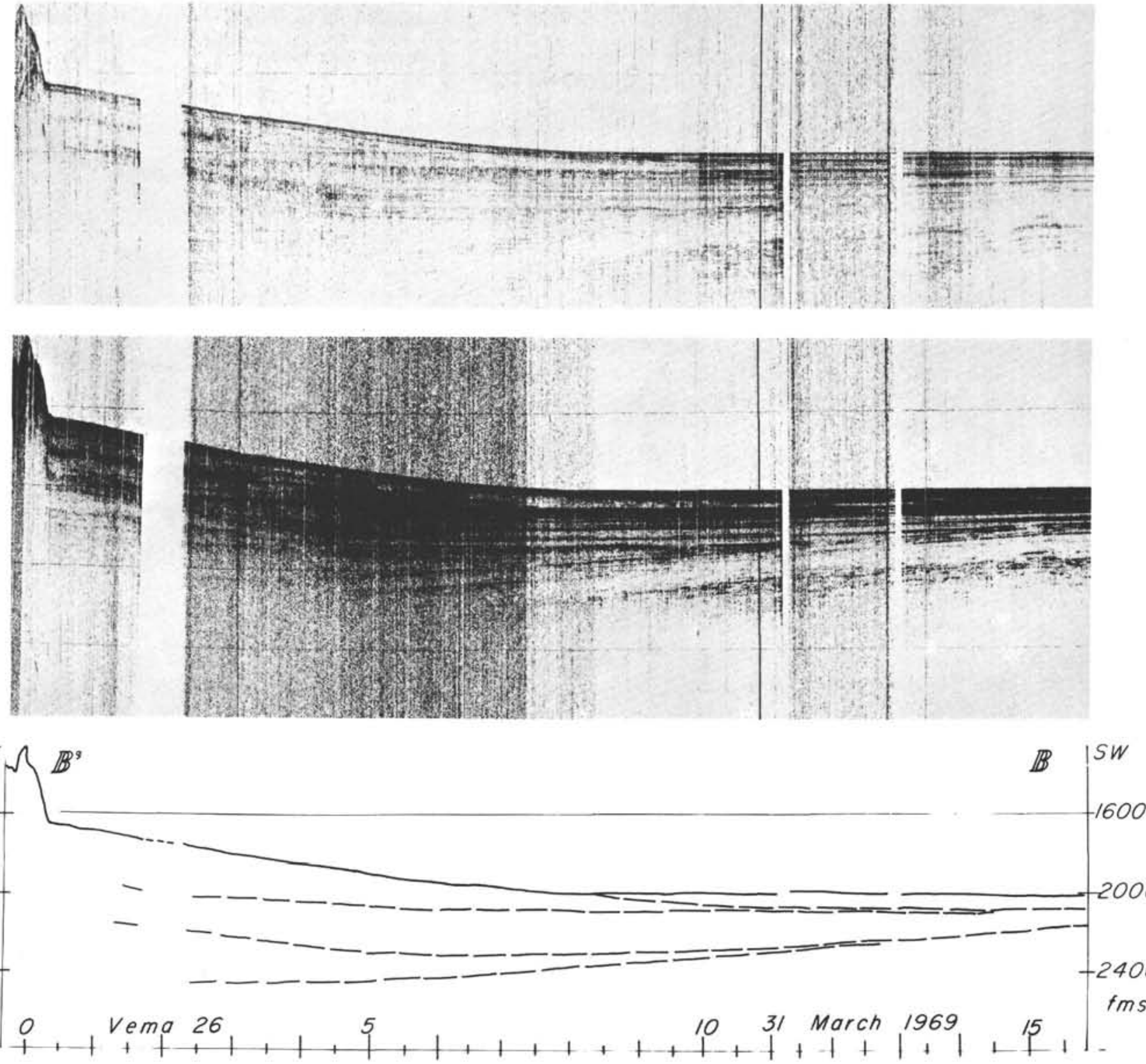

Figure 5. *Section BB' from Vema 24 which extends from due northeast of Hole 91.*

the sediment load. The slight upward concavity of these beds would indicate a nonlinear deposition pattern with deposition rates increasing as the Sigsbee Scarp is approached. This would further suggest a sediment source to the north during this period.

