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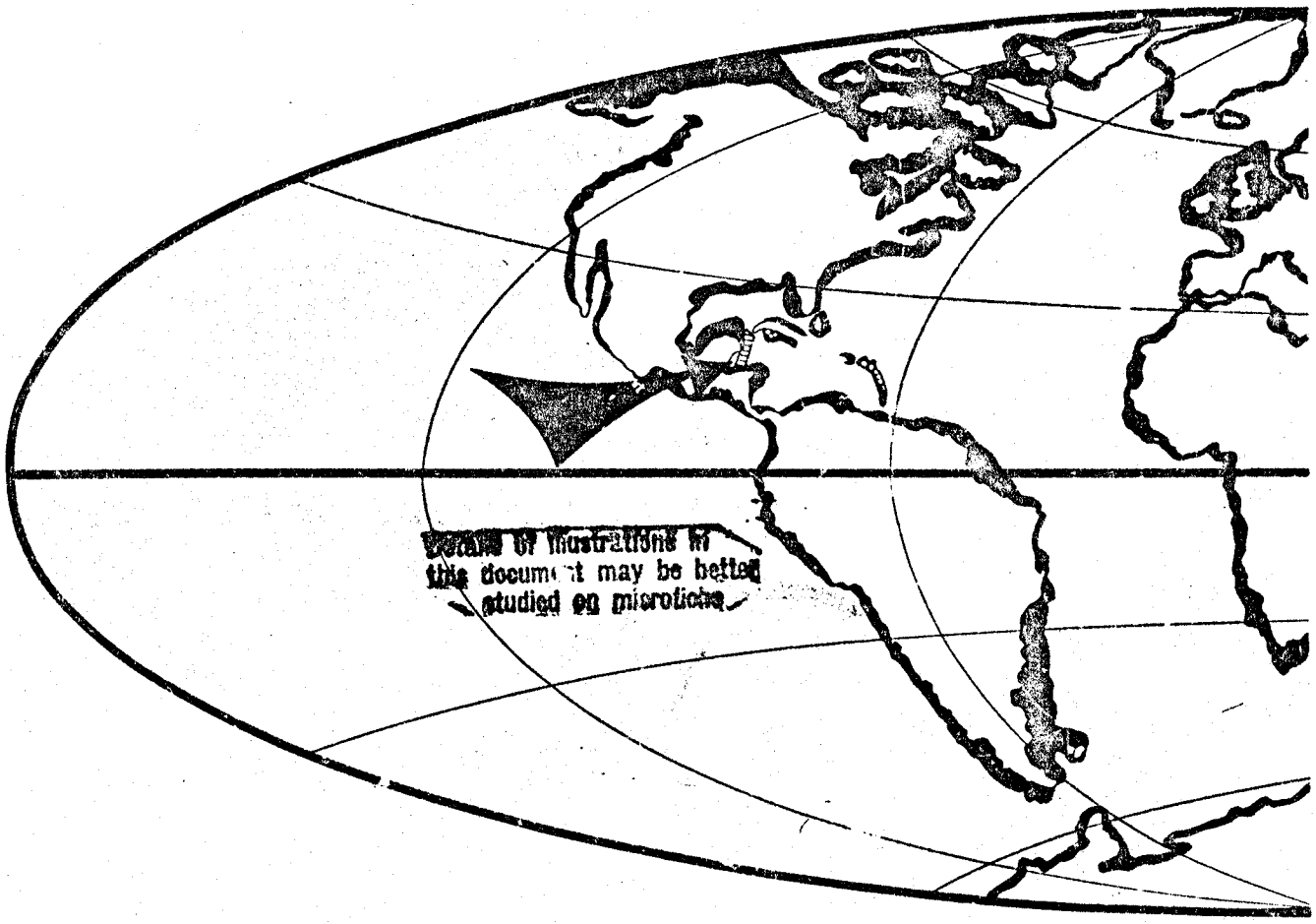
Acoustic Reflection Profiles

PB 207 595

EAST MARGIN YUCATAN PENINSULA



INTERNATIONAL DECADE OF OCEAN EXPLORATION

U. S. GEOLOGICAL SURVEY

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This report releases unedited subbottom acoustic-reflection profiles of Leg 2 of an international cruise performed by the U.S. Geological Survey through funding of the National Science Foundation under a program designated the International Decade of Ocean Exploration. Approximately 4,450 Km of track line was run along the eastern margin of the Yucatan Peninsula. Visiting scientists from the Institute of Geophysics and the Institute of Petroleum of the National University of Mexico and from the Mexican Navy aided in the investigation. The geological setting, preliminary results, and types of equipment used are described in a text of 7 pages; the profiles are reproduced on 18 folded pages; and a trackline map provides hourly location data.

