Holocene Sedimentary Framework of Transgressions and Regressions Along the Chenier Plain, Southwestern Louisiana

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The coastal zone of southwestern Louisiana is the product of regressions and transgressions in response to complex interactions among marine, riverine, aeolian, and storm processes. The two primary components of the chenier plain, a marginal deltaic environment, are sand/shell ridges, or relict beaches, and extensive inter-ridge marshes. Previous studies have interpreted fine-grained prograding deposits of the chenier plain to be the result of high sediment loads from the Mississippi River when the primary discharge pathway is to the west. Conversely, cheniers are thought to have formed as the result of delta lobe switching of the Mississippi River from west to east, causing decreased sediment supply to the chenier plain and enabling wave activity to erode deposits along the shoreline and concentrate sand/shells into ridges. Although information exists regarding the general sedimentary framework of the study area, questions remain regarding the timing of deposition and its relationship to switching of the Mississippi River and distributaries, sediment source, and spatial variations in sedimentary facies as a function of sediment source and environment of deposition.

Approximately 30 vibracores (up to 9 m long) were obtained along the central chenier plain that extend from the upper continental shelf (5 m water depth) north to the Holocene-Pleistocene margin of the coastal plain. Most cores contain the entire Holocene record of sediment deposition and penetrate the pre-Holocene surface as a basal unit. At least six distinct sedimentary facies characterize subsurface deposits, ranging from clean sandy/shelly units (1 to 4 m thick) to interbedded sandy muds (up to 4 m thick) to fine laminated clay (1.5 to 3 m thick). Depth to the pre-Holocene surface shallows northward and varies between 5 and 7 m near the present coastline. Spatial variability in the thickness and extent of specific units varies depending on sediment source and antecedent topographic control. A transition from predominantly estuarine to marine macrofossil assemblages (north to south) is accompanied by an increase in the extent of relict beach deposits, some ranging up to 4 m thick and 200 m wide. Although the Mississippi River has provided important input of fine-grained material to the chenier plan, local sediment sources, including the concentration of sand and shell from eroding marsh/mudflat deposits during transgressions, have contributed substantially to chenier evolution.

Petrophysical Properties and Geology of Selected Intervals in the Frio Formation, Stratton Field, South Texas for Modeling Interwell Seismic Logging Responses

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Seismic or continuity logging consists of locating a seismic source in one borehole near or in a low-velocity layer and deploying a detector array in a second borehole. Detection of guided waves transmitted between the two wells indicates bed connectivity. The guided wave signatures are either leaky modes or normal modes (or both).

The technique has numerous applications in various types of heterogeneous geological environments, including many Gulf Coast gas reservoirs. It can be used to determine the continuity of beds between wells, estimate and locate variations in the thickness of beds, and estimate the average rock physical properties of the beds.

Stratton field was selected as the Gulf Coast gas-play type field for a project to model interwell seismic logging responses. Stratton is a mature gas field located in the south Texas Gulf Coast, about 30 miles southwest of Corpus Christi. It encompasses over 120,000 acres in portions of Kleberg, Nueces, and Jim Wells counties. Stratton is one of 29 fields in the Frio Formation fluvial-deltaic play associated with the Vicksburg fault zone along the Texas Gulf Coast Basin.

This poster presentation explains the technique of interwell seismic logging, documents the petrophysical properties and geology of intervals in the upper and middle Frio, and presents the results of the forward modeling tests.