SEISMIC STRATIGRAPHY OF UPPER NEOGENE SHELF BREAK POSITION VARIATIONS BETWEEN EAST AND WEST OFFSHORE LOUISIANA

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POSTER SESSION ABSTRACT

The processes of sedimentation, subsidence, and sea level oscillation dictate the geologic evolution of a passive continental margin. Seismic stratigraphy can help decipher the synthesis of these processes. The Mississippi River controlled sedimentation during the Upper Neogene evolution of the Louisiana margin. There is a marked difference between the seismic stratigraphy and paleo-physiography of the outer shelf/upper slope of the east and west Louisiana offshore (i.e., Mississippi Canyon as contrasted with Garden Banks/Green Canyon). In the Mississippi Canyon area, the shelf break retreated 6 miles (11 km) from 10.0 to 8.2 mybp, then advanced 55 miles (100 km) from 8.2 to 2.8 mybp, followed by a retreat of 30 miles (55 km) from 2.8 to 0.7 mybp. Since then, the shelf break has advanced 20 miles (36 km). In contrast, the west Louisiana shelf break prograded 100 miles (185 km) during the last 6.7 my.

These oscillations are dated from paleontological determinations. The term "shelf break" refers to an ecological environment based on water depth. These determinations are averages based on samples collected during a high-low sea level continuum, with a bias toward highstand.

The following seismic stratigraphic/paleophysiographic description in the Mississippi Canyon area pertains to the area beyond the present shelf break: (The description will proceed up the stratigraphic column.)

1) During the shelf break advance from 8.2 to 2.8 mybp, the sediments change from mid to upper slope. Mid-slope sediments appear as continuous to semicontinuous high-amplitude reflectors with moderate to low dips, suggestive of turbidites. There is a gradual change to less continuous, variable amplitude reflectors characterized by much steeper dips. Some of the reflectors, although intermittent, appear to line up along a single, gently concave-upward horizon. Along that horizon, there are patches of concave-downward reflectors. The concave-upward horizons often converge down-dip. Such a reflector pattern is compatible with an interpretation of deepsea fans. Interspersed, there are single, high-continuity, high-amplitude reflectors that may represent highstand deposits.

2) During the shelf break retreat from 2.8 to 0.7 my ago, the reflectors show a marked increase in continuity. The reflector pattern in this section is reminiscent of the lower late Miocene section already noted. This lower Pleistocene section is suggestive of turbidites deposited along mid-slope.

3) The upper Pleistocene and Recent section, the last 0.7 my, is characterized by low continuity, variable amplitude, and sometimes chaotic reflectors. Such reflector patterns confirm the shelf break advance as it is now in the immediate area.

In sharp contrast, the west Louisiana offshore over the past 6.7 my is marked by a basinward progradation of shelf break up to the present. Shelf sediments are characterized by sub-horizontal reflectors paralleling the present shelf. At the shelf break, these sub-horizontal reflectors show a marked increase in dip toward the basin. Within the slope seismic facies, there is an alternating of single or double, high-continuity, high-amplitude reflectors, with low-continuity, variable-amplitude, and occasionally chaotic reflectors. Seismic facies analysis and paleophysiographic analysis, derived from paleontology, both show a continuous progradation of shelf break into the basin.

Features interpreted include: submarine canyons, slump blocks, debris flows, turbidites, and submarine fans. We note greater continuity of reflectors farther down slope and away from the shelf break. Thus, a judicious sorting by continuity and amplitude of reflectors would appear to be diagnostic of energy of deposition/erosion, and thereby, the environment of deposition.

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Additionally, there are sea level oscillations occurring at 100,000 years and less. Periodicities of these 4th order changes exhibit sea level ranges from 400 ft (125 m) to 150-75 ft (50-25 m). Such oscillations could change shoreline position by 90 miles (165 km) to 30 miles (55 km), respectively. The basinward depositional profile of coarse to fine sediments would be correspondingly offset. High energy shelf break/upper slope deposits appear as high-continuity, low-amplitude reflectors. Low energy highstand deposits appear as high-continuity, high-amplitude reflectors.

DEPOSITIONAL ENVIRONMENT AND DIAGENESIS OF THE BENBROOK MEMBER OF THE GOODLAND FORMATION (LOWER CRETACEOUS), SABINE PARISH, LOUISIANA

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POSTER SESSION ABSTRACT

The Goodland Formation is a carbonate unit that was depostied on a broad, shallow-marine platform during the Early Cretaceous in Sabine Parish, Louisiana. The Goodland is divided into four zones, "A" - "D", based on lateral distribution and vertical succession. The "C" zone depositional environment was an open platform. The facies from the base to the top are (1) oyster-gastropod wackestone/packstone, (2) mollusk wackstone, (3) dasyclad-mollusk wackestone, and (4) oyster wackestone/packstone.

The "A" zone depositional environment was a protected platform. The facies from the base to the top are (1) mollusk wackestone/packstone, (2) oyster mudstone/wackestone, (3) mollusk mudstone, and (4) mollusk wackestone.

Gryphaea, the common Lower Cretaceous oyster, is the dominant allochem in the "C" and "A" zones. Environmental conditions determined oyster growth and faunal diversity show variations between the "C" and "A" zones.

There were three gradational phases of "C" and "A" zone diagenesis: (1) early marine, (2) meteoric-phreatic, and (3) deep burial. Most diagenetic processes were porosity-destroying, either by cementation or compaction.

Permeability and porosity remain low except where associated with fractures. Fracture production is implied when there is production from a zone whose porosity and permeability fluctuate from high to low.

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