The fourth unconformity occurs at or near the base of the Pleistocene. The beds beneath this discontinuity are nearly parallel, although dipping gently landward. It is probable that these beds were laid down horizontally in a regime very similar to that presently existing.

This Pleistocene sequence strongly suggests that the primary source of land-derived sediments was originally well to the east as at present, and that it shifted to the north, perhaps in the vicinity of the present Atchafalaya River. Later it shifted back to the east, then back to the north, and presently to the east once more. (Fisk and McFarlan, Jr., 1955).

ACOUSTIC QUIET ZONE

Although there is no abrupt transition, the profiler sections for those holes in the Sigsbee Basin are noteworthy for the lack of echo return in the sections identified with the cored intervals dated as Early Pliocene and Late Miocene. Laminites observed in the cored sections are very thin and consist of silt-sized particles, obviously of insufficient acoustic contrast to produce echoes. The uppermost acoustic quiet zone on the profiler records thus correlates with the Late Miocene and Early Pliocene. This "clear space" on the profiler records can be traced from the Sigsbee Scarp to the Campeche Scarp and from about 89°W longitude (where it becomes too deep to follow with the equipment available thus far) to the Mexican continental slope, with the exception of the Campeche-Sigsbee Salt Dome Province where salt tectonics contorts and confuses the section.

Below this clear zone, coarse and thick turbidites again predominate in the Middle Miocene (see, for example, Figure 6 of Chapter 8) and a zone of multiple reflections is encountered on the profiler records. Unfortunately, none of the holes in the Sigsbee Abyssal Plain penetrated deeper than Middle Miocene, even though Hole 91 reached a total subbottom depth of 900 meters. It is clear from the profiler sections (Figures 4 and 5) that the top of the Middle Miocene would be expected at a depth of about 3000 meters, just seaward of the Sigsbee Scarp.

CAMPECHE-SIGSBEE SALT DOME PROVINCE

Site 88 was the only new hole drilled in the Campeche-Sigsbee Salt Dome Province (Figure 3). It had to be terminated at a total depth of 135 meters, because of encountering quantities of gases, including methane and ethane. This hole was still in Pliocene when terminated. Pore water salinity had increased by about 10 per cent at total depth.

SIGSBEE SCARP

Site 92, drilled just above the Sigsbee Scarp, was still in Pleistocene sediments at the total subbottom depth of 282 meters, when a failure in the core recovery system made it necessary to retrieve the bottom hole assembly. Unfortunately, this was about 30 meters short of the expected salt horizon. While redrilling the hole, orders were received to drill this hole no deeper than 100 meters; therefore, it had to be terminated. The Late Pleistocene contained terrigenous silts and clays, with some quartz and detrital carbonates. Below 220 meters, however, the Lower Pleistocene Cores were highly consolidated showing vertical fractures which were often annealed. Pore water salinities increased with depth, containing almost five times as much salt as seawater at 282 meters.

In our opinion, the overconsolidated sediments must have resulted from deep burial (700-800 meters more cover than at present) with later erosion or slumping removing the largest part of the section. The high salt content of the pore water is strong evidence that salt would be encountered at only a moderately greater depth. We believe that this supports the idea that the Sigsbee Scarp is related to salt tectonics.

GRAVITY ANOMALIES IN THE GULF OF MEXICO

Figure 6 is a free-air gravity anomaly map contoured on a 25-mgal interval, kindly made available in advance of its publication by Mr. Philip Rabinowitz of the Lamont-Doherty Geological Observatory. He is preparing a detailed analysis of these data. However, for our purposes here, note that along the axis of the Campeche-Sigsbee Salt Dome Province, and in the zone just above the Sigsbee Scarp, gravity highs are encountered. Since these are most probably related to salt features, it would be expected that gravity lows would be encountered. It is here suggested that basement highs must occur at depth causing uplift in these regions. This would form an anticline in the salt layer, localized above the basement high. Migration of the salt towards the higher part of the anticline, along with minor variations in depth along its axis, might well have provided the impetus for the formation of diapirs near the crest, forming in the one case, the Campeche-Sigsbee Salt Dome Province, and in the other, the Sigsbee Scarp.

