

1. INTRODUCTION

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Leg 10 of the *Glomar Challenger* was the first leg of the second phase of the Deep Sea Drilling Project. The second phase was well justified by the results of the first phase—18 months of drilling. For results of that work the reader should consult Initial Reports of the Deep Sea Drilling Project, Volumes 1 to 9 inclusive.

Glomar Challenger sailed from Galveston, Texas, on February 13, 1970. Departure was a few days late due to delays in shipyard overhaul. Difficulties were encountered with the positioning system at Site 85 requiring a trip into Brownsville, Texas, to effect repairs. Consequently, drilling did not get underway until the evening of February 21, 1970. Because of these delays, the time permitted for the cruise leg was extended and the leg ended in Miami on April 5, 1970. During the leg, holes were drilled at thirteen sites. Because of drilling restrictions, many of the proposed sites had to be neglected and new sites and objectives were chosen by the scientific staff on board.

The planned objectives of the Gulf Coast Site Selection Board were: 1) delineation of the Sigsbee Deep and associated continental rises; 2) evaluation of the various features believed to be associated with salt tectonics; 3) determination of the nature of the Florida and Campeche scarps; 4) investigation of the Mississippi Deep Sea Fan; and 5) the study of the transition from the Gulf of Mexico to the Straits of Florida. Most of these objectives could not be achieved because of the drilling restrictions imposed just prior to and during the leg, but significant drilling results were obtained in spite of these restrictions.

The operational statistics for Leg 10 are given in Table 1. The positions of each site drilled are shown in Figure 1.

GENERAL FRAMEWORK OF THE GULF OF MEXICO

The setting of the Gulf of Mexico is best described by starting with the deepest portion, the Sigsbee Abyssal Plain, which lies in the western portion of the Gulf of Mexico. The floor of this abyssal plain is extremely flat and almost level at a depth of about 3700 meters. Coring and dredging by more conventional types of oceanographic vessels have shown that at least the uppermost layers are abyssal deposits interbedded with abundant turbidites (Ewing et al., 1955, 1958).

The deeper structure has been investigated by seismic refraction and reflection measurements (Ewing et al., 1960; Ewing and Antoine, 1966) and has revealed that the sedimentary layers continue to about 7 km beneath the sea floor. These are underlain by a layer which could be composed of metamorphosed sediments or oceanic crust about 4 km thick. Beneath that layer, a layer about 5 km thick is believed to be oceanic crustal rocks. Mantle velocities

have been observed from 15 to 19 km below the sea surface beneath the Sigsbee Abyssal Plain.

The Sigsbee Abyssal Plain is interrupted by the Campeche-Sigsbee Salt Dome Province (Figure 1). Within this zone more than 124 knolls (features with topographic expression) and 36 domes (features without surface expression) have been delineated. (Ewing et al., 1962; Nowlin et al., 1965; Talwani and Ewing, 1966; Ewing and Antoine, 1966; Worzel et al., 1968; Pyle, 1968; Pequignat et al., 1971). In the drilling of Leg 1 of *Glomar Challenger*, one of the knolls (now called Challenger Knoll) was drilled and shown to be a salt dome (Ewing et al., 1969; Burk et al., 1969).

To the east, the Sigsbee Abyssal Plain merges into the Mississippi Deep Sea Fan. To the north, the plain gradually rises until it is abruptly terminated by the Sigsbee Scarp, where the depth changes quite abruptly from about 2900 meters to about 2200 meters. The continental slope rises in a distance of about 200 km to a depth of 200 meters. This slope is covered with peaks and valleys in a quite hummocky terrain due to the intrusion of salt diapirs (Gealy, 1955; Nettleton, 1957; Mathews, 1963; Moore and Curran, 1963; Uchupi and Emery, 1968; Lehner, 1969; Wilhelm and Ewing, 1972). The continental shelf along the Texas and Louisiana Gulf Coast shoals from 200 meters to the shoreline in a distance of about 160 km. Beneath the shelf the sedimentary layers are about 10 km in thickness. Many salt domes are known. Near the shelf edge there are several mounds which have been attributed to salt domes, reef building, and both processes (Fisk and McFarlan, 1955; Scruton, 1955; Williamson, 1959; Atwater, 1959; Curran, 1960; Shepard et al., 1960; Hardin and Hardin, 1961; Forgotson, 1963; Uchupi and Emery, 1968; and Wilhelm and Ewing, 1972).