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INTERNATIONAL DECADE OF OCEAN EXPLORATION

U.S. GEOLOGICAL SURVEY

LEG 2, 1971 CRUISE, UNITEDGEO I

J. G. VEDDER, CHIEF SCIENTIST

ACOUSTIC REFLECTION PROFILES EAST MARGIN, YUCATAN PENINSULA

USGS-GD-72-003

1972

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INTRODUCTION

As part of a cooperative marine research program designated the International Decade of Ocean Exploration (IDOE), the United States Geological Survey is participating in an investigation of the geologic framework and economic significance of continental margins and small ocean basins in the Gulf of Mexico, Caribbean Sea and West African continental shelf areas. These studies are funded through the National Science Foundation. Leg 1, completed June 22, 1971, concerned the southern part of the Bay of Campeche. Leg 2, described in this report, traversed the westernmost part of the Caribbean Sea from the Yucatan Channel southward to Glovers Reef off British Honduras (fig. 1). The area of Leg 2 lies at the western extremities of 3 major sea floor features, the Yucatan Basin, the Cayman Ridge and the Cayman Trough. Acoustic reflection, magnetic, and gravity data from the investigation will be studied in order to evaluate mineral resource potential and to analyze the structural framework as it relates to the hypothesis of global plate tectonics.

Scientists and observers from the Institute of Geophysics and Institute of Petroleum of the National University of Mexico and from the Mexican Navy joined the research vessel UNITEDGEO I, at the beginning of Leg 2 and remained aboard for two weeks. The cruise offered an excellent opportunity for the Mexican collaborators to observe the instrumentation, operational techniques, and interpretation of records aboard a marine research vessel.

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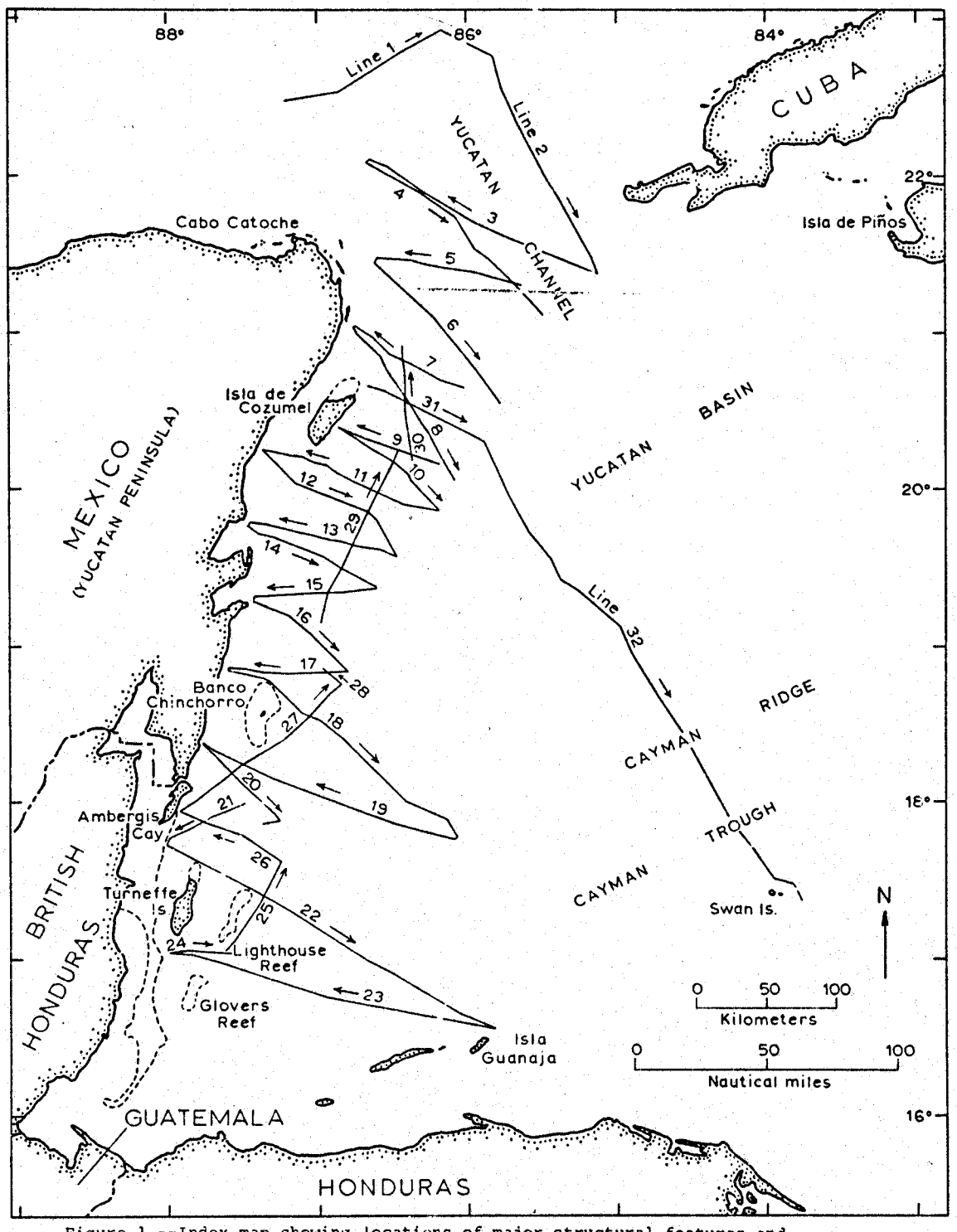

