
PERMIAN BASIN/MID-CONTINENT EXPLORATIONISTS

Permian Basin and Mid-Continent Exploration Meeting

Tuesday, November 19, 1991

6:00 p.m. - Post Oak Doubletree Inn

"UPGRADE YOUR CARBONATE KNOWLEDGE"

The November meeting will feature the widely acclaimed speaker Dr. Charles Kerans, who will present his revealing study titled "Origin of Reservoir Compartmentalization in Lower Ordovician Karstic Dolostones, Ellenburger Group, West Texas". The recognition of a karst topography and its significance to reservoir development is a key skill needed by all geologists working carbonate facies.

ORIGIN OF RESERVOIR COMPARTMENTALIZATION IN LOWER ORDOVICIAN KARSTIC DOLOSTONES, ELLENBURGER GROUP, WEST TEXAS

Ellenburger Group reservoirs constitute a major play in the Permian Basin of West Texas, with over 1.4 billion bbl cumulative production through 1985. These reservoirs typically have been developed by assuming homogeneous fracture-related pore systems. Examination of core, log, and production data demonstrates that most Ellenburger reservoirs are characterized by pronounced vertical and lateral heterogeneities created by post-Ellenburger karst development.

Vertical reservoir compartmentalization in the Ellenburger evolved from development of a laterally-extensive cave system between 100 and 300 ft. beneath the original land surface. Caves were filled by relatively impermeable siliciclastics from the overlying Simpson Group, effectively isolating permeable cave-roof breccias (uppermost Ellenburger) from collapse breccias deposited on cave floors prior to shale infill. This cave-fill-associated vertical reservoir compartmentalization is prevalent throughout a 3,000 square-mile, six-county area, which has produced more than 80% of the oil from all major Texas Ellenburger reservoirs. Historically, most wells were completed in the uppermost (cave-roof) Ellenburger to avoid water-coning, leaving significant mobile oil (as much as 30% of original oil in place) ineffectively drained from the less commonly exploited lower collapse zone.

Lateral compartmentalization of Ellenburger reservoirs originated by localized collapse of the cave system both during karst formation and after burial. In the Shafter Lake field, lateral compartmentalization is the result of a 200-ft. vertical collapse during deposition of Simpson Group sands. Abrupt lateral discontinuities in the Big Lake and Glasco fields may represent similar collapse-related features, such as are spectacularly displayed in Ellenburger-equivalent outcrops of the Franklin Mountains. An estimated 750 million bbl of remaining mobile oil in addition to conventional reserves, occurs in this mature but complexly compartmentalized play. Considering this paleokarst model will aid in further exploitation of Ellenburger reserves.