DEPOSITIONAL FRAMEWORK OF THE LOWER DOCKUM GROUP (TRIASSIC), TEXAS PANHANDLE[1]

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ABSTRACT

The Dockum Group of Texas and New Mexico consists of up to 2,000 ft of complexly interstratified terrigenous clastic red-bed facies. The lower part of the Dockum, discussed in this report, is from 200 to 1,100 ft thick. At least two lacustrine subbasins existed during Dockum deposition: one lay north and west of Amarillo Uplift-Bravo Dome and another, the subject of this report, lay between the Amarillo Uplift-Bravo Dome and the Glass Mountains. The relict Matador Arch crosses the area, but it exerted little influence on Dockum sedimentation. Depositional trends inferred from outcrop and subsurface studied indicate that the southern basin was peripherally filled. Sediment input in Texas was from the south, the east, and the north. Sediment also entered the basin from the west through Lea and Roosevelt Counties, New Mexico. The geologic setting of the basin during Dockum deposition included structural highs on the north and south, and broad lowlands to the east and west.

Previous workers assigned a Late Triassic age to the Dockum. An abrupt change in depositional style occurs between Permian and Triassic deposits in some areas, such as eastern New Mexico and the Palo Duro Canyon area in Texas. Elsewhere there is no evidence of an unconformity. Permian and Triassic strata are uncomformable near basin margins and adjacent structural highs and conformable toward the basin center.

Deposition was influenced by relict Paleozoic structural elements and inferred Triassic climatic cycles. Arid conditions in the Permian progressed slowly toward increased rainfall in the Triassic. Deposition was by braided and meandering streams, and associated alluvial fans, fan deltas, high-constructive lobate delta and lacustrine environments. Alluvial fans and fan deltas developed chiefly in northern and southern parts of the basin adjacent to relict Paleozoic structural highs. High-constructive lobate deltas were best developed in central basin areas. Superimposed upon depositional elements were periods of valley incision, ranging from 50 to 200 ft, caused by lowered lake level.

Several depositional cycles controlled by base level (lake) fluctuations are recognized in Dickens, Crosby, Kent, and Garza Counties. A cycle comprises a sequence of facies that accumulated during a humid high stand and an arid low stand of lake level. Progradational delta sequences overlain by meanderbelt systems were produced under high stand, relatively stable base level conditions. Delta sequences are thin and commonly were partly eroded by meandering streams that cut downward and migrated laterally. Progradational sequences are composed of sediment derived primarily from beyond the basin; these sediments are predominantly siliciclastics that range from mudstone to sandstone; conglomerate is rare. A typical progradational sequence consists of lacustrine and prodelta mudstone-siltstone, delta-front siltstone-sandstone, channel-mouth-bar and distributary sandstone, and meanderbelt sandstone-conglomerate. Interdistributary and floodplain areas were sites of crevasse splay deposition. Splays comprise poorly sorted sandstone to boulder conglomerate (large clasts are characteristically mudstone and siltstone derived from older Triassic deposits).

A shift from humid toward arid conditions was accompanied by a lowering of base level and erosion of older Dockum sediment. Small fan deltas were constructed at low stand by sediment transported to lake margins through short, high-gradient, headwardly eroding streams; fan-delta, fluvial, and lacustrine facies represent low stand deposition. These reddish-brown low-stand deposits (red beds) range from mudstone to boulder conglomerate and are typified by abrupt vertical and lateral changes in facies. "Lower Dockum" red-bed facies consist of lacustrine mudstone, prodelta mudstone-siltstone, delta foreset siltstone-conglomerate, delta-platform sandstone-conglomerate, valley-fill mudstone-conglomerate, and interdeltaic mudstone with desiccation features, rare chert, salt hoppers, and gypsum.

Preliminary data indicate that radioactive elements are most common in sandstones of the high-constructive delta-meanderbelt sequence: meanderbelt, distributary channel, delta-front, and crevasse sandstone bodies.

[1]Publication authorized by Director, Bureau of Economic Geology, The University of Texas at Austin
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