Figure 1.--Index map showing locations of major structural features and track lines along the east margin of the Yucatan Peninsula.

SHIP SCHEDULE

Leg 2, which covered a total of 25 days, included four days in transit from Veracruz, Mexico to the project area and 7 days from the project area to San Juan, Puerto Rico. Continuous acoustic reflection profiling, gravimetry, magnetometry, bathymetry and rock dredging were done within the project area.

Day 170	(June 19, 1971)	Left Veracruz with Mexican observers
Day 182	(July 1, 1971)	Reached southern point, Isla Guanaja
Day 186	(July 5, 1971)	Completed profile lines and dredge hauls; arrived Isla de Cozumel, debarked observers
Day 187	(July 6, 1971)	Departed Isla de Cozumel
Day 189	(July 8, 1971)	Off Swan Islands, secured seismic gear, continued gravity and magnetics
Day 191	(July 10, 1971)	Put into Kingston for fuel and water
Day 195	(July 14, 1971)	Arrived San Juan.

OBJECTIVES OF INVESTIGATION

The lack of offshore data in the area of Leg 2 of the USGS-IDOE cruise necessitated the assembly of detailed geophysical and geologic information in order to evaluate the resource potential and to resolve the tectonic framework of the continental margin. The first phase (1971) was primarily a geophysical reconnaissance designed to provide information that will help decipher the structural evolution of the continental margin east of the Yucatan Peninsula. A few dredge sites were selected as a possible means of determining the age and lithology of the rocks that form major surveyed features.

The primary scientific objectives of Leg 2 were: (1) to investigate the evolution of the continental margin east of the Yucatan Peninsula and its relation to concepts of continental margin development; (2) to explore the possibility of structural and stratigraphic links between western Cuba and the Yucatan Peninsula; (3) to study the western terminus of the Cayman Ridge and Trench system and to determine its influence on the structure of British Honduras and Guatemala; (4) to examine the Yucatan Basin in order to interpret the origin of this distinct sea floor feature in the northwestern Caribbean; (5) to learn more about the nature of interaction between the North American and Caribbean plates in this area.

GEOLOGIC SETTING

The geology of the offshore area from Cabo Catoche at the northern tip of the Yucatan Peninsula to Glovers Reef off British Honduras not only is very complex but also has received less study than most other areas in the circum-Caribbean region. Onshore work by Flores (1952),

Dengo (1969), Dengo and Bohnenberger (1969) and Viniegra (1971) provides background information on the regional geology and structural setting of the eastern continental margin of the Yucatan Peninsula and northern Central America. Their work indicates that two orogenic cycles, one Paleozoic, the other Mesozoic, can be distinguished in the southern part of the area. The oldest rocks in the lower cycle are slightly to moderately metamorphosed and probably are mid-Paleozoic in age. These rocks are locally cut by granitic intrusives and are overlain by a greatly deformed clastic wedge of upper Paleozoic strata that are slightly metamorphosed at places (Kesler and others, 1970; Bateson and Hall, 1971). Baie (1970) has speculated that a remnant of this Paleozoic fold belt connects Cuba and the Yucatan Peninsula along the outer edge of the continental margin. In British Honduras, granitic rocks of Triassic age intrude the upper Paleozoic clastic rocks (Bateson and Hall, 1971).

