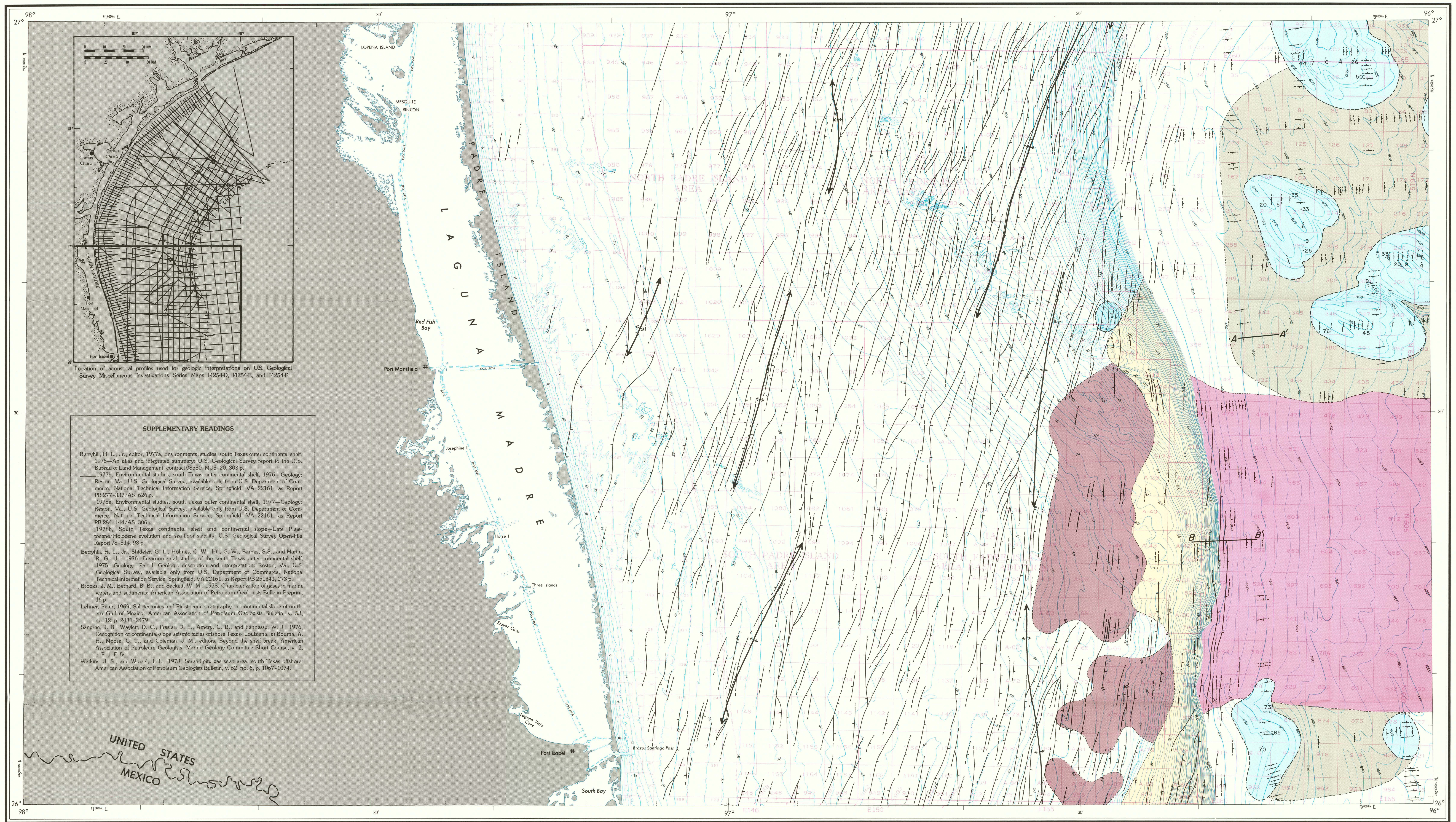
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED ON BEHALF OF THE U.S. BUREAU OF LAND MANAGEMENT
STATE TERRITORIAL WATER DATA COLLECTED IN COOPERATION WITH THE BUREAU OF ECONOMIC GEOLOGY, UNIVERSITY OF TEXAS AT AUSTIN

MISCELLANEOUS INVESTIGATIONS SERIES
MARINE GEOLOGY ATLAS
PORT ISABEL QUADRANGLE, TEXAS
MAP I-1254-F



Location of acoustical profiles used for geologic interpretations on U.S. Geological Survey Miscellaneous Investigations Series Maps I-1254-D, I-1254-E, and I-1254-F.

