

the eroded Hercynian surface. This provided a seal for subsequent hydrocarbon migration from the underlying Silurian and Devonian source rocks. Important epeirogenic events and tensional faulting occurred during the Jurassic and Cretaceous.

Compressional forces in the Tertiary culminated in the Alpine orogeny. A broad zone of uplift and southward-directed imbricate thrusting formed along the northern margins of Algeria obscuring much of the sub-Tertiary depositional and structural features.

Hydrocarbon accumulation in Algeria has been predominantly controlled by the relationships among the Silurian-Devonian source rocks, the Hercynian unconformity, and the distribution of the overlying Triassic clastic and evaporite sequence. More than 65% of the recoverable oil reserves and 90% of the gas reserves are trapped immediately below or above the Hercynian unconformity, with the evaporites providing the seal.

Heretofore, the complex geology of the Tertiary overthrust zone has been a deterrent to exploration in both the autochthonous Miocene basins and the sub-Tertiary sequence. However, improved seismic techniques and renewed interest in the potential of overthrust provinces point to increased activity in this area.

KNUTTEL, STEPHEN, and SHERWOOD W. WISE, JR., Florida State Univ., Tallahassee, FL and DAVID K. REA, Univ. Michigan, Ann Arbor, MI

#### Downslope Transportation of Metalliferous Sediments Along East Pacific Rise During Messinian

The distribution of metalliferous sediments adjacent to active spreading centers is of both scientific and economic interest. Metal-rich waters emanating from active hydrothermal vents have been traced in intermediate level water masses far beyond the ridge crest, but the greatest concentrations of metal oxides in sediments occur near the vents. There, however, it is possible that the oxides may be redistributed and possibly further concentrated by redeposition. We document one such case of redeposition for Messinian sediments cored at Deep Sea Drilling Project Site 599, which, along with the other DSDP Leg 92 sites, was the first on the East Pacific Rise to be drilled using the hydraulic piston corer.

Site 599 (19°27.09' S, 119°52.88' W; water depth = 3,654 m), drilled in a small basin about 600 km from the present ridge crest, recovered 41 m of mostly Miocene calcareous oozes characterized by alternating light (mostly yellowish brown to dark yellowish brown) and dark (mostly dark reddish brown) zones from 10 to 100 cm thick and/or bands 2-5 cm thick. A sharp contact at sample point 599-3-3, 21 cm, separates fine-grained light-colored in-situ sediments of calcareous nannofossil Zone CN9b below from a coarser grained and darker metalliferous-rich unit above, which contains older nannofossils derived from Zone CN8b. Indicative of downslope transport of metalliferous materials during the Messinian, this example may explain much of the sediment banding seen throughout the section.

KOCUREK, GARY, and JAMIE NIELSON, Univ. Texas at Austin, Austin, TX

#### Eolian Reservoir Characteristics Predicted from Dune Type

The nature of eolian-dune reservoirs is strongly influenced by stratification types (in decreasing order of quality: grain-flow, grain-fall, wind-ripple deposits) and their packaging by internal bounding surfaces. These are, in turn, a function of dune surface processes and migration behavior, allowing for predictive models of reservoir behavior. Migrating, simple crescentic dunes produce tabular bodies consisting mainly of grain-flow cross-strata, and form the best, most predictable reservoirs. Reservoir character improves as both original dune height and preserved set thickness increase, because fewer grain-fall deposits and a lower percentage of dune-apron deposits occur in the cross-strata, respectively. It is probable that many linear and star dunes migrate laterally, leaving a blanket of packages of wind ripple laminae reflecting deposition of broad, shifting aprons. This is distinct from models generated by "freezing" large portions of these dunes in place. Trailing margins of linear and star dunes are prone to reworking by sand-sheet processes that decrease potential reservoir quality. The occurrence of parabolic dunes isolated on vegetated sand sheets results in a core of grain-flow and grain-fall deposits sur-

rounded by less permeable and porous deposits. Compound crescentic dunes, perhaps the most preservable dune type, may yield laterally (1) single sets of cross-strata, (2) compound sets derived from superimposed simple dunes, or (3) a complex of diverse sets derived from superimposed transverse and linear elements.

KOEPNICK, RICHARD B., Mobil Research and Development Corp., Dallas, TX

#### Impact of Stylolites on Carbonate Reservoir Continuity: Example from Middle East

Growth of stylolites may adversely affect the continuity of carbonate reservoirs by producing barriers to fluid flow. The impact of stylolite development on reservoir performance, however, may differ from one part of a reservoir to another. Therefore, for effective reservoir management, the distribution and the permeability of stylolite-bearing beds should be known. In an example from the Lower Cretaceous of the Middle East, 3 zones of stylolites (D1, D2, and D3) are important to reservoir management. Only the uppermost zone (D1) is a significant barrier to fluid flow. Because the impermeable zone (D1) formed largely before oil entrapment, local precipitation of calcium carbonate occurred at abundant crystal-nucleation sites adjacent to the stylolite zone. The other stylolite zones (D2 and D3) were formed largely during or after oil entrapment. Oil inhibited carbonate precipitation by coating crystal nucleation sites. Calcium carbonate, dissolved at pressure-solution surfaces, was then transported away from stylolite zones prior to precipitation. Consequently, stylolites formed after oil entrapment do not constitute significant barriers to fluid flow.

KOEPNICK, RICHARD B., Mobil Research and Development Corp., Dallas, TX, DAVID E. EBLY\*, Champlin Petroleum Co., Englewood, CO, and KEITH C. KING, Mobil-North Sea, London, England

#### Controls on Porosity and Dolomite Distribution in Upper Smackover Formation (Upper Jurassic), Southwestern Alabama and Western Florida

Upper Smackover carbonates of southwestern Alabama and western Florida exhibit arcuate trends of porous dolomitized grainstones separated by areas of impermeable muddy limestones. The origin of these porous trends is related to the depositional and diagenetic history of upper Smackover carbonates and overlying Buckner evaporites. Shallow-water oolitic and peloidal grainstones of the upper Smackover were deposited across basement and salt-related topographic highs. Subsequent aggradation and stepwise progradation of oolitic shoals over low-energy packstones and wackestones produced a complex sea-floor topography of arcuate oolite ridges (highs) and elliptical muddy lagoons (lows). Marine regression during Buckner deposition led to the formation of saline ponds and sabkhas that were initially located over Smackover lagoonal lows and rimmed by Smackover oolite ridges. Precipitation of evaporites within these depressions created magnesium-rich brines that selectively dolomitized adjacent Smackover carbonates. Both the outflow of brine and the pattern of dolomitization were controlled by the fluid transmissibility of Smackover sediments. Consequently, permeable oolitic and peloidal grainstones were preferentially dolomitized over less-permeable muddy carbonates. A possible hydrologic analog for the study area exists within the MacLeod Evaporite basin, western Australia.

Following burial, dolomites maintained greater effective porosity on the flanks of basement and salt-related topographic highs than on the crests.

KOHL, BARRY, Chevron USA, New Orleans, LA

#### Modern Analog for Deep-Water Deposition of Shallow-Water Pliocene Sands, Gulf of Mexico

Paleoenvironmental studies using benthic foraminifers and total fauna can be used to identify displaced shallow-water sands. A productive sand in Eugene Island field, which has a high resistivity but suppressed spontaneous-potential, was conventionally cored to determine reservoir characteristics and environment of deposition.