CAMPECHE SCARP

Site 85 was drilled near the base of the Campeche Scarp (Figure 7) and encountered reworked older debris (Pliocene, Paleocene, and Late Cretaceous) in a Pleistocene matrix. Drilling had to be terminated at a depth of 198 meters, when a dark brown, organically rich, dolomitic sandstone was encountered that could not be penetrated. The drillers believed this sandstone occurred in large chunks and was not held rigidly enough within the matrix to allow the drill to penetrate.

Site 93 (Figure 7), drilled in a valley incised into the Campeche Scarp just shoreward of Site 85 (Figure 8), was very disappointing as it was hoped that the hole could be started well below the top of the Cretaceous that was identified in Site 86. Two attempts to drill this hole resulted in twisted-off bottom-hole assemblies because stiff materials were encountered at very shallow depths. Those samples recovered strongly suggested that this hole was spudded into a slump block.

FLORIDA STRAIT

Site 96, drilled just off the Catoche Tongue to investigate possible diapiric structures, was terminated at a depth of 332 meters because of beacon failure, so that the identity of the intrusive core was not determined. All of the sediments penetrated were Tertiary in age, with only the Pliocene and Miocene not represented. The Pleistocene contained fine sand turbidites on top of the knoll standing about 16 meters higher than the surrounding sea floor. This somewhat anomalous feature suggests that (a) turbidity currents have thicknesses greater than 16 meters in this area, (b) turbidity currents can climb at least 16 meters above an abyssal plain, (c) this peak was uplifted 16 meters since the Pleistocene, or (d) some combination of these alternatives occurred. We see no evidence for a preference among these choices.

Site 97, located on the slope from the Florida Strait to the distal edge of the Mississippi deep sea cone, was terminated after drilling well into Lower Cenomanian sediments as the time for the leg ran out. The post-Miocene sediments were clastics mixed with coccolith ooze. The pre-Oligocene sediments consisted of chalks. An unconformity, with Early Cenomanian to Eocene missing, is underlain by Lower Cenomanian pebbly mudstones, dolomitic limestones, and dolomites containing dense black cherts.

CHERTS

Cherts were encountered in Sites 94 through 97, ranging in age from Cenomanian to Early Oligocene. Laury (chapter 27, this volume) studied these and decided that they were late post-depositional replacement of deep water calcareous foraminiferal nannoplankton ooze. He further concluded that the degree of replacement increases with increasing age. However, the degree of replacement does not seem to be related to the depth of burial or water depth. On the basis of this and previous Deep Sea Drilling