The second orogenic cycle evolved during Late Jurassic and Early Cretaceous time with the deposition of a thin sequence of red beds followed by shallow-water marine sedimentation in elongate troughs. The Mesozoic clastic rocks are little deformed but locally were intruded by plutonic rocks during Late Cretaceous or early Tertiary time in southeastern Guatemala (Clemons and Long, 1971). In Late Cretaceous time, serpentinites also were injected along major east-trending fault zones in central Guatemala. Deposition of a thick succession of shallow water carbonates and evaporites began in mid-Cretaceous time and continued into Late Cretaceous and early Tertiary time. Very slightly deformed carbonate platform deposits compose the bulk of the late Tertiary strata on the Yucatan Peninsula.

PRELIMINARY RESULTS

More than 4,450 kilometers of track line were traversed within the project area using a continuous acoustic reflection profiling system, a ship-towed magnetometer, and a shipboard gravimeter. Dredging at 10 sites selected on the basis of geophysical records provided critical information on the types of rocks and sediments that form major sea floor features. Accurate positioning was established by a satellite navigational system.

Cursory shipboard examination of the subbottom profiles indicates that the continental slope east of the Yucatan Peninsula is characterized by a steep gradient from near the shoreline to a depth of about 1,000 meters. Seaward from the narrow shelf, several elongate reefs, banks, and islands lie parallel to the coast and interrupt the slope. Farther basinward, the sea floor slopes gradually to depths of about 1,200 to 1,800 meters where another set of ridges, not evident on existing charts, projects above the regional gradient and also lies parallel to the coast. A relatively sharp declivity on the east side of this ridge system drops to the floor of the Yucatan Basin at a depth of about 4,000 meters. Dredge hauls of muscovite schist and marble from near the base

of the slope in the Yucatan Channel and off Isla de Cozumel suggest that the two subparallel sets of ridges are belts of relatively resistant metamorphosed sedimentary rock bordering an elongate basin partially filled with sediments. The fill may be as thick as 1,800 meters in the borderland basin east of Isla de Cozumel where the sedimentary rocks and overlying unconsolidated deposits also are broadly folded and locally faulted. The outer ridges serve as depositional barriers to sedimentation in smaller troughs developed along the east edge of the ridge-basin system.

The basement ridges of the British Honduras-Yucatan continental margin probably should be considered tectonic dams (Emery, 1968); presumably they represent fault blocks formed during the large scale rifting that formed the continental margin in post-late Paleozoic to pre-late Mesozoic time. However, some recent activity also is indicated by extensional faults in the nearshore basin sediments. This relatively recent movement of the blocks may have resulted from activity on the nearby border of the North American and Caribbean lithospheric plates.

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OPERATIONAL DATA

Navigation

A satellite navigation system, supplemented by radar, was used for positioning.

The satellite system consisted of an ITT 4007 AB satellite-navigation receiver, a DEC PDP-8L computer, and an ITT teletypewriter. In a 48-hour test, while at the dock in San Juan harbor, 15 satellite fixes were within about 70 m (230 ft.) of a plotted average; 10 were within about 45 m (150 ft.) of the average position. Precision of satellite fixes while underway was estimated at about 180 m (600 ft.).

The radar system was a Decca RM 329, with 25 kw of power and a range up to about 65 km (40 mi.). A 9-foot wave-guide antenna giving a beam width of less than 1° at the half-power points provided high azimuth resolution. Accuracy of radar fixes was subject to many variables, but the average positioning error was estimated at 0.5 nautical mile, or about 925 m (3000 ft.). Plotting was done on bottom-contour charts 903 and 904 of the U.S. Navy's Hydrographic Office. The detailed track chart (Plate 1) is at the same scale as the bottom contour charts.

Time for navigation and scientific records was referred to Greenwich Mean Time (Z), and days are numbered consecutively from the first day of the year. A WWV receiver was available on board, and scientific clocks were adjusted at regular intervals according to WWV time standards.

Acoustic-reflection System

The acoustic-reflection profiles were obtained using a sparker system consisting of separate, van-mounted, self-contained 160- and 120-kilojoule units triggered from a single source. Maximum usable power was about 220 kilojoules. The triggered discharge of large capacitors through 6 twin-electrode "ladders" trailed behind the ship created sparks which produced low-frequency acoustic pulses. These pulses were reflected from the sea bottom and from subbottom surfaces and were received and preamplified by a 100-hydrophone streamer. They were selectively filtered (mainly in the 15 to 125 hz range) and recorded graphically on a Raytheon recorder. An Ampex CP 100 7-channel recorder was used to put the data on magnetic tape for later playback at different filter settings and for record enhancement. The sparker ladders were trailed about 70 m behind the navigation antenna; the center of the hydrostreamer was at about 180 m.

