NORTH AMERICAN EXPLORATIONISTS

HGS NORTH AMERICAN EXPLORATIONISTS GROUP DINNER MEETING—FEBRUARY 16, 1993
Social Period, 5:30 p.m.,
Dinner and Meeting, 6:30 p.m.
Post Oak Doubletree Inn

MAGELL P. CANDELARIA—Biographical Sketch

Magell P. Candelaria received his B.S. degree in geology from Pomona College in 1978 and his M.S. in geology from Wisconsin in 1982. In 1983 he began working for ARCO Exploration Company in Denver, Colorado doing various regional studies in the Rocky Mountain region until 1986. He was transferred to the ARCO Oil and Gas Company Midland office in 1986 and worked as an exploration geologist in the Permian Basin region for 5 years. In 1991 he was transferred to the southern Oklahoma exploration group in Midland where he currently works in both development and exploration capacities.

He has published 21 papers and abstracts in 6 different journals and has served as First Vice President for PBS-SEPM and is currently President-Elect for PBS-SEPM. He is also an AAPG Certified Petroleum Geologist and serves on the AGI Minority Scholarship Committee.

LOWER-MIDDLE WOLFCAMPIAN SEQUENCE STRATIGRAPHY OF THE EASTERN CENTRAL BASIN PLATFORM, TEXAS

Wolfcampian-age reservoirs have produced in excess of 250 million barrels of oil from numerous fields peripheral to the Midland Basin of West Texas. The vast majority of this production is located along the eastern margin of the Central Basin Platform. The results of this sequence stratigraphic study of a portion of the eastern Central Basin Platform indicates that significant potential remains for substantial oil accumulations in Wolfcampian carbonate reservoirs in this region. This study has developed the criteria for seismic delineation of 1) subtle stratigraphic traps at porosity pinchouts; and 2) complex reservoir geometries within existing Wolfcamp fields which can result in significant reserve additions through infil drilling, extension wells and new field exploratory discoveries. Along the eastern Central Basin Platform, Wolfcamp fields produce from a wide variety of carbonate reservoir facies including skeletal-nonskeletal grainstones, algal mounds, and dolomitized high-angle platform margin bank facies. Additionally, detrital accumulations such as basin slope grainflow accumulations, submarine fans, debris flows and mega-slide blocks comprise locally significant reservoirs.

Sequence stratigraphic interpretation of the platform to basin transition reveals stratal geometries not readily interpretable from well log and biostratigraphic data alone. Interpretation of various seismic data sources including high-fold and high-resolution data aided and constrained by biostratigraphic, well log and facies interpretation reveals a complex evolution of the Early Pennsylvanian (Morrowan) to Early Permian (Leonardian) margins of the Central Basin Platform. This morphological evolution involved early Pennsylvanian onlap of the incipient Central Basin Platform followed by Middle Pennsylvanian progradation. Subsequent backstep of prograding Late Pennsylvanian platform margins was followed by continued progradation through Middle Wolfcampian time. Renewed backstep of prograding Late Wolfcampian platform margins was followed again by extensive progradation in early Leonardian time. This platform margin evolution resulted in approximately 12 km of net progradation from early Pennsylvanian to late Wolfcampian time in the study area.

In the Wolfcamp section, high-resolution and to a lesser degree, high-fold seismic data, resolves the subtle transition from platform interior to platform margin facies, and assists with mapping of sequence boundaries, systems tracts and prediction of reservoir facies distribution as well as stratigraphic trap geometry. The diagnostic seismic signature of Wolfcampian platform interior facies consists of high-amplitude, continuous parallel reflections characteristic of interbedded variegated shale and lime mud-rich, upward-shoaling peritidal facies. The seismic signature of the platform margin facies is characterized by subtle, low amplitude, discontinuous mounded to low-angle oblique reflections. The low-angle oblique reflections are interpreted as progradational carbonate bank facies as identified from well cuttings, cores and wire-line logs. Platform margin lithofacies are characterized by upward-shoaling sequences interbedded with minor gray to green marine shale. Platform margin parasequences consist of basal phylloid algal-peloidal wackestone grading upward to mixed skeletal-nonskeletal packstone, which is capped by peloidal-skeletal to oolitic packstone-grainstone. *In situ* and allochthonous skeletal to oolitic grainstones comprise the reservoir facies in many Wolfcampian fields in the study area.

Third-order lowstand systems tracts are not developed on the platform margin in the study area, though unequivocal evidence for lowstand detrital accumulations exist elsewhere marginal to the Central Basin Platform. Transgressive systems tracts overlie third-order sequence

boundaries and are characteristically very thin, commonly less than 15 m thick. Marine flooding surfaces are not well developed in the study area within the Lower-Middle Wolfcampian interval, but are very well exhibited in the Upper Wolfcampian interval. Highstand systems tract facies comprise the majority of the third-order sequence accumulations on the platform margin. Highstand systems tracts are commonly 30-40 m in thickness, consisting of stacked, upward-shoaling, grainstone-rich progradational parasequences. Third-order sequence boundaries are typically subtle in appearance in core and well cuttings. Thus, use of biostratigraphic zonation and geometric relationships observable in seismic (onlap, toplap and truncation) are generally necessary to identify these important surfaces.

In summary, a fully integrated approach to sequence stratigraphic study of low angle carbonate platform margins is essential to development of the sequence framework from which predictions of reservoir distribution, type and occurrence can be made with greater confidence. This study has demonstrated that high-resolution seismic interpretation in conjunction with lithofacies and biostratigraphic analyses: 1) identifies stratigraphic trap relationships within low angle, prograding carbonate platform margin facies; 2) has defined the criteria for recognition of the seismic expression of depositional facies which have implications for reservoir facies occurrence; 3) explains reservoir porosity and production heterogeneities within existing fields by defining internal reservoir geometry; and 4) facilitates more accurate prediction of reservoir facies distribution and trap style in new field exploratory areas.