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Historical Seismicity of Texas—A Summary

A survey of the historical seismicity of Texas revealed more than 100 earthquakes of magnitude 3 or greater from February 1847 to December 1984. Of these, 82 earthquakes are known to have been felt, and 24 events are associated with reports of damage. The largest earthquake (magnitude = 5.9) occurred on August 16, 1931, near the town of Valentine in west Texas. Many buildings were damaged in the epicentral area, and the total felt area exceeded 1 million km². Earthquakes in the Valentine area, as well as other events farther west near El Paso, are probably related to the Rio Grande rift system. Several large events in the Texas Panhandle may be associated with a zone of crustal weakness that follows the trend of the Amarillo uplift. Earthquakes in eastern Texas are associated with several fault systems in the Gulf coastal plain. A large earthquake on October 22, 1882, had previously been located in northeast Texas near the town of Paris; however, a reevaluation of the intensities suggests the epicenter was probably farther north in Oklahoma. Several other events in previous catalogs have been discarded or relocated.

More recent Texas earthquakes may have been induced by oil field operations. Seismic activity in west Texas near the towns of Kermit and Snyder are probably caused by waterflooding projects. Several recent earthquakes in the Gulf coastal plain may be associated with fluid withdrawal from oil and gas fields in up-to-the-coast normal faults.

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Structural Investigation and Tectonic History of East-Central Párras Basin, Coahuila, Mexico

Detailed field mapping and imagery analysis (Landsat, SIR-A radar, and black-and-white air photos) facilitate a structural and tectonic interpretation of the Párras basin. Párras basin is the erosional remnant of a Maestrichtian-Paleocene foreland basin with over 4,000 m of interfingered deltaic and marine deposits that accumulated during the early development of the Sierra Madre Oriental. The deformation sequence in Párras basin began with a main phase of north-northwest-directed thrusting accompanied by layer-parallel shortening, producing a weak solution cleavage. Thrusting was followed by formation of east-northeast-trending, symmetric to slightly asymmetric, north-northwest-verging, gently west-plunging, parallel folds with minor limb thrusting and thinning. The early cleavage was rotated in the limbs of the folds and a moderate axial surface-parallel solution cleavage was formed in the hinge zones. A well-defined 20-km wide zone of north-northwest-trending high-angle strike-slip and normal faults cuts all previously developed structures. Mesoscopic folds, slickenfibers, syntectonic vein fibers, and striae document a dominant north-northwest transport direction and a poorly developed secondary west-northwest transport direction. Párras basin rocks and structures reflect Laramide orogenic activity and the development of the Sierra Madre Oriental. Early thrusting of the thick Mesozoic carbonate sequence and flexure of the foreland generated an asymmetric, longitudinal depression parallel with the advancing sheet. The thickest accumulations of detritus shed from the rising hinterland are preserved along the Sierra Madre Oriental structural front. Continued northward migration of this front along a basal decollement culminated with local overthrusting and the incorporation of the Párras basin rocks in the fold-thrust belt. The present transverse and salient geometry of the fold-thrust belt reflects the influence of irregular basement structures related to the late Paleozoic configuration of northeastern Mexico.

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Depositional Environments of Wilcox Lignites in Choctaw and Winston Counties, Mississippi

Fourteen lignite outcrops from the Wilcox (lower Eocene) Group in Winston and Choctaw Counties in east-central Mississippi were studied by proximate and petrographic measurements. An inverse relationship

was found between the ash content and seam thickness; in 12 of 14 seams investigated, the ash content decreased as the seam thickness increased. Increased ash content is apparently related to the type of lignite-forming environment (freshwater) and the proximity of nearby fluvial systems.

Lignitized tree trunk remains found in several seams were identified as belonging to the taxodiaceous (cypress) groups. In addition, a small amount of dicotyledonous woody material was found. This further points to an "upland" freshwater fluvial swamp environment.

Comparison of the cellular humic material (textinite and ulminite) versus the macerated humic material (humodetrinite) may indicate the physical and botanical environment present during the period of humic accumulation. The data identify two types of plant communities and corresponding physical environments that might enhance humic accumulation from a particular plant community. The two types of marsh or swamp plant communities, based on maceral identifications, are: (1) cellulose-rich/lignin-poor plants (reeds and angiosperms) associated with macerated humic material (humodetrinite), and (2) cellulose-poor/lignin-rich plants (Taxodium) associated with cellular humic material (textinite and ulminite).

Eight of 11 seams petrographically investigated contain a preponderance of humodetrinite (cellulose-rich/lignin-poor) material, implying that most of the lignite seams were formed from a reed-dominated plant community.

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Geologic Effects of Hurricane Alicia on Upper Texas Coast

Hurricane Alicia made landfall on August 18, 1983, on the eastern end of Follets Island just west of San Luis Pass and Galveston Island. The maximum winds (198 km/hour), storm surge (390 cm), and wave energy were concentrated just east of landfall, along the western half of Galveston Island and the easternmost tip of Follets Island. In this area, the mean high waterline typically eroded 30-50 m (100-165 ft), whereas the vegetation line typically eroded 20-30 m (65-130 ft). Maximum erosion of the mean high waterline (up to 300 m) and the vegetation line (up to 100 m) occurred adjacent to San Luis Pass. A narrow band of washover sands, typically extending 20 m (60 ft) inland, was deposited along the nondeveloped portions of west Galveston Island. Because of the modification of the foredune system, these washover sediments typically extended 60-80 m (200-250 ft) inland along the developed portions of the shoreline. Erosion of the shoreline along the eastern part of Galveston Island was minor, although some washover channels formed where beach access roads cut through the dunes.

In contrast, the area west of landfall on Follett's Island experienced little shoreline erosion and virtually no washovers. This area was dominated by offshore-directed winds during the passage of the hurricane; thus, the main effect was numerous storm-surge ebb channels formed by the draining of West Bay. These channels are, on the average, 20 m (65 ft) wide, 55 m (180 ft) long, and up to 3 m (10 ft) deep; the largest channel is 40 m (130 ft) wide and 110 m (360 ft) long. These channels were initiated along low spots in the dunes (typically beach access roads) and grew landward by headward erosion until they encountered the highway, where they were partially deflected.

Much of the sand transported offshore during the storm returned to the beach within the following 6 months by progressive welding of swash bars to the foreshore to form a broad, flat berm. Since then, the patterns of shoreline accretion and erosion appear to reflect seasonal rather than long-term changes. The vegetation line had not shown any significant recovery 20 months after the storm, and complete recovery of the beach to its prehurricane position seems unlikely.

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Depositional Systems and Distribution of Cotton Valley Blanket Sandstones in Northern Louisiana

In northern Louisiana, the Terryville Sandstone of the Cotton Valley Group is composed of four regressive, massive sandstone members. These sandstones lie stratigraphically between the underlying marine shales of the Bossier Formation and the overlying Knowles Limestone. Extending updip from the two youngest sandstone members of the Terryville are at least 14 distinct sandstone tongues, or blanket sandstones.