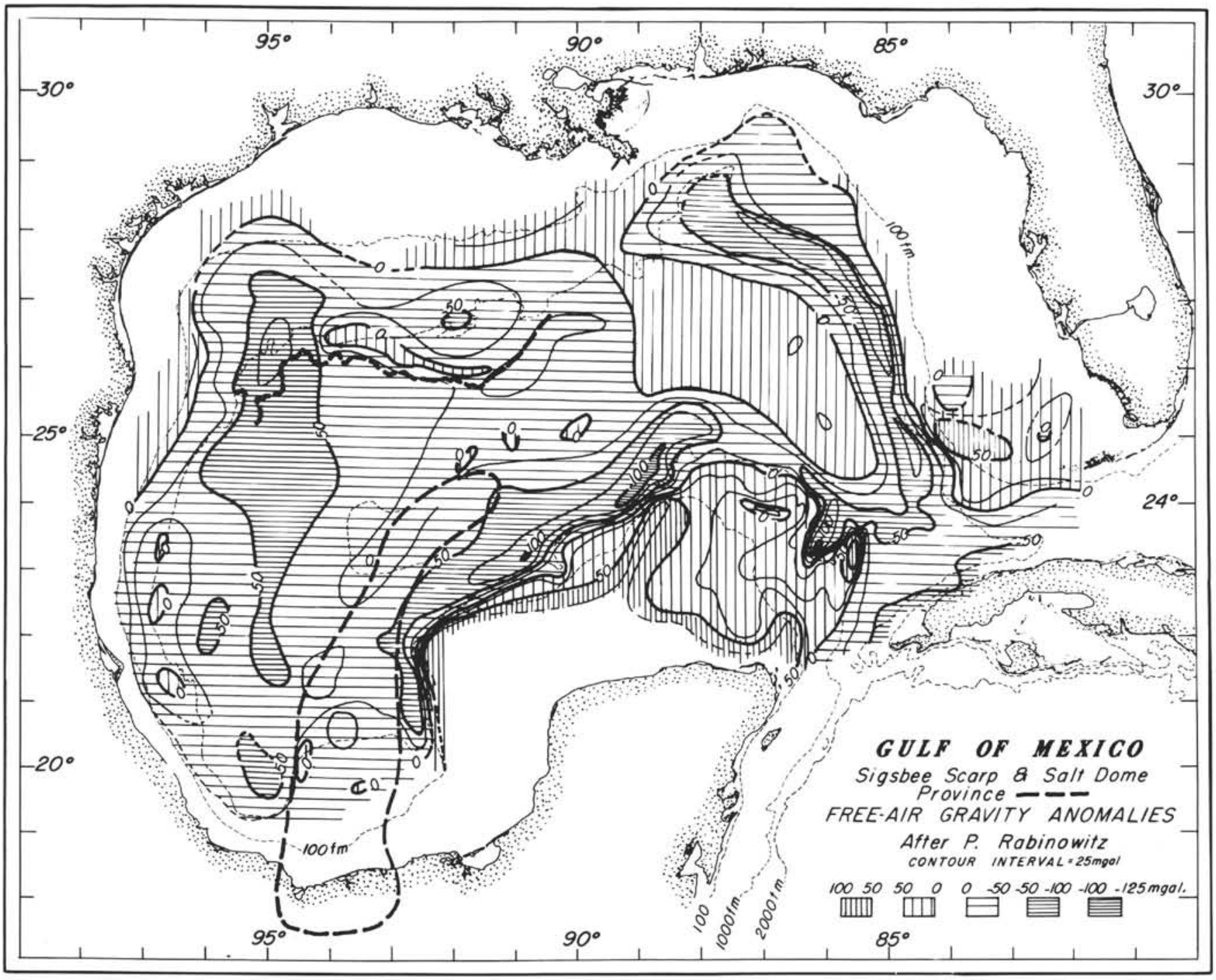

Figure 6. *Free-air gravity map of the Gulf of Mexico with the Campeche-Sigsbee Salt Dome Province and the Sigsbee Scarp overlayed in heavy dashed lines.*

Project legs, chert is uncommon in sediments less than 10 to 15 million years old. The youngest completely recrystallized, sediments of Leg 10, are Campanian (See Chapter 27, for a more complete discussion.).

VOLCANICS

Volcanic debris was encountered in Sites 86, 88, and 89. Site 89 had a much larger concentration than the other holes. The debris was present continuously to the Middle Miocene, the oldest sediments reached in this hole. Volcanic glass was encountered in the Pliocene and Pleistocene of Site 88 to the total depth of penetration. Site 88 is located on what is presently a topographic high, and if that were the case throughout this time span, as is likely, these volcanics would of necessity have been brought there largely as airborne sediments. Site 86 has volcanic ash laminae within the cores recovered which range in age from Paleocene through Eocene. Site 94 has traces of volcanic ash throughout the section, but ash is more common in the Oligocene and Eocene. This distribution of volcanics suggests a source to the west in Mexico. (Murray, 1961).