SUPPLEMENTARY READINGS

Berryhill, H. L., Jr., editor, 1977a, Environmental studies, south Texas outer continental shelf, 1975—An atlas and integrated summary: U.S. Geological Survey report to the U.S. Bureau of Land Management, contract 08550-MU5-20, 303 p.

______1977b, Environmental studies, south Texas outer continental shelf, 1976—Geology: Reston, Va., U.S. Geological Survey, available only from U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161, as Report PB 277-337/AS, 626 p.

______1978a, Environmental studies, south Texas outer continental shelf, 1977—Geology: Reston, Va., U.S. Geological Survey, available only from U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161, as Report PB 284-144/AS, 306 p.

______1978b, South Texas continental shelf and continental slope—Late Pleistocene/Holocene evolution and sea-floor stability: U.S. Geological Survey Open-File Report 78-514, 98 p.

Berryhill, H. L., Jr., Shideler, G. L., Holmes, C. W., Hill, G. W., Barnes, S.S., and Martin, R. G., Jr., 1976, Environmental studies of the south Texas outer continental shelf, 1975—Geology—Part I, Geologic description and interpretation: Reston, Va., U.S. Geological Survey, available only from U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161, as Report PB 251341, 273 p.

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Lehner, Peter, 1969, Salt tectonics and Pleistocene stratigraphy on continental slope of northern Gulf of Mexico: American Association of Petroleum Geologists Bulletin, v. 53, no. 12, p. 2431-2479.

Sangree, J. B., Waylett, D. C., Frazier, D. E., Amery, G. B., and Fennessy, W. J., 1976, Recognition of continental-slope seismic facies offshore Texas- Louisiana, *in* Bouma, A. H., Moore, G. T., and Coleman, J. M., editors, Beyond the shelf break: American Association of Petroleum Geologists, Marine Geology Committee Short Course, v. 2, p. F-1-F-54.

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EXPLANATION

ANTICLINAL AXIS—Arrows show direction of plunge. Crests are at a general depth of 500-800 milliseconds beneath sea-floor surface. One millisecond approximately equal to 0.73 m. Regional trends shown in figure 1*B*

SUBSURFACE DIAPIRIC MASS—Dashed line is general outline of intrusive mass as indicated by acoustical profiles and by the topography of the sea floor. Number indicates approximate subsea-floor depth in milliseconds to caprock of diapir

AREA OF BURIED HIGHLY DEFORMED SEDIMENTS—Overlain by younger undeformed, prograded deltaic sediments. Areas of poor acoustical return on the profile suggest trapped gas within the subsurface zone. Discrete faults largely obscured by sound attenuation within the highly contorted sediments

AREA OF DEFORMED SEDIMENTS ALONG SEA FLOOR AND AT RELATIVELY SHALLOW SUBSURFACE DEPTHS—Deformation caused by gravity slumping of rapidly deposited unconsolidated sediments where the Continental Shelf joins the steeper Continental Slope along seaward edge of the ancestral Rio Grande delta. Shallow rotational faults locally numerous

AREA OF DEFORMED SEDIMENTS ON THE CONTINENTAL SLOPE—Characterized by hummocky topography and slumping of sediments on a large scale; includes buried older slumped sequences, indicating repeated movement through time

AREA OF DEFORMED SEDIMENTS ASSOCIATED WITH DIAPIRIC MASSES—Characterized by compressional ridges formed by a combination of downslope movement and the buttressing effect of rising diapirs

