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Correlation of Fold Belts of Alaska, Canada, and Siberia[1]

Most of Alaska is part of the Cordilleran fold belt. The cordilleras arose from several geosynclines, some of which took form in late Precambrian and early Paleozoic time, and others as late as Mesozoic time. Early deformational features in the middle Paleozoic have been largely obscured by Mesozoic and local Cenozoic orogenic events, especially along the Pacific margin. Plutonic rocks and thick wedges of coarse clastic sedimentary rocks, derived from uplifts within the geosynclines, identify the older orogenic events.

Easternmost Siberia, opposite Alaska, contains a fold belt that is the extension of the Cordilleran fold belt across the shallow Bering Sea from Alaska. In northern Alaska there also is a belt composed of probably early Paleozoic geosynclinal rocks and late Paleozoic and Mesozoic successor basin deposits that seems to correlate with the Innuitian fold belt of Canada. The continuity of these fold belts around the rim of the northern Pacific and Arctic basins must be taken into account in evaluating continental drift and the age of the ocean basins in the Arctic.

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Transport and Deposition of Carbonate-Reef Sand, Windward Coast, Carriacou, West Indies

Different stages in the evolution of backreef sedimentologic regimes are represented in 2 bays behind a barrier reef 0.25–1 mi off the east coast of Carriacou.

In the largest bay, wave transport of reef-produced sediment has formed a shoreward prograding sand body at a depth in equilibrium with sediment grain sizes and prevailing wave conditions. Variations in grain-size distribution on top of and shoreward from the backreef sand flat reflect sorting and mixing, under oscillatory flow, of the mechanically distinguishable lag, rolling, saltating, and suspended sediment populations.

Decrease in the height of the water column, caused by partial filling of the backreef area in the smaller bay, has increased the rate of tidal flow. The sediment grain sizes, bottom depths, currents, and wave conditions are elements of a dynamic equilibrium which, given a steady relative sea level, results in the transport of all reef-produced sediment, up to pebble size, from the backreef area into adjacent deep water, and the maintenance of an equilibrium bottom profile.

The delineated processes and the resulting sediment properties and distribution patterns constitute a model of backreef clastic sedimentation which may be of wide applicability.

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Computer Applications in Geology at Industry Level

(No abstract submitted)

[1] Publication authorized by the Director, U.S. Geol. Survey.

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Closed System for Generation and Entrapment of Hydrocarbons in Cenozoic Deltas, Louisiana Gulf Coast

Deltas deposited during the Miocene, Pliocene, and Pleistocene in the vicinity of the present-day Mississippi River delta illustrate a closed system for the generation and entrapment of hydrocarbons. During those times various processes contributed to this closed system of deltas.

1. Vast quantities of sediments were derived from erosion of igneous, metamorphic, and sedimentary rocks of the high continental interior. These were transported gulfward and deposited in major deltaic masses by one or more large rivers ancestral to the Mississippi River.

2. Rapid burial in the deltas preserved stream-transported organic matter and related nutrients. The sediments also were enriched by abundant marine organic matter concentrated in the delta area by prevailing winds and ocean currents. Abundant raw materials and reducing conditions necessary for the generation and preservation of hydrocarbons were present.

3. Frequent shifting of distributaries resulted in the deposition of discontinuous lenticular bodies of sand and clay, a situation favorable for retention of locally generated hydrocarbons. In places, rapid deposition of large volumes of clay produced thick sections of under-compacted shales that are troublesome to drill.

4. Contemporaneous deformation, in the form of growth faults and folds, modified existing lenticular bodies and created structures which have trapped major quantities of oil and gas.

5. Differential distribution of the weight of the deltaic sediments, coupled with regional tilting, caused upward flowage of deeply buried Mesozoic salt beds. The resulting piercement salt domes or deep salt anticlines have contributed to the formation of other hydrocarbon traps.

In the closed system the hydrocarbons were formed almost *in situ* and impounded by early migration in structural and stratigraphic traps. Orogenic movements were not needed to form structural traps as these were formed by large-scale slippage, slumping, and salt movement within the deltaic masses. Thus, all the elements in this closed system worked together in a positive direction to form the giant oil and gas fields that are being exploited today. Many more remain to be found. Therefore future exploration for hydrocarbons in the Gulf Coast will be like its history—exciting, productive, and profitable.

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Provenance Model Studies: Piedmont Rivers to Atlantic Deep-Sea Floor

Petrographic analyses of 500 impregnated sands from the piedmont rivers, coastal plain, beach, shelf, and deep sea off the southeastern United States indicate that they have differences in composition which reflect changes in depositional history.

Piedmont rivers transport mainly nonpolycrystalline quartz (20–80%), polycrystalline quartz (5–50%), microcline (2–15%), orthoclase (0–10%), plagioclase (0–4%), and minor amounts of reworked red sediments. Coastal-plain sands are more quartzose (more