Organization of profile records.--The subbottom acoustic profiles in this report are presented in numerical order at approximately 1/5th scale. Many are shown in reversed direction in order to facilitate comparison of structural and sedimentary features from profile to

profile. All east-west directed profiles have been assembled with the west end at the left; thus, the user views such profiles as though looking northward. The start and end of each line are indicated, as are time marks every hour. Day notations are listed consecutively from day one of the year 1971. The records in this report were made between days 174 and 189 (June 23 to July 8). Hour marks shown on the profiles are GMT and correspond to those on the detailed track chart (Plate 1) and on the location-depth printout (Table 1).

The subbottom profiles were all run at a 4-second firing rate and 4-second sweep. The vertical scale shown on the acoustic profiles is two-way travel time, in seconds. The sparker energy source was generally set at 80 kj, but 120 kj was used for deeper-water track lines (1, 2, 3, 4 and 32). The filter band pass was 98/20 hz on lines 1, 2 and 4-19, and 76/16 hz on line 3 and lines 20-32.

Strong north-directed currents in the Yucatan Channel area produced significant changes in ship speed that, in turn, resulted in a wide range in vertical exaggeration on the profiles. Exaggeration of the sea floor profile ranges between about 9:1 and 13:1; the least exaggeration is generally in the profiles run in a south to southeast direction.

Depth Recorder

A 3.5 Khz Edo transducer acoustic reflection system was used as an echosounder and shallow-penetration subbottom profiler. Twelve transducers were mounted into a well that was built into the ship's hull. These transducers provided a pulse signal programmed by a Gifft graphic recorder. The pulse was reflected at the ocean bottom and provided uncorrected water depths in seconds (two-way travel time). These water depths, in seconds, were transcribed at half-hour or quarter-hour intervals and, in conjunction with navigation fixes, were computer-processed using corrections from Matthews Tables. Computer output was printed at one-hour intervals and includes the position of each station, the observed depth in seconds (two-way travel time), and the corrected depth in meters (Table 1).

Table 1.--Positions and depths expressed in two-way travel time and corrected meters along lines of Leg 2, eastern margin of Yucatan Peninsul 1971.

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
1	174	0100	22.4296	87.0943	0.069	52
1	174	0200	22.4546	86.9290	0.285	218
1	174	0300	22.4889	86.7699	0.410	312
1	174	0400	22.5692	86.6413	0.477	363
1	174	0500	22.6467	86.5112	0.940	711
1	174	0600	22.7226	86.3802	1.196	901
1	174	0700	22.7910	86.2457	1.414	1063
1	174	0800	22.8469	86.1122	1.421	1068
1	174	0900	22.7750	85.9694	1.292	973
1	174	1000	22.7151	85.8447	1.298	977
2	174	1100	22.6164	85.7595	1.499	1126
2	174	1200	22.4960	85.7220	1.620	1216
2	174	1300	22.3485	85.6615	2.200	1647
2	174	1400	22.2135	85.5871	2.520	1887
2	174	1500	22.0760	85.5082	2.763	2069
2	174	1600	21.9433	85.4320	2.884	2159
2	174	1700	21.8170	85.3504	2.052	1538
2	174	1800	21.6896	85.2790	2.523	1889
2	174	1900	21.5715	85.2087	3.132	2347
2	174	2000	21.4533	85.1383	3.500	2624
2	174	2100	21.3737	85.1613	3.430	2571
3	174	2200	21.4344	85.3163	3.530	2647
3	174	2300	21.4953	85.4715	2.896	2168
3	175	0000	21.5563	85.6268	2.255	1688
3	175	0100	21.6259	85.7893	2.670	1999
3	175	0200	21.6955	85.9517	2.542	1903
3	175	0300	21.7855	86.1104	1.983	1486
3	175	0400	21.8787	86.2700	0.970	733
3	175	0500	21.9952	86.4475	0.330	252
4	175	0600	22.0358	86.6120	0.127	97
4	175	0700	22.0023	86.5522	0.133	101
4	175	0800	21.9539	86.4607	0.316	241
4	175	0900	21.9044	86.3668	0.576	438
4	175	1000	21.8549	86.2730	1.005	759
4	175	1100	21.7939	86.1771	1.486	1117
4	175	1200	21.7294	86.0745	2.179	1632
4	175	1300	21.6364	85.9950	2.500	1872
4	175	1400	21.5301	85.9275	2.510	1879
4	175	1500	21.4501	85.8271	2.611	1955
4	175	1600	21.3616	85.7276	2.750	2059
4	175	1700	21.2613	85.6189	2.959	2215

