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Distinguished Lecture Tour

Ancient Delta Systems of the Gulf of Mexico Basin

by

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ABSTRACT

Thick, offlapping, terrigenous clastic wedges make up the principal fill of the Gulf Basin. Proximal parts of these wedges consist of paralic deposits formed either as large-scale high-constructive delta systems (with related strike systems) or as a series of smaller high-destructive delta systems. Distal parts accumulated as continental slope deposits associated with salt diapir fields at the terminus of prograded paralic systems.

High-constructive delta systems (e.g. Lower Wilcox, Yegua, and Jackson) are comparable in scale and facies to Holocene Mississippi deltas. They were supplied by rivers with large-volume sediment discharge; fluvial facies are concentrated locally along the basin margin. These deltas consist dominantly of fluvial and fluvially-influenced deposits, with extensive coal-bearing delta plain facies, thick progradational delta front sand facies, and very thick organic-rich prodelta mud facies. Progradational sand facies show either lobate or elongate patterns in plan. Delta systems of this type supported extensive strike-fed systems comparable to strandplain and barrier bar systems of the Holocene northwestern Gulf Coast.

High-destructive delta systems (e.g. Upper Wilcox and Frio) are analogous to the Rhone and other Holocene deltas with significant marine modification (chiefly wave action) of fluvially-introduced sediments. These deltas were supplied by numerous, relatively small rivers with moderately high sand load; updip fluvial facies persist along the entire basin margin. High-destructive deltas are composed of a series of sand bodies with thickness axes roughly parallel to regional strike. Each of these deltas consists of local progradational sand facies (channel and channel mouth bars) flanked marginally by extensive sand units reworked from channel mouth bars. Associated prodelta mud facies is moderately thick to thin. High-destructive deltas supported local rather than areally extensive strike-fed systems.

Principal oil and gas reservoirs in high-constructive deltas occur in the progradational delta front sands with trends controlled by geometry and distribution of these lobate or elongate sand bodies. Vertical stacking of sand bodies is common, resulting in multipay fields. Trends within these delta systems are discontinuous along strike, as facies between main prograded lobes consist mostly of muds and tight sands. Attendant growth faulting, salt doming, and mud intrusion cause structural traps. In related barrier bar and strandplain systems, trends are regionally persistent with stratigraphic traps. Oil and gas trends in high-destructive deltas are defined by local cusplate-

trending coastal barrier sands and downdip progradational channel mouth bars; principal traps are stratigraphic.

Continental slope systems, making up the distal parts of Gulf Basin terrigenous wedges, have been penetrated only in younger units of the Basin or in very deep wells. Systems are comparable in scale, composition, and structural association to modern continental slope deposits of the northwestern Gulf. Thick and rapidly-deposited delta systems of the Gulf Basin mobilized underlying deep-seated salt. Principal flowage was toward the distal front of the prograding systems resulting in distinct diapir fields coextensive with continental slope systems; minor flowage was toward thinner inter-deltaic areas. Salt mobilization was a significant control in determination of facies fabric and growth faulting. Younger offlapping units inherited and perpetuated the tectonic grain established by underlying systems.

Biographical Sketch - WILLIAM L. FISHER

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Academic Background:

- 1954 - B.A. Geology, Southern Illinois University
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Experience:

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