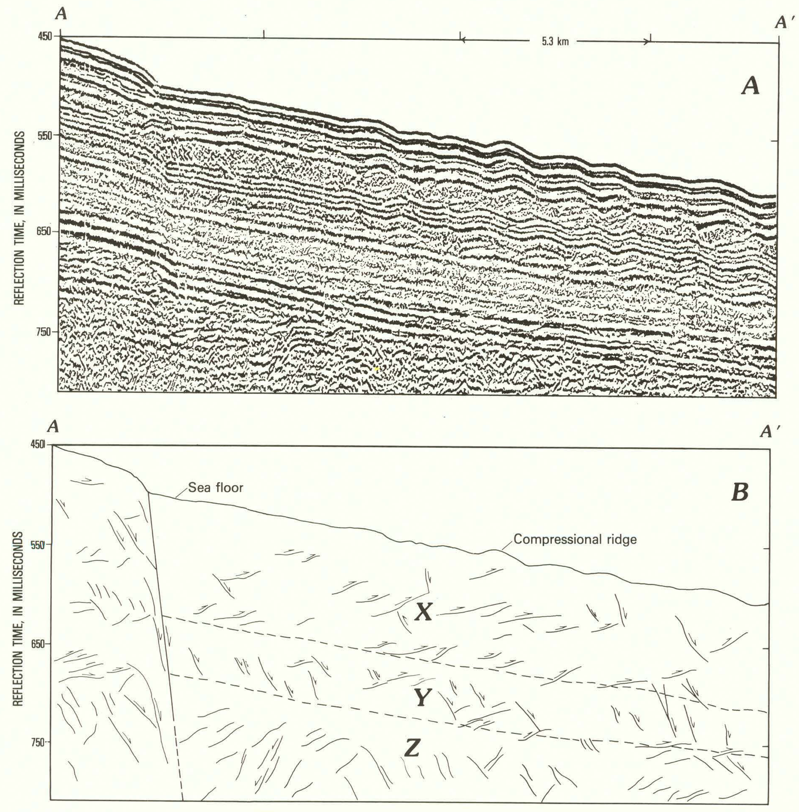
FAULT—Position plotted from acoustical profiles. Hachured on downthrown side. Short line indicates fault where spacing of profiles is too broad to permit plotting of fault trends between profiles. Most faults mapped are growth faults, that is, throw increases with increasing depth beneath sea floor. Figure 1*A* shows chronological summary of faulting on a regional scale

DISCUSSION

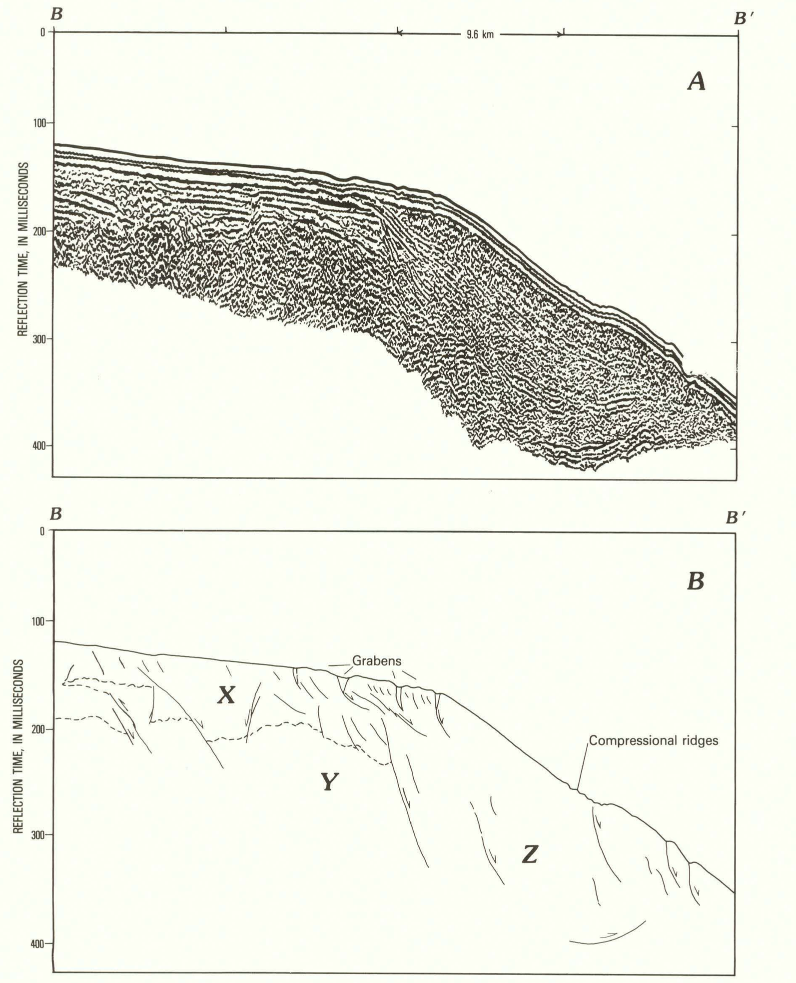
This map is one of a set of six environmental geologic maps for the Port Isabel 1° × 2° quadrangle, Texas. The six maps constitute a marine geologic atlas that has been designed to integrate a variety of environmental data and to show the fundamental geologic and associated processes involved in the building and evolution of the Continental Shelf.

