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Algal Mounds of Upper Cambrian Carbonates of Appalachians, Western Maryland: Examples of Early Patch and Marginal Reefs

The platform carbonates of the Conococheague limestone (Late Cambrian) of the Great Valley, Maryland, carry clotted and digitate mounds from 0.5 to 10 m high, similar to Aitken's (1967) "thrombolites." These mounds are surrounded by cross-bedded oolitic-peloidal grainstones, intraformational conglomerates, and thin-bedded graded dolostones. Internally the mounds are composed of an upward directed network of cm-scale "fingers" of micrite-microspar separated by infills of skeletal packstone-wackestone with abundant remains of gastropods, brachiopods, trilobites, etc. *Renalcids* encrust the edges of the mud fingers and, in the interior, make an irregular, convex lamination which contains filament (?) molds. Stromatactis-like cavities cross-cut the *Renalcid* encrusted mud fingers and the interfinger infills. There observations suggest that the mounds were rigid frameworks constructed by encrusting colonies of algae and forams (?) and inhabited by a diverse marine fauna. The fauna, the association with current-worked sediments, and the position at the base of the shoaling-upward cycles indicate a wave- and current-scoured open subtidal bank environment for these mounds, which we interpret as early algal patch reefs.

In contrast, we find transported blocks of different boundstones to the east in massive off-platform breccias of the equivalent basinal facies of the Frederick Valley, Maryland. These boundstone blocks are composed of masses of *Epiphyton*-encrusted thin micrite plates (platy algae?) and are cut by cavities lined with early marine cements. These boundstones, we believe, were rigid framework algal reefs but were situated along the platform edge as an early Paleozoic marginal reef tract.

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Computer Analysis and Synthesis of Stratigraphy and Petroleum Geology, Upper Cambrian Strata, Morrow County, Ohio

Computer analysis indicates that hydrocarbon accumulations found at the tops of paleogeomorphic features on the Knox unconformity surface of Morrow County, Ohio, are controlled primarily by structural trapping. In the subsurface of Morrow County, the Knox unconformity separates dolomite of the Copper Ridge formation (Cambrian) from the shales, limestones, and dolomites of the Middle Ordovician Chazy formation. A computer-generated three-dimensional plot of the Copper Ridge Dolomite surface reveals a pattern of northwest-southeast trending erosional remnants which exhibit up to 150 ft (46 m) of local relief and resemble a karst topography. The distribution of erosional remnants is believed to be controlled by paleodrainage patterns. The primary reservoir rock is the Copper Ridge Dolomite. The rocks of the overlying Chazy Limestone have buried the erosional remnants and serve as the trap for Copper Ridge Dolomite accumulations.

Trend surface analysis of horizons above and below the Knox unconformity indicates a regional structural dip of 50 to 55 ft/mi (9.5 to 10.4 m/km) toward the east. Negative residuals from the trend surface analysis, which border the eastern edge of production, indicate folding and the existence of a structural trap in Morrow County. Hydrocarbons migrating up structural dip (to the west) were initially caught in the structural trap and then accumulated at the tops of erosional remnants on the Knox unconformity surface.

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Benthic Foraminiferal Response to Glacial/Interglacial Episodes, Deep Gulf of Mexico

Q-mode factor analysis of 55 surface samples and 190 species from water depths beyond 1,500 m in the Gulf of Mexico defined an 8 assemblage model which accounted for 91% of the original information contained in the data matrix. Distributions of these 8 assemblages are related to variations in sediment terrestrial organic carbon content, calcium carbonate content, and water depth. No relationship could be defined for the 8 assemblages and overlying water temperature, salinity, dissolved O_2 concentration, or median grain diameter of the sediment.

Species counts on 58 samples at ~10 cm intervals from the USNS *Kane* core K-129 were completed in order to examine the response of benthic foraminiferal populations to glacial/interglacial episodes in the Gulf. The core is from a site at 3,108 m water depth in the southwestern Gulf (20°56.7′N, 95°05.7′W). It was chosen because it had been previously zoned on the basis of planktonic foraminifers and it spans a relatively long interval of time (~165,000 years).

A 4 factor model of the core, produced by direct factor analysis, accounted for 93% of the original information of the 58 sample by 118 species matrix. An *Eponides turgidus* assemblage was found to dominate high calcium carbonate dissolution intervals through core K-129, whereas an *Epistominella decorata* assemblage dominates intervals of low carbonate dissolution. A *Bulimina translucens* assemblage shows highest factor loadings when surface water temperatures were elevated and continental glacial volumes were reduced. A *Cibicidoides wuellerstorfi* assemblage, which shows highest factor loadings during glacials, demonstrates a highly significant inverse relationship to the development of the *Bulimina translucens* assemblage.

The results of this study suggest that the deep-water benthic foraminifers of the Gulf of Mexico have responded to climatic events of global and regional significance through the late Quaternary. Global climatic effects may be inferred from demonstrated relationships between the foraminiferal assemblages and the planktonic oxygen isotope record, and dissolution history of core K-129. A regional effect is suggested by the relationship defined for the *Cibicidoides wuellerstorfi* assemblage and the distribution of terrestrial organic carbon of the Gulf through time.

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Petroleum Potential of Continental Margin off Southeastern United States

The continental margin off the southeastern United States is underlain by two major basins, the Carolina trough off North Carolina and South Carolina and the Blake Plateau Basin off Florida and Georgia, with the latter basin's landward extension, the Southeast Georgia embayment. The embayment, beneath the continental shelf is the only area in which drilling has taken place. Strata of the landward part of the Blake Plateau Basin including the embayment form a wedge of onlapping marine