southern extension is deeply buried and unknown. A down-to-the-southwest fault system had been suggested previously as the updip limit for much of the early Mesozoic sequence along the northwestern edge of the salt basin. However, 4 seismic profiles show the loss of section to be primarily the result of thinning and convergence of beds. Jurassic deposition was affected by the uplift, which served as a source for clastic material.

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Depositional Systems in Woodbine Formation (Upper Cretaceous), Northeast Texas

The Woodbine Formation (Upper Cretaceous) in northeast Texas is a sequence of terrigenous clastic rocks derived largely from Paleozoic sedimentary and mildly metamorphosed sedimentary rocks exposed in the Ouachita Mountains of southern Oklahoma and Arkansas and deposited in a complex of nearshore environments along the margins of a broadly subsiding basin. On the basis of a regional outcrop and subsurface investigation in which external geometry of framework sands was integrated with observations of lithology, sedimentary structures, fossil occurrence, and bounding relationships, 2 principal depositional systems are recognized in Woodbine rocks—a fluvial system and a highly destructive delta system.

The tributary-channel facies and the highly meandering channel facies, both components of the fluvial system represented by massive sand and gravel bodies of the lower Woodbine (Dexter) lithosome, are dominant north and northeast of a line from Dallas to Tyler. On the south and southwest, the highly destructive delta system is persistent throughout the entire section. The 4 component facies of the delta system includes: progradational distributary-mouth bar facies; coastal-barrier sand facies, developed either lateral to or basinward of the distributary mouth; prodelta mud facies; and embayment-strandplain facies, developed laterally adjacent to principal deltaic facies.

Following or near the end of deposition of Woodbine rocks and before their transgression by Eagle Ford Shale, emergence of the Sabine uplift resulted in erosion of Woodbine material and its redeposition along the margins of the uplift in a lithosome designated the "Harris Sand."

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Gulf of Mexico Basin: Interactions Among Tectonics, Sedimentation, and Hydrocarbon Accumulation

The eastern and western carbonate platforms of the Gulf of Mexico have subsided about 5,000 m since the middle part of Late Jurassic time; about 7,000 m beneath the Isthmian (Isthmus of Tehuantepec) Cenozoic terrigenous clastic sequence south of the Bay of Campeche (in the Northern Central American orogen); and 15,000–16,000 m beneath the Jurassic through Holocene Gulf Coast geosyncline of the northern Gulf rim.

Carbonate-platform sequences are present in eastern Mexico (Tamaulipas platform; includes Tampico-Tuxpan and Veracruz basins) and in Yucatán and Florida (Yucatán and Florida platforms), because terrigenous clastic provenances either were not available, or because barriers prevented the transport of terrigenous materials into these regions. In contrast, the terrigenous sedimentary piles of the Isthmian basin and Gulf Coast geosyncline regions had important provenances for terrigenous debris. The Isthmian section differs from that of the Gulf Coast geosyncline because (1) the provenance and, therefore, the sediment supply was smaller, and (2) the Cenozoic basin is part of an orogenic belt. In contrast to the Isthmian region, the provenance area for the Gulf Coast geosyncline is huge, and the basin is on a stable continental margin, well removed from active orogenic belts.

The central oceanic plate of the Gulf of Mexico sank at the same time and at about the same rate as its margins. This conclusion is substantiated by several observations. (1) Seismic data suggest that the Mohorovičić discontinuity is at least 17–18 km below s.l. (2) The same seismic data show that a minimum thickness of 5,000 m of sedimentary strata is present beneath the Gulf of Mexico floor. This amount is 5–10 times the normal thickness of sediments on oceanic crust. (3) The "normal" depth of an oceanic abyssal plain is 5,000 m, yet the depth of the Sigsbee abyssal plain is only 3,500 m below s.l. Thus the base of the sedimentary column at the Gulf center is about 8,500 m below s.l. If the "normal" abyssal plain depth is assumed to have prevailed once in the Gulf, one may subtract the figure of 5,000 m from 8,500 m and arrive at a minimum of about 3,500 m subsidence for the center of the Gulf. However, seismic data suggest that the *average* sediment thickness beneath the Gulf exceeds 6,500 m, and locally reaches 9,000 m. If the 6,500-m figure is used, the Gulf has subsided at least 5,000 m, or about the same amount as the carbonate platform areas on the eastern and western margins of the deep basin.

This amount of subsidence shows that the Gulf was an oceanic basin during Late Jurassic time. One must accept this choice, assume that the Gulf was 8,500–10,000 m deep during Late Jurassic time, or adopt the position that its subsidence rate has been about twice that of the surrounding land areas. The simple geometric argument presented here to show that the Gulf most probably has been oceanic from Late Jurassic to the present time is supported strongly by the geology of the surrounding continental areas. Subsurface and surface data indicate that the Gulf is at least as old as Late Mississippian-Early Pennsylvanian. New data just obtained from the deep Gulf support this minimum date. The writers believe that the Gulf basin has been an oceanic plate since the beginning of earth history.

The much greater subsidence of the Gulf's northern margin resulted from the huge accumulation of sediments along that margin. This much greater subsidence beneath the Gulf Coast geosyncline imparts to the Gulf oceanic plate and the Mohorovičić discontinuity an overall northward tilt. Yet the flanking Yucatán and Florida platforms on the east and Tamaulipas platform on the west show no conspicuous northward tilt. This fact indicates that a hinge-type, north-south-oriented, scissorslike, differential movement has taken place along the western and eastern flanks of the deep Gulf basin. This movement presumably is manifested now by the Florida scarp, the western Campeche scarp, DeSoto and Campeche canyons, and the north-south belt of salt-anticline ridges along the western side of the Gulf. This same hypothesis and the predominance of clastic deposition explain the markedly different topography of the northern margin of the Gulf and along the southern side of the Bay of Campeche—the two prominent "hummocky" topography zones of the Gulf of Mexico.