The topical maps interrelate data on water circulation and sedimentation, trace metals, geochemistry, biogeology, sea-level change, and deformational movements within the Continental Shelf, including folding, faulting, diapirism, and slumping. The types of data portrayed on individual maps are those that have a cause-and-effect interrelationship in the environment. For example, amounts of trace elements and numbers of invertebrates that live in bottom sediments are both closely related to the grain size or texture of the sediments. Likewise, the sediment-deposition rate is dependent on the speed and direction of oceanographic currents (both surface and subsurface). The maps are organized to emphasize the interactions of processes as a function of time and to demonstrate the long-term effects of the related processes. Thus, map A covers the most fundamental aspect of marine geology, the rate at which sediment introduced to the ocean is spread by its transporting medium, water. The rate of spreading varies from minutes and hours to seasons and years; therefore, yearly rates of sediment deposition are related to the movement of water averaged in both yearly and seasonal increments. Map B shows trace-metal data for surficial bottom sediments. Map C portrays somewhat longer term cumulative effects of the varying hydraulic regimes, as revealed by the grain size of surficial bottom sediments (sampled to a depth of 6 cm), and the variations in the texture and type of sediment deposited over hundreds or thousands of years, as revealed by gravity cores that penetrated to depths from a few tens of centimenters to 2 m. The amount of sediment deposited over the Continental Shelf and the extent and magnitude of faulting since the last low stand of sea level, about 18,000 years ago, are shown on map D. Map E shows paleogeography of the shelf when it was exposed as land and the sedimentary facies of the ancestral Rio Grande delta that was built across the shelf as sea level fell prior to 18,000 years ago. The cumulative deformation caused by the interaction of sediment loading, diapirism, and sea-level changes over the past several hundred thousand years are shown on map F.

The maps of the Port Isabel 1° × 2° quadrangle include the Federal lease block grid and bathymetry, so that the data and interpretations can be easily tied to a specific legal geographic entity within the region at a scale large enough to permit reasonable accuracy of location. These maps provide a summary state-of-the-art inventory of the segment of the Continental Shelf located in the Port Isabel 1° × 2° quadrangle that can be used in planning specific site studies as well as more detailed topical investigations.



Acoustical profile and interpretive drawing of section *A–A′* showing seismic stratigraphy and deformational characteristics of sediments along the shelf edge and on the Continental Slope. *A*, Facsimile of upper part of acoustical profile along line *A–A′*. *B*, Interpretive drawing of deformational features shown by the acoustical profile: *X*, zone of compressional folding and small-scale overthrusting subparallel to the bedding planes; *Y*, zone of resistance to downslope movement of sediments above as suggested by the numerous small drag faults; *Z*, zone of hyperbolic reflectors probably indicating a diapiric mass at depth.



Acoustical profile and interpretive drawing of section *B–B′* showing seismic stratigraphy and deformational characteristics of sediments along the shelf edge and on the Continental Slope. *A*, Facsimile of upper part of acoustical profile along line *B–B′*. *B*, Interpretive drawing of deformational features shown by the acoustical profile: *X*, outer shelf deltaic sediments offset by shallow slump faults in the upper part of the zone and rotational collapse in the lower part; *Y*, zone of chaotic, diapiric sediments (note suggestion of lateral flowage near left margin of drawing); *Z*, large-scale slumping of sediments on upper Continental Slope, creating a series of superposed slides that terminate in a large buttressing slope toe (near the right-hand margin of the diagram).