To the west, the Sigsbee Abyssal Plain rises gradually in a continental rise to a depth of about 3300 meters from where it gradually steepens becoming the continental slope and rises to depths of about 200 meters in a distance of approximately 220 km. South of about 23° north, there are broad folds, partly faulted which have been attributed to salt tectonics (Bryant et al., 1966, 1968; Wilhelm and Ewing, 1972).

Along the southern margin of the Bay of Campeche, the continental rise and continental slope are masked by the Campeche-Sigsbee Salt Dome Province (Worzel et al., 1968; Wilhelm and Ewing, 1972). The continental shelf is fairly narrow along the east coast of Mexico varying from about 35 km to about 100 km.

There is little if any continental rise where the Sigsbee Abyssal Plain rises fairly abruptly at the Sigsbee Scarp from about 3600 meters to 200 meters depth in a distance of about 55 km. Dredging has recovered calcareous and

TABLE 1
Leg 10 Site Summary Data

Site Hole	Date	Latitude	Longitude	Water Depth (m)	Penetration Depth (m)	No. Cores	Cored Interval		Core Recovered	
							(m)	(%)	(m)	(%)
85	February 22	22°50.49'N	91°25.37'W	3733	212.6	5	38.6	18	25.4	66
85A	February 24	22°50.49'N	91°25.37'W	3733	302.0	2	39.0	13	0.0	0
86	February 25-26	22°52.48'N	90°57.75'W	1462	686.0	14	103.5	15	42.6	41
87	March 1-2	23°00.90'N	92°05.16'W	3751	700.0	1	9.0	1	2.5	28
88	March 4	21°22.93'N	94°00.21'W	2532	135.0	5	35.0	26	33.0	94
89	March 5-7	20°53.41'N	95°06.73'W	3067	440.0	6	35.5	8	26.0	73
90	March 9-11	23°47.80'N	94°46.09'W	3713	768.0	13	85.5	11	57.9	68
91	March 12-15	23°46.40'N	93°20.77'W	3763	899.6	25	213.8	24	148.7	70
92	March 16-17	25°50.69'N	91°49.29'W	2573	282.0	11	69.5	25	41.4	60
93	March 20	22°37.25'N	91°28.78'W	3090	1.5	1	1.6	100	1.5	100
94	March 22-26	24°31.64'N	88°28.16'W	1793	660.0	40	295.7	45	175.6	59
95	March 27-30	24°09.00'N	86°23.85'W	1633	463.0	22	170.0	37	118.1	69
96	March 30-31	23°44.56'N	85°45.80'W	3439	332.0	5	38.6	12	28.3	73
97	April 1-3	25°53.05'N	84°26.74'W	2930	337.0	12	59.0	28	35.9	61

dolomitic sediments and rocks from this scarp. Little penetration has been achieved with reflection profiling along the scarp. The Campeche Bank forms a broad continental shelf about 220 km wide, with depths mostly less than 40 meters. Along the eastern facing portion, the scarp is less steep, rising from about 3600 meters to about 200 meters depth in a distance of about 200 km. In several places the scarp is indented by broad fjord-like indentations similar to those in the Bahama Banks. Several authors have suggested that there are buried reef structures near the shelf edge and within the shelf. Some appropriate references are: Harding, 1967; Bryant et al., 1968, 1969; Bass and Zartman, 1969; Logan et al., 1968; and Wilhelm and Ewing, 1972).

The Mississippi Cone laps on to the foot of the easterly facing portion of the Campeche Scarp and the West Florida Scarp. The West Florida Scarp rises from depths of about 3000 meters to depths of 200 meters in a distance of about 50 km in the south and about 110 km in the north. Dredging has recovered principally carbonates and dolomites with some clastics present in the Miocene and Pliocene. Reefs near the shelf edge are believed to extend at least as far back in time as Late Cretaceous. Circular magnetic anomalies are found just back of the shelf edge suggesting that a series of buried igneous peaks are present beneath the edge of the shelf. The continental shelf is about 220 km wide in this region. Some of the most pertinent references are: Gould and Steward, 1955; Miller and Ewing, 1956; Antoine and Ewing, 1963; Ludwick, 1964; Heirtzler et al., 1966; Antoine et al., 1967; Maher et al., 1968; Bryant et al., 1969; and Wilhelm and Ewing, 1972.

Right off the Catoche Tongue in the approaches to the Straits of Florida several diapir-appearing structures have been discovered. Magnetic anomalies associated with them suggest that these are buried igneous peaks (Pyle et al., 1969; Bryant et al., 1969).

Several general discussions of the Gulf of Mexico as a whole and in some cases the surrounding related regions may be found in the following references: Lyons, 1957; King, 1959; Murray, 1961; King, 1964; Meyerhoff, 1967; and Wilhelm and Ewing, 1972.