GASES IN THE SIGSBEE BASIN

Gases were encountered in Sites 88, 89, 90, and 91. In Site 88, drilled on a topographic high showing diapir-like structure in the profiler records, increasing gas content was encountered to a depth of 108 meters. The one deeper core (from 128-135 meters) showed a slightly smaller gas content. The gas in the uppermost cores consisted almost entirely of methane; the last two, while predominantly of methane, contained 5 per cent ethane. This hole was terminated at 135 meters because of the gas content. Hole 89 showed a slight gas content at a depth of about 100 meters increasing from there to 380 meters. Below that depth the gas content fell off rapidly. Although there were traces of other gases, the gas was predominantly methane. Hole 90 showed gas present from 130 meters to 767 meters with the greatest concentration in the 237- to 348-meter interval. Methane predominated but traces of ethane were observed. Site 91 showed gases present from 159 to 838

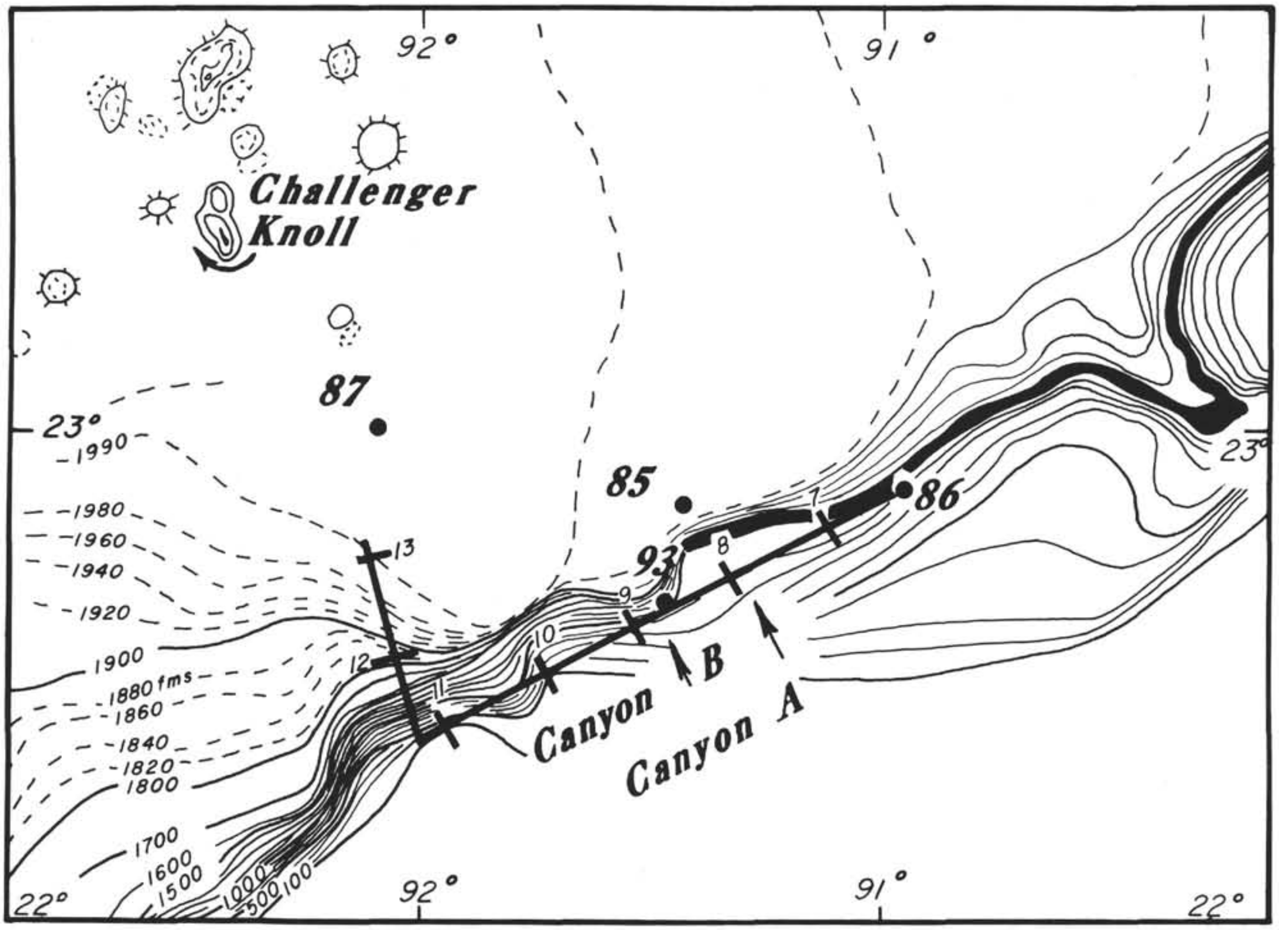

Figure 7. *Chart of a portion of the track of* Glomar Challenger *in departing Hole 86. The dogleg was made because information was received on the ship that Hole 87 would be permitted to be drilled at that point in the track.* Canyon A *and canyon* B *are indicated on the track at the appropriate position relative to the profiler record which is reproduced in Figure 8.*

meters, but the quantities were much less than in the other holes. The gas in this hole was predominantly methane.

In all of these holes organic material was prevalent, predominantly in turbidites. Therefore, it is considered most likely that these gases were biogenic in origin.

There were several surprising aspects of the cores containing gases. One was the large quantities of gas emitted, estimated to be at least ten times the volume of the core. Small holes had to be drilled in the liners along the length to release the gases to prevent extrusion of the core material. The second surprising aspect was the length of time required for the core to de-gas. Normally, this took two hours or more.