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
4	175	1800	21.1605	85.5197	4.150	3115
5	176	0300	21.2833	85.6165	3.063	2294
5	176	0400	21.3267	85.7770	2.532	1896
5	176	0500	21.3667	85.9333	2.448	1833
5	176	0600	21.3892	86.1078	2.038	1527
5	176	0700	21.4240	86.2636	1.220	919
5	176	0800	21.4467	86.4339	0.254	194
6	176	0900	21.4117	86.5633	0.049	37
6	176	1000	21.3287	86.4654	0.290	222
6	176	1100	21.2488	86.3775	0.612	465
6	176	1200	21.1666	86.2813	1.458	1096
6	176	1300	21.0827	86.1808	2.039	1528
6	176	1400	20.9733	86.0882	1.907	1430
6	176	1500	20.8672	85.9984	1.665	1250
6	176	1600	20.7536	85.9031	3.280	2459
6	176	1700	20.6464	85.8200	5.610	4229
7	177	0200	20.6696	86.0608	1.992	1493
7	177	0300	20.7307	86.2048	1.752	1315
7	177	0400	20.8080	86.3479	1.579	1186
7	177	0500	20.8841	86.5007	0.944	714
7	177	0600	20.9957	86.6358	0.500	380
8	177	0700	20.9711	86.6683	0.698	529
8	177	0800	20.8460	86.5389	0.825	624
8	177	0900	20.7361	86.4730	1.334	1004
8	177	1000	20.6433	86.4040	1.566	1176
8	177	1100	20.5347	86.3346	1.670	1254
8	177	1200	20.4214	86.2652	1.125	849
8	177	1300	20.3063	86.1849	2.835	2123
8	177	1400	20.1858	86.1163	3.450	2586
8	177	1500	20.0667	86.0400	6.040	4562
9	177	2300	20.2172	86.2846	1.970	1477
9	178	0000	20.2632	86.4280	1.586	1191
9	178	0100	20.3121	86.5761	1.645	1235
9	178	0200	20.3680	86.7220	1.586	1191
10	178	0300	20.3773	86.7724	0.675	512
10	178	0400	20.2980	86.6459	1.638	1230
10	178	0500	20.2211	86.5165	1.282	965
10	178	0600	20.1321	86.3932	0.468	356

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
10	178	0700	20.0272	86.2957	3.400	2549
10	178	0800	19.9118	86.1827	6.010	4539
11	178	0900	19.8887	86.2525	6.030	4555
11	178	1000	19.9287	86.4185	2.750	2059
11	178	1100	19.9913	86.5540	1.970	1477
11	178	1200	20.0533	86.6924	1.610	1209
11	178	1300	20.1199	86.8253	1.630	1224
11	178	1400	20.1864	86.9751	1.240	934
11	178	1500	20.2281	87.1218	0.878	664
11	178	1600	20.2662	87.2780	0.455	346
12	178	1700	20.2271	87.2826	0.500	380
12	178	1800	20.1314	87.1810	0.545	414
12	178	1900	20.0398	87.0771	1.070	808
12	178	2000	19.9978	86.9618	1.498	1125
12	178	2100	19.9558	86.8465	1.645	1235
12	178	2200	19.9138	86.7312	1.410	1060
12	178	2300	19.8581	86.6046	2.570	1924
12	179	0000	19.7630	86.5225	2.950	2209
12	179	0100	19.6460	86.4575	5.250	3955
12	179	0200	19.6100	86.4864	6.000	4531
13	179	0300	19.6395	86.6138	2.580	1932
13	179	0400	19.6680	86.7500	2.230	1670
13	179	0500	19.7015	86.9000	1.700	1276
13	179	0600	19.7316	87.0486	1.580	1187
13	179	0700	19.7646	87.1824	1.440	1082
13	179	0800	19.7942	87.3194	1.100	830
14	179	0900	19.7498	87.3577	0.450	343
14	179	1000	19.7138	87.2539	0.870	658
14	179	1100	19.6723	87.1420	1.650	1239
14	179	1200	19.6300	87.0288	1.660	1246
14	179	1300	19.5870	86.9148	1.580	1187
14	179	1400	19.5334	86.8178	2.560	1917
14	179	1500	19.4741	86.7062	4.210	3160
14	179	1600	19.4148	86.5946	6.020	4547
15	179	1700	19.3726	86.7015	4.900	3687
15	179	1800	19.3635	86.8392	2.830	2119
15	179	1900	19.3587	86.9902	2.075	1555
15	179	2000	19.3512	87.1261	1.880	1410
15	179	2100	19.3436	87.2609	1.630	1224

