of NPRA are defined and illustrated with examples of applications that are used to determine resource potential.

WINKER, CHARLES D., and MARC B. EDWARDS, Bur. Econ. Geology, Univ. Texas at Austin, Austin, TX

Unstable Progradational Clastic Shelf Margins

Ancient shelf margins have generally been overlooked in some progradational clastic systems such as the northwestern Gulf of Mexico and the Niger delta. Apparently the contemporaneous structural deformation, particularly growth faulting, obscures depositional dips and foreset-topset geometry, making recognition of shelf breaks from these criteria virtually impossible. Nonetheless, their positions can be estimated from their association with characteristic microfaunal assemblages, with initiation of growth faulting, with facies changes, and with geopressure.

Rapid subsidence of progradational shelf margins results primarily from three processes: isotatic depression of the basement due to sedimentary loading, extensional thinning of the sedimentary wedge due to gravity tectonics, and compaction. Instability of the continental slope causes substantial basinward mass transport by deep-seated gravity sliding. This is manifested as down-to-basin listric growth faults originating at the outer shelf and upper slope (extensional regime), and shale and salt ridges and domes originating at the lower slope (compressional regime). The rapidly subsiding shelf margin acts as a major sediment trap, leading to accumulation of thousands of feet of shallow-water sediments, including deltaic sandstones, along a growth-faulted trend that may be hundreds of miles long.

Shelf-margin deltas differ substantially from shallow-shelf deltas in that they show thicker and better differentiated progradational units and steeper clinoforms. Sand geometry of shelf-margin deltas is influenced by two competing factors: absence of a broad shelf to attenuate wave energy, thus favoring wave dominance, and high sand continuity, versus rapid subsidence, which prevent lateral reworking and thus favor river dominance and low sand continuity. Rapid downfaulting of shelf-margin deltaic sandstones against dewatering slope shales leads to the accumulation of excess fluid pressure in deep fault-bounded reservoirs. Mapping of geopressure trends can therefore provide a generalized picture of shelf-margin progradation in Cenozoic basins.

WITHJACK, MARTHA O., and CYNTHIA SCHEINER, Cities Service Co., Tulsa, OK

Effect of Regional Strain on Fault Patterns Produced by Doming: Experimental and Analytical Study

Experimental (clay) and analytical models suggest that regional strain, either extension or compression, significantly affects fault patterns produced by doming. Our models simulate the shallow deformation produced by gentle doming of a homogeneous material with and without a simultaneously applied, regional horizontal strain. The models show that without regional strain, randomly oriented normal faults develop on the crests, and radial normal faults form on the flanks of circular domes. With regional extension, normal faults on the crests and flanks of circular domes trend perpendicular to the applied extension direction, and strike-slip faults trending 60° from the regional extension direction form on the flanks. With regional compression, normal faults on the crests and flanks strike parallel to the applied compression direction. Strike-slip faults trending 30° from the regional compression direction also form on the flanks, and reverse faults striking perpendicular to the regional compression direction develop on the peripheries. Our models show that regional strain affects the fault patterns produced by elliptical doming.

This study has important implications for hydrocarbon exploration. The models provide guidelines for determining the strike of faults on domes and suggest that strike-slip and reverse faults, as well as normal faults, may form during doming. These faults may influence hydrocarbon migration and entrapment. Strike-slip faults develop on domes formed in the presence of regional extension (for example, many Gulf Coast domes). Strike-slip and reverse faults develop on domes formed in the presence of regional compression (for example, several domes of the Rocky Mountain foreland province).

WOLBERG, DONALD L., and ADRIAN HUNT, New Mexico Bur. Mines and Mineral Resources, Socorro, NM, and J. KEITH RIGBY, JR., et al, U.S. Bur. Land Management, Albuquerque, NM

Stratigraphy and Paleobiology of Late Cretaceous "Fossil Forest," San Juan Basin, New Mexico

Exposures of the Fruitland Formation in the Bisti badlands contain an abundant fossil flora and fauna of Late Cretaceous age. Proposed development of Fruitland coal reserves has increased the need for adequate paleontologic data for mitigation purposes and has resulted in a cooperative investigation of a Fruitland "fossil forest" in the area of Split Lip Flats, south of Farmington, New Mexico.

The exposed stratigraphic sequence consists of approximately 26 m of interbedded shales, siltstones, channel sandstones, carbonaceous shales, and coal; the uppermost 5 m is probably part of the Lower Shale Member of the Kirtland Formation. The beds are laterally discontinuous although the carbonaceous shales and coal have greater lateral extent.

At least two, and possibly three, levels of in-situ tree stumps, fallen logs up to 20 m in length, and several leaf localities occur. Preliminary analysis indicates the presence of *Taxodium, Sequoia,* and palm. Within the study area, channel sandstones and mudstones have produced a large assemblage of turtles, lizards, crocodiles, and dinosaurs including ankylosaurs, hadrosaurs, ceratopsians, and carnosaurs. Fossil mammals, including multituberculates, marsupials, and insectivores, have been found at two sites in clay-pebble conglomerates. Mollusk-rich beds occur at three stratigraphic levels.

WONG, P. K., Esso Resources Canada Ltd., Calgary, Alberta, and A. E. OLDERSHAW, Univ. Calgary, Calgary, Alberta, Canada

Burial Cementation in Upper Devonian Kaybob Reef, Alberta, Canada

Analysis of the petrography and distribution of compositionally zoned ferroan calcite and dolomite cements in the Devonian Kaybob reef complex of Alberta, Canada, has demonstrated that porosity occlusion is predominantly a result of burial diagenesis to depths in excess of 4 km. Different but temporally related mechanisms of formation are indicated for the two cement types: coarsely crystalline dolomite and coarsely crystalline calcite. Calcite cement precipitational history, determined by correlation of compositional zones, demonstates that pressure solution along stylolites was the essential mechanism of calcite cementation in the reef-interior