At the time of core recovery, these results were perplexing, but in retrospect it now seems probable that gas hydrates (Stoll et al., 1971; Katz et al., 1959) were present in these cores. This would explain the large volumes of gas locked in the small quantity of water filling the pore spaces. The time for heat transfer required, before the gas hydrates could give up the gasses present, would explain the long period of time required for the gas to be released. Unfortunately, the possibility of gas hydrates was not known to those on board so no measurements to give positive identification were made. The Deep Sea Drilling Project is now aware of this possibility and opportunities for definitive measurements are being sought.

SEDIMENTATION RATES

Sedimentation rates are notoriously difficult to evaluate. On Leg 10, it was recognized that many discontinuities were encountered, many more were undoubtedly missed in the unsampled sections, and there is strong evidence for slumping in both the profiler records and within the recovered cores. Nevertheless, we have made some "average" figures, ignoring these difficulties, based on the paleontologically derived dates and core depths. These are shown in Table 1. They are arranged by geological provinces. Wherever possible, average rates for each geological age are given. On the right side of the table, average rates (perhaps more properly called average rates of sediment preservation) derived for the total depth of hole drilled are given.

From this table it may be seen that sedimentation rates in the Pleistocene range from about 3 cm/10^3y to 50 cm/10^3y in the Sigsbee Basin, are around 3 to 4 cm/10^3y on a dome in the Campeche-Sigsbee Salt Dome Province, are 11 to 30 cm/10^3y just above the Sigsbee Scarp, lie between 2 and 6 cm/10^3y on the Campeche Scarp, and are