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
16	179	2200	19.3111	87.3597	0.870	658
16	179	2300	19.2673	87.2544	1.720	1291
16	180	0000	19.2254	87.1536	1.860	1395
16	180	0100	19.1579	87.0628	1.660	1246
16	180	0200	19.0889	86.9840	0.450	343
16	180	0300	19.0153	86.9013	2.910	2179
16	180	0400	18.9435	86.8231	5.110	3847
16	180	0500	18.8767	86.7500	5.500	4144
17	180	0600	18.8582	86.8792	5.850	4415
17	180	0700	18.8533	87.0082	2.620	1962
17	180	0800	18.8522	87.1399	1.540	1157
17	180	0900	18.8627	87.3038	0.985	744
17	180	1000	18.8797	87.4068	1.090	823
18	180	1100	18.8718	87.5210	1.210	912
18	180	1200	18.8452	87.3975	0.890	673
18	180	1300	18.8043	87.2700	0.730	553
18	180	1400	18.7238	87.1818	0.790	598
18	180	1500	18.6495	87.0959	1.940	1455
18	180	1600	18.5849	87.0054	1.700	1276
18	180	1700	18.5339	86.9047	1.440	1082
18	180	1800	18.4698	86.8203	5.800	4376
18	180	1900	18.3891	86.7235	5.660	4267
18	180	2000	18.3047	86.6354	5.685	4287
18	180	2100	18.2202	86.5473	5.650	4260
18	180	2200	18.1358	86.4591	5.625	4240
18	180	2300	18.0507	86.3621	5.630	4244
18	181	0000	17.9979	86.2493	5.680	4283
18	181	0100	17.9514	86.1388	3.620	2715
18	181	0200	17.8669	86.0491	3.050	2284
19	181	0300	17.8205	86.1051	3.200	2398
19	181	0400	17.8526	86.2646	4.190	3145
19	181	0500	17.9107	86.4249	5.530	4167
19	181	0600	17.9597	86.5834	5.530	4167
19	181	0700	18.0168	86.7422	5.480	4128
19	181	0800	18.0744	86.9014	4.930	3710
19	181	0900	18.1320	87.0605	4.800	3612
19	181	1000	18.1898	87.2198	3.500	2624
19	181	1100	18.2572	87.3750	1.840	1380
19	181	1200	18.3325	87.5339	1.160	875
19	181	1300	18.4223	87.6998	0.810	613

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
20	181	1500	18.2781	87.5624	1.415	1064
20	181	1600	18.2030	87.4831	2.620	1962
20	181	1700	18.1287	87.4059	3.300	2474
20	181	1800	18.0538	87.3264	2.890	2164
20	181	1900	17.9779	87.2459	4.760	3582
21	181	2000	17.9146	87.2305	4.570	3436
21	182	0200	17.9722	87.5847	0.805	609
21	182	0300	17.9000	87.7292	1.660	1246
21	182	0400	17.8333	87.8583	1.185	893
22	182	0500	17.7722	87.9683	0.575	437
22	182	0600	17.7183	87.8501	1.020	771
22	182	0700	17.6587	87.7322	0.790	598
22	182	0800	17.5976	87.6109	2.600	1947
22	182	0900	17.5364	87.4895	1.480	1112
22	182	1000	17.4762	87.3707	4.200	3153
22	182	1100	17.4173	87.2634	4.950	3725
22	182	1200	17.3531	87.1517	4.930	3710
22	182	1300	17.2878	87.0433	4.760	3582
22	182	1400	17.2191	86.9303	4.685	3524
22	182	1500	17.1485	86.8146	5.090	3832
22	182	1600	17.0778	86.6990	5.125	3859
22	182	1700	17.0090	86.5801	5.225	3936
22	182	1800	16.9444	86.4537	5.680	4283
22	182	1900	16.8774	86.3385	6.050	4570
22	182	2000	16.8097	86.2228	6.700	5072
22	182	2100	16.7420	86.1070	7.200	5463
22	182	2200	16.6761	85.9858	2.700	2022
22	182	2300	16.6201	85.8337	1.600	1202
23	183	0000	16.6156	85.8929	1.670	1254
23	183	0100	16.6448	86.0446	1.950	1462
23	183	0200	16.6718	86.1983	7.110	5392
23	183	0300	16.7004	86.3548	6.910	5235
23	183	0400	16.7312	86.5182	6.300	4765
23	183	0500	16.7595	86.6861	5.260	3963
23	183	0600	16.7933	86.8588	4.940	3717
23	183	0700	16.8423	87.0196	4.580	3443
23	183	0800	16.8926	87.1786	4.000	3002
23	183	0900	16.9428	87.3376	3.600	2700
23	183	1100	17.0344	87.6558	0.420	320
23	183	1200	17.0760	87.8167	0.890	673
23	183	1300	17.0887	87.8854	1.000	756

