by Paul M. (Mitch) Harris
Chevron Petroleum Technology Company, Houston, Texas

Exploration Concepts for Lower Cretaceous Shelf Margin Carbonates of Texas

Stratigraphic studies, focusing on the Lower Cretaceous Edwards and Sligo margins in east central Texas suggest new exploration opportunities. One is based on an extension of the favorable stratigraphy of the Edwards beyond the commonly recognized shelf margin, and another on recognizing that the Sligo margin underwent a major period of exposure resulting in deposition of downslope debris wedges. These examples show how new exploration ideas can be developed in mature areas when new tools and approaches are utilized.

The Edwards-An Underdrilled Opportunity

Analysis of well cuttings and core, coupled with detailed seismic correlation, confirms that the Edwards margin consists of both grainstone and reef facies and shows that both sets of facies repeated themselves several times within the Edwards as the margin prograded. The Edwards margin prograded southeastward >5 km beyond the Sligo margin, placing prospective backreef and reef grainstones far seaward of the commonly recognized margin. In essence, there are equivalent facies to those of the Word field complex, a mature Edwards gas field producing at a depth of approximately 3962 m, downdip of the field but the facies lack the underpinning of the Sligo margin for structural drape. The extent of this "opportunity fairway" within Lavaca County alone is over 4.8 km in width and 40 km in length.

3D seismic and a corresponding geologic cross-section (figure 1), show the progradational nature of the Edwards in detail. Three Edwards sequences defined by four key reflectors on the 3D data occur within one sequence on the 2D seismic. Reflector 1, which is a high-amplitude event downdip that diminishes in strength updip, occurs at the top of an interval of deeper water argillaceous wackestones (Upper Tamaulipas). Reflector 1 is immediately overlain by a prograding reef/bank complex and distal slope wackestones of the Edwards margin as seen in cores and cuttings. Reflector 2 is a weak event that ties lagoonal packstone/grainstones to a reef and bank complex and eventually forereef and slope deposits. Reflectors 3 and 4 tie backreef wackestone/packstones to reef and backreef grainstones. It seems clear that the "top Edwards" interval between reflectors 3 and 4 represents a progradational package with an ultimate culmination is even seaward of the study area.

The Sligo Forereef–An Untested Opportunity

A 3D seismic line illustrates a major sequence boundary in the Sligo margin and several events on the seaward side of the margin that display onlap and downlap reflector terminations. These events exhibit the proper architecture to comprise part of a downslope debris wedge in excess of 300 m thick. Although this Sligo forereef and slope play is regional in extent throughout the northern rim of the Gulf of Mexico, the opportunity has yet to be tested.

The existence of a Sligo downslope wedge between the sequence boundary and the overlying Pearsall shale does not guarantee the presence of coarse-grained material. It is likely the lowstand created a period of instability, resulting in coarse breccia and grainstone transported farther downslope in the form of debris flows and sediment gravity flows. During the subsequent transgression and relative highstand, the Sligo shelf margin initially kept up with sea level rise and continued to contribute

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grainstone debris downslope. Rapid deposition of the downslope carbonates may have helped to preserve primary porosity by limiting the amount of marine cementation. Data from reservoir analogs confirm that such downslope carbonates can retain reservoir-quality porosity (e.g., Poza Rica field from east-central Mexico). Facies variation and slump faulting on the foreslope create the potential for trapping and juxtaposition to deepwater carbonates sets up the source and migration pathway. Eventually, the Sligo shelf margin was flooded by a major transgression represented by the Pearsall, which would provide a top seal.

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Biographical Sketch

PAUL M. (MITCH) HARRIS, of Chevron Petroleum Technology Company in Houston, Texas, works on carbonate technical support projects, consulting and training for the various operating units of Chevron. His work during the last 23 years has centered on facies-related, stratigraphic, and diagenetic problems that pertain to carbonate reservoirs and exploration plays in most carbonate basins worldwide. Mitch received B.S. and M.S. degrees from West Virginia University and Ph.D. from the University of Miami, Florida. He has published numerous papers, edited several books, and is active in AAPG and SEPM. □

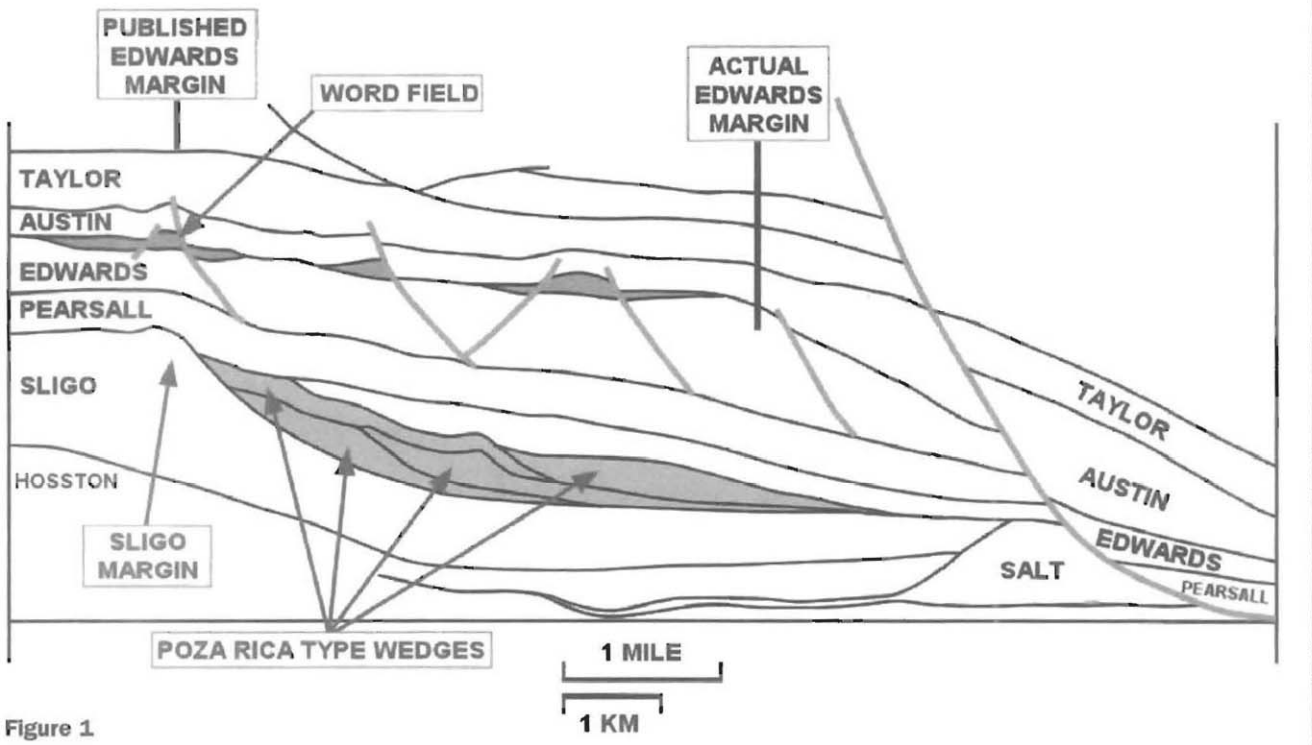

Figure 1