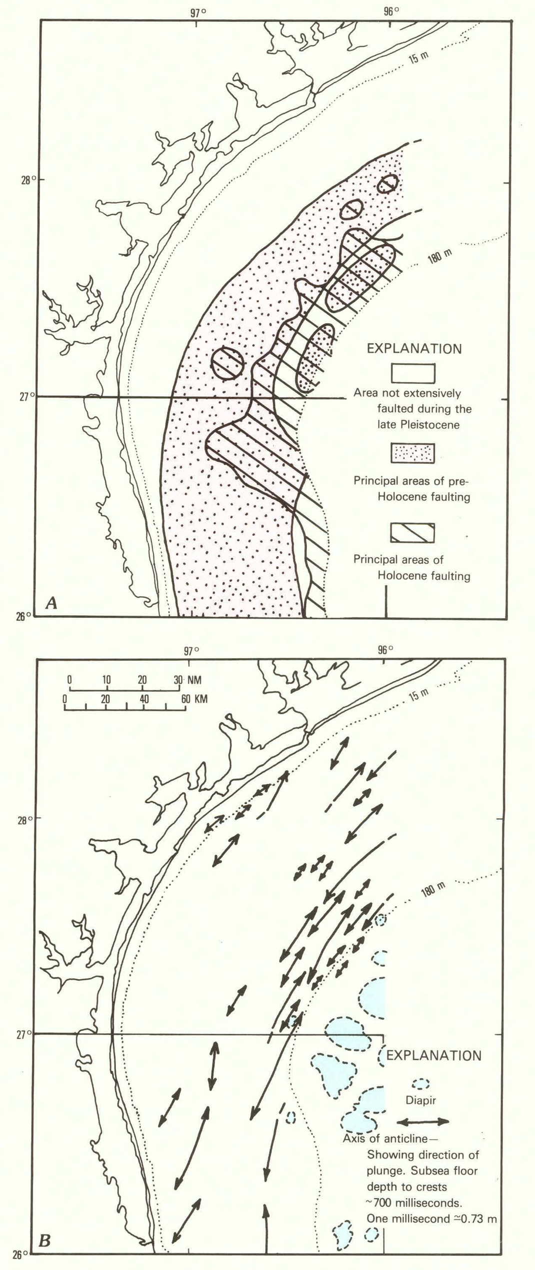


Figure 1.—General structural relations, south Texas outer Continental Shelf region, Port Isabel quadrangle outlined. *A*, Chronological summary of faulting during the late Pleistocene and Holocene; *B*, Trend of fold axes.

Base map information including bathymetry, compiled by the National Ocean Survey from NOS hydrographic surveys supplemented by hydrographic information from other sources. Bathymetric contour intervals: 10 meters to the 200 meter depth, supplemented by 2 meter intervals, thence 50 meters to maximum depth.
Datum MLW.
Universal Transverse Mercator Grid, Zone 14; 10:000 meter ticks (-) are shown on the neatline
Lack of sufficient data on portions of this map requires the use of generalized form lines to infer probable shape for conical or elliptical shaped features that would otherwise appear truncated. The form lines are not at the prescribed contour interval.

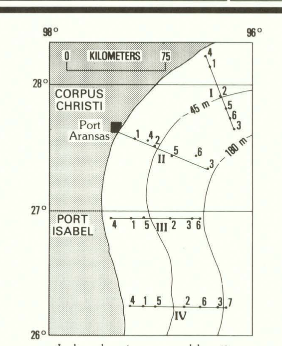
EVALUATION OF BATHYMETRIC SURVEY ACCURACY

SURVEY NUMBER	SURVEY DATE	SCALE	SURVEY LINE SPACING (NAUT. MILES)	HORIZONTAL POSITIONING (METERS)
H-6397	1938	1:20,000	.06- .17	20-40
H-6403	1938	1:40,000	.41-1.21	30-100
H-6405	1938	1:80,000	.10-2.0	40-200
H-6489	1939	1:20,000	.06- .23	20-40
H-6490	1939	1:20,000	.06- .13	20-40
H-6491	1939	1:20,000	.03- .14	20-40
H-6493	1939	1:10,000	.02- .06	15-30
H-6494	1939	1:40,000	.08-1.24	30-100
H-6495	1939	1:40,000	.15-1.50	30-100
H-6496	1939	1:40,000	.12-1.28	30-100
H-6497	1939	1:80,000	.35-2.10	40-200
H-6498	1938-39	1:80,000	.36-1.70	40-200
H-6499a	1939	1:240,000	.50-15.30	600-1500

VERTICAL DEPTH ACCURACY (METERS)

Depth	
0 – 20	0.3
20 – 50	0.5
50 – 200	1.0
Over 200	1% of depth

TRANSVERSE MERCATOR PROJECTION
Scale 1:250,000



Index showing general location of sample-station transects

INTERIOR GEOLOGICAL SURVEY, RESTON, VA—1980—G80134

Compiled by H. L. Berryhill, Jr. and A. R. Trippet in 1978. Scientific contributors include H. L. Berryhill, Jr., A. R. Trippet, and D. L. Mihalyi.

MAP SHOWING STRUCTURE OF THE CONTINENTAL TERRACE IN THE PORT ISABEL 1° × 2° QUADRANGLE, TEXAS

Compiled by
Henry L. Berryhill, Jr. and Anita R. Trippet

1980

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225