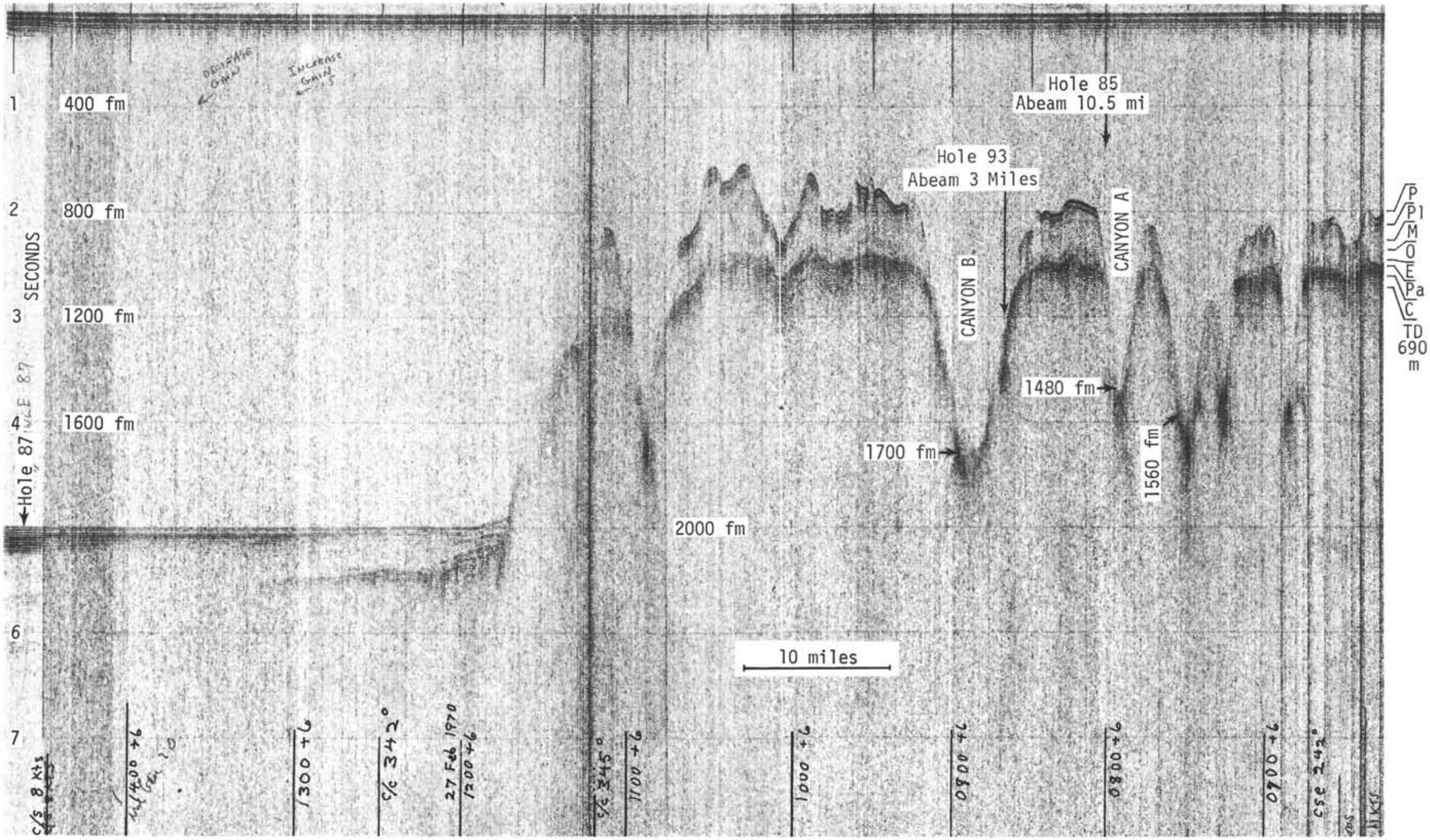

Figure 8. *Profiler record of the track from Hole 86 to the approaches to the Hole 87. Note that Hole 85 is abeam of the track at the location where Canyon* A *is indicated and that Hole 93 was attempted in canyon* B.

TABLE 1
Sedimentation Rates[a]

Site	Pleistocene		Pliocene		Miocene			Oligocene		Eocene			Paleo-cene	Aver.	Range	Area
	Late	Early	Late	Early	Late	Mid	Early	Late	Early	Late	Mid	Early				
														11	Early Pleist.–Recent	Sigsbee Scarp
85	– – 31 – –													31	Pleist.–Recent	
87														6.5	Late Mioc-Rec.	
89	– – 5.5 – –		– – 3.7 – –		2.8									3.8	Late Mioc-Rec.	Sigsbee Basin
90	11	3	– – 2 – –		2.8	4.1								4.9	Mid Mioc-Rec.	
91	50	10	– – 4 – –		– – 3.7 – – – –									6.4	Mioc-Rec.	
88	4.0	2.9	2.6											2.6	Plioc-Recent	Campeche-Sigsbee Salt Dome Prov.
86	5.0 – –		6.0 – –	4.0	Discontinuity			– – 0.7 – –		– – – 0.3 – – –			0.6	0.9	Paleoc-Rec.	Campeche Scarp
94	– – 1.8 – – –		4.5 – – –		– – 0.7 – – – – –			– – 0.5 – –		– – – 1.1 – –			0.04	0.9	Paleoc-Rec.	
95	2.2?		Discontinuity					– – 1.5 – –		– – – 0.52 – –			0.50	0.45	Paleoc-Rec.	
97					1.2									0.4	Late Eoc-Rec.	Florida Strait
96	5.6							0.33		– – – 0.42 – –				0.6	Late Eoc-Rec.	Salt D (?)

