major fault systems. A few of the faults are over structures of "punch-type" origin such as salt domes and igneous masses; radial fault patterns and grabens are commonly associated with these structures (for example, see northern McMullen Co.). Several faults are associated with folds such as the Pearsall and Chittim anticlines. Finally, there are many faults which appear to be structurally independent and which lie outside the fault systems.

The largest known fault displacement in the region is less than 1,000 ft; most displacements do not exceed 200 ft. The total displacement of the down-to-the-coast faults is usually about the same as the total displacement of the opposing nearby up-to-the-coast faults. The individual faults and fault systems generally have strikes which are within 10 to 20 degrees of the strikes of the beds in which they occur. Surface and subsurface studies both show that the ends of controlled faults commonly turn in a downdip direction.

The actual movements on the faults constituting the major fault systems appear to have occurred only in the downthrown blocks; these blocks are almost invariably lower than persistent regional stratigraphic surfaces. The upthrown blocks are usually even with these surfaces.

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Bathymetry of Gulf of Mexico

The Gulf of Mexico can be divided into two major provinces: a carbonate province on the east and a terrigenous one on the west. The steep side slopes of the Campeche (Yucatan) and Florida (U.S.A.) escarpments are not fault scarps, but were formed during the Cretaceous by carbonate deposition along the seaward edge of the subsiding continental block. After the algal banks or reefs that formed the steep side slopes died, sediment progradation and upbuilding formed the shelf and the smooth and gentle upper continental slope. Seaward progradation extended to the top of the escarpments and buried the algal banks.

The continental margin within the terrigenous province between De Soto Canyon and Campeche Canyon was formed by upbuilding and outbuilding. The resulting sedimentary framework has been altered by salt intrusions. The Sigsbee escarpment at the seaward edge of the sedimentary framework was also formed by salt intrusion. Diapiric structures are not limited to the continental margin, but extend into the center of the Gulf of Mexico basin. Structures in the center of the basin appear to be restricted to the eastern margin of the Sigsbee abyssal plain and are aligned in a northeasterly direction. This trend and concentration, if real, may delineate a fracture zone extending from De Soto Canyon to the Golfo de Campeche.

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Is There Longshore Drift Convergence on Central Padre Island, Texas?

The existence of a convergence of longshore drift in the vicinity of central Padre Island has been postulated by several workers. Support for this hypothesis has been obtained from a detailed study of shell distribution on Padre Island beaches integrated with a study of the actual nearshore currents with drift bottles and theoretical predictions of longshore currents from Corpus Christi wind records.

Three sedimentologic provinces occur on central Padre Island: a northern province, a southern province, and a transition zone between them. The northern province has a finer grain size mode and a heavy mineral suite characteristic of rivers and Pleistocene deposits on the north. The coarser grain size mode and the heavy mineral suite of the Rio Grande characterize the southern province. Central Padre Island is unique on the Texas coast in having a high percentage (10–80%) of shell material in the beach sediment. On the basis of the distribution of this shell material, the writer has distinguished a southern province, a northern province, and a transition zone all of which correspond closely to the terrigenous provinces described above. Thus three separate sedimentary parameters indicate that the sediment along Padre Island is being transported from southern and northern sources to be mixed in a central transition zone.

Although the study is incomplete, the close correlation between drift-bottle paths and local winds suggests that the latter may be used to determine the current direction and perhaps velocity. This analysis of the local wind system suggests that there is a net annual convergence of longshore drift in the vicinity of the sedimentologic transition zone on central Padre Island. The net annual convergence is probably responsible for the distribution of the sediments of central Padre Island into three transitional sedimentologic provinces.

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Geologic Framework of Gulf of Mexico Basin

The basin contains more than 6,000,000 cu mi of predominantly Mesozoic and Cenozoic sediments. Deep-water sediments overlying an oceanic crust occupy its central part.

Late Paleozoic orogenies influenced the basin shape: the "buried" Llanoria structural belt along the northern margin, the Chiapas-Guatemalan structural belt along the southern margin, and a "connecting" structural belt (now "buried") along the western margin. This last margin was more strongly established by Nevadan (Jurassic) and Laramide (early Tertiary) orogenies. A complex system of transcurrent faulting, created as the Gulf basin (and Mexico) drifted westward (leaving the Caribbean "Pacific tongue" behind), marks the southeastern margin.

Great thicknesses of Jurassic salt occur in major depressions within the basin. Much of this salt apparently was deposited rather abruptly in deep water. During salt deposition, the African continent probably marked the eastern margin of the Gulf basin. The Nevadan orogeny restricted normal gulf circulation from the Pacific, creating conditions favorable for salt sedimentation.

Post-salt sediments came from two major provenances: Mesozoic from the Appalachians and Cenozoic from the Rocky Mountains.

The history of the Gulf basin supports modern concepts of continental drift. The Gulf "salt basin" appears to be related genetically to a series of "salt basins" which formed from north to south as continents began to drift apart along the Mid-Atlantic "swell." Progressive decrease in age from late Paleozoic at the north to Early Cretaceous at the south suggests the supercontinent began rifting apart first at the northern end. The sedimentary and structural records indicate that drift was spasmodic rather than continuous.