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
23	183	1400	17.0938	87.7675	1.030	778
23	183	1500	17.0830	87.6297	0.550	418
24	183	1600	17.0744	87.5161	3.750	2815
24	183	2100	19.0589	86.2691	2.050	1536
25	183	2200	17.1667	87.4900	2.950	2209
25	183	2300	17.2801	87.4101	4.630	3482
25	184	0000	17.4005	87.3257	4.830	3634
25	184	0100	17.5230	87.2615	4.550	3420
25	184	0200	17.6453	87.1991	4.500	3382
26	184	0300	17.7404	87.2889	2.510	1879
26	184	0400	17.8254	87.4181	1.770	1328
26	184	0500	17.8883	87.5783	1.775	1332
26	184	0600	17.9459	87.7309	1.660	1246
27	184	0700	18.0051	87.8289	1.150	867
27	184	0800	18.0568	87.7392	1.640	1231
27	184	0900	18.1678	87.5939	2.050	1536
27	184	1000	18.2625	87.4678	1.860	1395
27	184	1100	18.3339	87.3381	1.450	1090
27	184	1200	18.4106	87.2071	1.270	956
27	184	1300	18.4966	87.0940	2.360	1767
27	184	1400	18.6040	86.9850	2.380	1782
27	184	1500	18.7246	86.8681	5.930	4477
28	184	1600	18.8289	86.8275	5.905	4457
29	185	0400	19.2023	86.9102	2.000	1499
29	185	0500	19.3599	86.8759	2.200	1647
29	185	0600	19.5014	86.7912	2.660	1992
29	185	0700	19.6279	86.7246	2.920	2186
29	185	0800	19.7499	86.6650	2.430	1819
29	185	0900	19.8719	86.6055	2.580	1932
29	185	1000	19.9940	86.5455	2.100	1573
29	185	1100	20.1160	86.4805	2.120	1588
29	185	1200	20.2354	86.4204	1.560	1172
30	185	2200	20.2223	86.3203	0.0	0
30	185	2300	20.3859	86.3518	1.620	1216
30	186	0000	20.5620	86.3666	1.650	1239
30	186	0100	20.7068	86.3667	1.520	1142
30	186	0200	20.8695	86.3841	0.0	0

I.D.O.E. '71 LEG 2 - YUCATAN

LINE	DAY	TIME (Z)	LATITUDE (NORTH)	LONGITUDE (WEST)	DEPTH (SEC)	DEPTH (M)
31	188	0400	20.6191	86.5045	1.495	1123
31	188	0500	20.5484	86.3588	1.650	1239
31	188	0600	20.4731	86.2020	0.350	267
31	188	0700	20.4057	86.0531	3.640	2731
31	188	0800	20.3386	85.9188	5.550	4182
32	188	0900	20.2481	85.8168	6.050	4570
32	188	1000	20.1039	85.7504	6.040	4562
32	188	1100	19.9614	85.6773	6.040	4562
32	188	1200	19.8173	85.5938	6.043	4565
32	188	1300	19.6773	85.4993	6.050	4570
32	188	1400	19.5483	85.4018	6.055	4574
32	188	1500	19.4251	85.3204	6.055	4574
32	188	1600	19.3143	85.1622	6.050	4570
32	188	1700	19.2092	85.0386	6.045	4566
32	188	1800	19.0973	84.9351	6.045	4566
32	188	1900	18.9712	84.8728	6.030	4555
32	188	2000	18.8582	84.8018	5.720	4314
32	188	2100	18.7361	84.7177	5.050	3801
32	188	2200	18.6108	84.6289	4.460	3351
32	188	2300	18.4940	84.5483	2.900	2171
32	189	0000	18.3771	84.4795	2.350	1759
32	189	0100	18.2601	84.4155	4.100	3077
32	189	0200	18.1462	84.3513	6.160	4656
32	189	0300	18.0351	84.2867	6.680	5057
32	189	0400	17.9215	84.2207	6.880	5212
32	189	0500	17.8096	84.1342	6.950	5267
32	189	0600	17.6991	84.0508	6.800	5149
32	189	0700	17.5944	83.9737	5.700	4298
32	189	0800	17.5297	83.8704	3.650	2738
32	189	0900	17.4652	83.7777	1.840	1380