[a]These rates are determined from boundaries usually interpolated between drill cores. In most cases, the rates would not be changed by more than about 30% by making other possible boundary choices. Although sedimentary discontinuities must be present, they have been ignored in these calculations. The last column is calculated from the ages at the bottom, or close to the bottom, and the depth at that point, again neglecting any sedimentary discontinuities in the section. (This, of course, includes repetition by slumping).

about 5.6 cm/10^3y in the Florida Strait. On the other hand, the sedimentation rates varies between 2 and 4 cm/10^3y in the Pliocene in the Sigsbee Basin, the Campeche-Sigsbee Salt Dome Province and the Campeche Scarp. These rates reflect the large component of turbidites in the Pleistocene and the predominantly pelagic sedimentation in the Pliocene.

For the Upper Miocene, the sedimentation rate is about 3 to 4 cm/10^3y in the Sigsbee Basin, again a region predominantly of pelagic sedimentation, as indicated by the transparent sedimentary zone on the profiler records. On the Campeche Scarp, in the Upper Miocene, the sedimentary rate is about 1 cm/10^3y, or is depicted by a discontinuity probably representing a time of slumping.

In the Early Tertiary, the sedimentation rate on the Campeche Scarp diminishes (backwards in time) to about 0.5 cm/103 y by the Paleocene.

The overall averages for the region above the Sigsbee Scarp are 11 cm/10^3y from Lower Pleistocene, 4 to 6.5 cm/10^3y from the Miocene in the Sigsbee Basin, 2.6 cm/10^3y from the Pliocene on the knoll of the Campeche-Sigsbee Salt Dome Province, 0.5 to 0.9 cm/10^3y on the Campeche Scarp since Paleocene, and 0.4 to 0.6 cm/10^3y from the Upper Eocene in the Florida Strait.

It is of some interest to see what these overall sedimentary rates give for the Sibsbee Basin. Using the figures of 4 to 6.5 cm/10^3y, we find that the depth to the beginning of the Cretaceous would fall at 5 to 8 km which is within the 5.0 km/sec layer (Ewing, Antoine, and Ewing, 1960). This is the layer in which the Louann Salt is believed to be located (Ewing, Antoine and Ewing, 1960, p. 2511).

RADIOLARIANS

Radiolarian fossils were well preserved with calcareous fossils in Sites 86, 94, and 95. Within these holes, all of the Cenozoic is represented so that a good correlation between the calcareous and siliceous plankton can be made. The reader is referred to the two chapters in this volume on Radiolaria (one by Helen P. Foreman, and the other by Sanfilipo and Riedel) for a very detailed discussion of the radiolaria.

CONCLUDING STATEMENT

Much more work is needed in the Gulf of Mexico, especially to determine the nature of the Sigsbee, West Florida, and Campeche scarps; the deeper structure of the western flank of the Sigsbee Basin; the origins and development of the diapiric structures in the Campeche-Sigsbee Salt Dome Province; the nature and origin of the Catoche Tongue and the buried features just seaward of it; and especially the nature of the transition to the Straits of Florida and the Yucatan Channel. Much of this work can be done with improved geophysical and coring techniques from normal oceanographic vessels.

In the last analysis, however, the drill must be used to identify and confirm the analysis of geophysical and geological data. Further drilling is needed in the Gulf of Mexico to attain the original objectives and to extend the results of this leg. Especially important will be deeper drilling within the Sigsbee Basin, drilling the Mississippi Deep Sea Cone, investigating deeper into the Campeche

Scarp (especially if the drill can be successfully spudded in one of the deeply incised canyons), penetration at least to the next deepest reflection horizon in the approaches to the Florida Strait, and perhaps even a definitive hole in the Yucatan Channel.

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