Abstracts

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Tertiary Kenai Group, Cook Inlet, Alaska, Tectonic and Depositional Model Applied to Barranca Formation (Upper Triassic), Central Sonora, Mexico

The Barranca Formation contains important deposits of coal and, where metamorphism was more intense, some of North America's most valuable graphite reserves. Information derived from petroleum exploration supports a Tertiary model for the Cook Inlet basin that applies to the Barranca. Since a fore-arc basin has existed near Cook Inlet through the present time, the modern Cook Inlet could also be an analog of the Barranca basin.

The Kenai Group in the Cook Inlet area consists of fluvial-deltaic, swamp, and estuarine sediments about 4,600 m thick that represent three sedimentation phases: (1) the Oligocene to Miocene West Foreland, Hemlock, and lower Tyonek formations contain conglomerate, graywacke, siltstone, tuff, basalt flows, and coal; (2) siltstone, shale, carbonate, and coal of the Miocene upper Tyonek and lower Beluga formations indicate lower energy deposition; and (3) the Pliocene upper Beluga and Sterling Formations are mostly coarse clastic rock.

The three members of the Barranca Formation, which is over 1,500 m thick, indicate gross changes from high to low to high-energy deposition. The upper and lower members contain sandstone, conglomerate, minor shale, and coal, and enclose a middle member that consists of coal, nonmarine to shallow marine shale and siltstone, and some conglomerate and impure sandstone. The rocks within each member, and mainly within the middle one, indicate that shallow marine incursions interrupted fluvial and swamp sedimentation.

Paleogeographic and tectonic similarities between the two areas suggest that detailed aspects of Cook Inlet sedimentary environments apply to the Barranca Formation.

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Gulf of Suez—A Rewarding Environment

High current levels of exploration activity in the Gulf of Suez continue to show that this geologically complex rift area remains the most prolific oil province in Egypt. Favorable conditions for generating and trapping oil are well-documented in the central and southern Gulf of Suez. More than 15 oil and gas discoveries have been made from both Miocene and pre-Miocene age reservoirs during the past five years.

Exploration results in the northern Gulf of Suez have thus far been disappointing, failing to find any new oil or gas accumulations. Influenced by the Mesozoic growth of the Ayun Musa high, the northern Gulf of Suez differs both tectonically and stratigraphically from the more prolific areas to the south.

South of the Gulf of Suez in the Red Sea, drilling activity has been minimal. Although efforts to date have not met with notable success, exploration of this relatively large rifted basin is continuing.

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Deep-Water Evaporites: Detrital, Authigenic, or Diagenetic?

The thought of "deep-water" evaporites commonly conjures images of hypersaline starved basins, chemical precipitation of evaporite minerals in the water column or at the sediment-water interface, and cyclically laminated salts. It is implicit in this model that the evaporite fabrics reflect stagnant, unstirred, abiotic conditions, but deep-water evaporites in the Messinian of the Sicilian basin include evaporite turbidites and resedimented clastic evaporites with wholly different petrographic characteristics and sedimentary structures. Detrital dolomites in the Onondaga Limestone and in the Cretaceous of the western United States reflect clastic depositional histories and yet may have strong diagenetic overprints that obscure the original depositional textures.

Diagenetically altered, sandy, anhydritic dolomites from the Bell Canyon Formation in Texas provide examples of deep-water detrital, evaporitic carbonates with a depositional history indicated principally by the included siliciclastics and a diagenetic history indicated first by "groundmass" versus pore-filling dolomite crystal fabrics and second by nodular versus pore-filling and replacement anhydrite. Comparisons between the Bell Canyon deep-water anhydritic dolomites and other deep-water evaporites is useful in making the distinction between clastic, penecontemporaneous authigenic, and later diagenetic origins.

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Geochemistry and Isotopic Composition of Hydrocarbon-Induced Diagenetic Aureole (HIDA), Southwestern Oklahoma

The Permian red beds at Cement and Chickasha oil fields in southwestern Oklahoma have undergone extensive and intensive alteration. This diagenetic mineralization is a direct expression of hydrocarbon migration along unconformity surfaces and fault zones. The oxidation of seeping hydrocarbons to carbon dioxide is the major source of carbon in diagenetic carbonates, which occur as cement and as replacement of gypsum and detrital grains. Calcite cement with δC^{13} values up to -39 ppt PDB reflect this hydrocarbon source. However, a few calcite samples analyzed show δC^{13} values of approximately -6 ppt PDB which indicates a freshwater origin. In addition, isotopically hybrid carbonate cement with a bimodal carbon source also is found throughout the stratigraphic section.

Bleaching of red beds and formation of pyrite are explained as reduction of iron oxides by hydrogen sulfide associated with hydrocarbons. Sulfur isotope ratios of pyrite are similar to those of crude oil. The δS^{34} values of pyrite samples collected from the surface and shallow subsurface tend to be slightly enriched in S^{32}. The enrichment of pyrite with the light isotope S^{32} may be due either to increases in biological activity or to increases of oxygen fugacity. Authigenic kaolinite and mixed-layered illite-smectite are formed as by-products of