Seafloor Morphology and Sediment Paths of the Northern Gulf of Mexico Deepwater

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The bathymetry of the continental slope of the northern Gulf of Mexico is very complex. This is mainly due to 15 km of sediments have been deposited on top of over 3 km of salt since Late Jurassic. The buoyancy of the salt accompanied with sediment differential loading and salt gravity spreading has pushed the salt through the overlying sediment as well as moving basinward. Many of the resulting allochthonous salt structures are very close to the seafloor, and basins that are hundreds of meters in relief were formed in between salt domes or overlying salt withdrawal massifs. The seafloor morphology was further complicated by the salt-sediment interplay caused faults and sea level fluctuations resulted shifts in sediment sources.

Recently compiled multibeam and digitized seismic data has detailed the bathymetry of the northern Gulf of Mexico slope and deep water areas. Based on this bathymetry and a watershed basin analysis model, land like drainage paths in the underwater environment have been generated. Four drainage systems have been identified: western, central, northeastern, and southeastern continental slope areas. These drainage systems coincide with the major sediment sources in the west (Rio Grande River system), in the northwest (Brazos and Colorado Rivers systems), and in the north (Mississippi River system). The carbonate-dominated platforms in the eastern and southern Gulf of Mexico show few drainage pathways. On a regional scale, these drainage paths are the primary conduits of turbidity currents and debris flows during periods of low sea stand.

Sequence Stratigraphic Analyses of the Upper Cretaceous Deposits, Rio Grande Embayment, Using Well Logs, Cores and Outcrops

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The present study is an attempt to solve problems of stratigraphic correlation in the Upper Cretaceous strata, Rio Grande Embayment, using sequence stratigraphic principles applied to cores, outcrops and wireline log information.

Well-defined log signatures, supplemented by core and outcrop data, were observed and correlated between boreholes. Chronostratigraphically significant surfaces, especially transgressive surfaces, were correlated. Upward – coarsening sand units within the three Upper Cretaceous progradational wedges, San Miguel, Olmos and Escondido formations, encased in prodelta and shelf mudstones were laterally correlated through the study area. Observations indicate a basinward decrease in number of sand units and net sandstone thickness. Outcrop studies in Maverick County indicate deposition of the coal-bearing Olmos Formation in the lower deltaic plain whose upper part is eroded and unconformably overlain by transgressive units of the Escondido Formation. Cored intervals through reservoir-quality clean and mature sandstones from the San Miguel Formation confirm long reworking history by wave action and longshore currents forming strand plain deposits within a wave dominated deltaic setting. Cores sampled in the updip position indicate more tight and argillaceous sandstones with more fluvial influence and low reservoir potential. Downdip Olmos and Escondido formations were interpreted to belong to a transgressive systems tract. Updip Olmos, a coal-bearing sandstone and shale sequence of coastal-plain and deltaic origin, is more argillaceous and low reservoir quality and belongs to a highstand systems tract.