The reader is directed to other volumes of the Initial Reports of the Deep Sea Drilling Project (for example, see Volume 12, p. 9-30) for explanations of core handling, physical property measurements, and the numbering of sites, holes, cores, and sections. Sediment classification used in the Site Report chapters is consistent with current usage by the Deep Sea Drilling Project.

Detailed operations reports are not included here. Interested readers may consult the Shipboard Hole Summary Book for Leg 10, part of the permanent data archive on file at DSDP, Scripps Institution of Oceanography.

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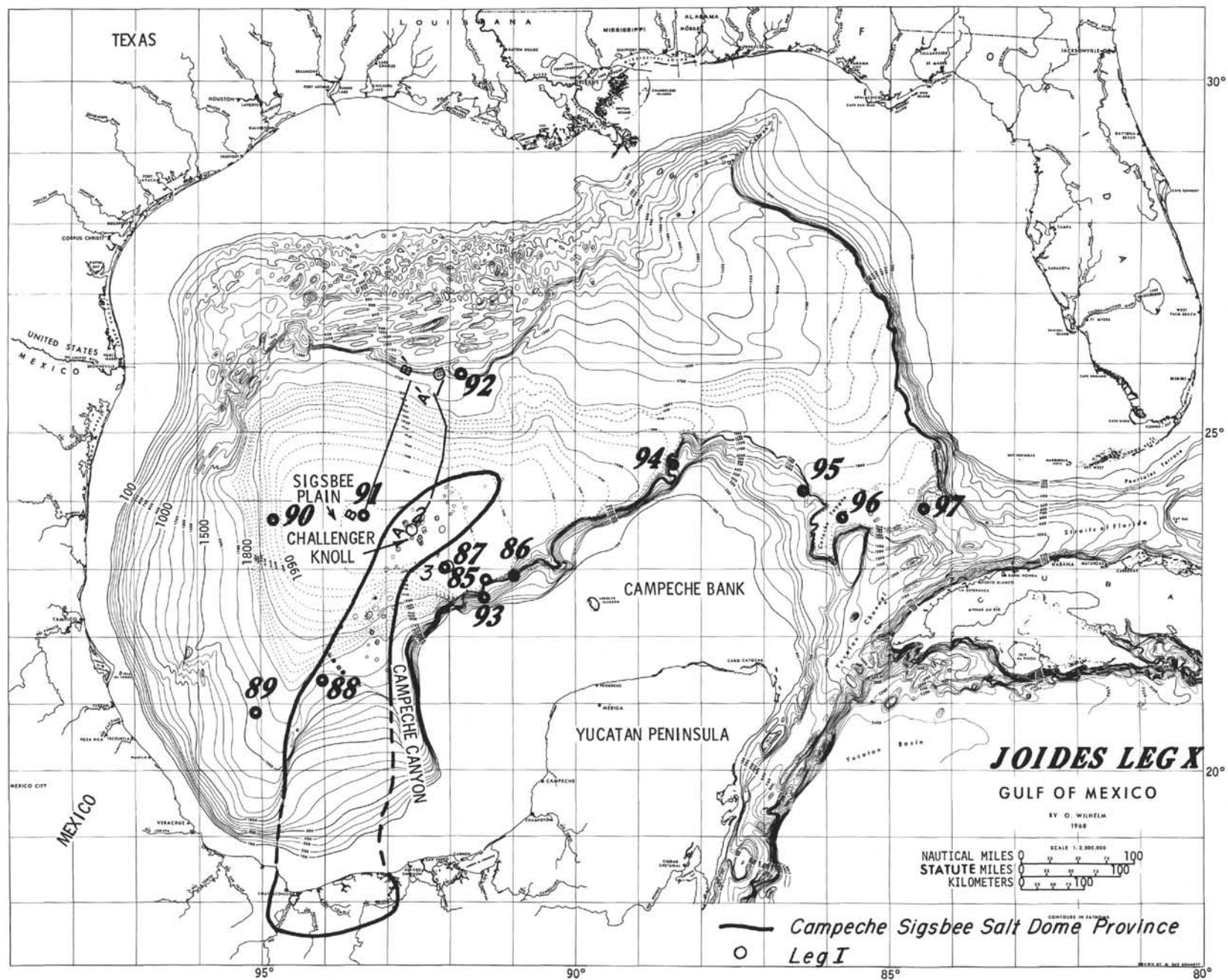


Figure 1. Map showing sites drilled on Leg 10.

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