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North Blowhorn Creek Oil Field—A Stratigraphic Trap in Black Warrior Basin of Alabama

The Black Warrior basin of northwestern Alabama contains shallow oil and gas prospects. To date more than 1,000 wells have been drilled in the region and more than 90 petroleum fields and pools have been discovered. Mississippian sandstone reservoirs are the most productive horizons for hydrocarbons in the basin, and the Carter sandstone is the most prolific. Identification of stratigraphic traps will enhance petroleum exploration by delineating sand body geometry. Definition of reservoir thickness and extent is critical for identifying successful prospects. The North Blowhorn Creek field in Lamar County, Alabama, which produces from the Carter sandstone, is a prime example of a stratigraphic trap. As of March 1983, this field has produced a total of 657,678 bbl of oil and 972.3 mmcf of gas. The Carter sandstone there was deposited as part of a delta which prograded from northwest to southeast across the Black Warrior basin of Alabama. Primary and secondary porosity in the Carter sandstone ranges from 10 to 16% with an average of 13.5%. Permeability ranges from approximately .01-29 md with an average of 10 md. The Parkwood shales interbedded with the Carter sandstone are probably the primary petroleum source beds of the Mississippian hydrocarbons.

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Climate Control of Cretaceous Coal Distribution

The large-scale distribution of coal deposits is generally associated with wet paleoclimates and is given a wide tolerance for paleotemperatures. Numerical modeling of the climate pattern considering continental positioning at 100 Ma indicates five latitudinally controlled "wet" and "dry" zones. Coal deposits have a high probability of being formed in the wet zones where precipitation exceeds evaporation. The global belts of net precipitation and net evaporation for the Cretaceous show no basic latitudinal deviation from those of today. The wet zones run from the polar regions to approximately the 35° latitudes and include the equatorial region between the 4° to 8° latitudes. Based upon precipitation balance alone, coals would be expected in the equatorial tropics and the higher latitudes up to and including the polar regions.

Several factors, such as the absence of coal deposits from Cretaceous tropical landmasses, indicate that other controls on coal formation are present. As part of IGCP Project 191 (Cretaceous Paleoclimate Atlas Project), the significance of climate control on coal formation is determined by mapping coal distribution relative to paleogeography and coal abundance and quality. The quantity and quality of North American data relative to quantitative coal distribution provides a good framework for observation in the Cretaceous. Distributions of coal by Cretaceous stage level show a good relationship with paleolatitude and a shifting pattern relative to sea level cycles.

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Mega Cross-Bedding in Pyroclastic Flow Deposits: A Product of High Energy, High Aggradation Deposition on Steep Slopes

Pyroclastic flow deposits of May 13, 1980, found high on the steep (14°-28°) slopes of Mount St. Helens, show large-scale internal cross-stratification and upper surface bed forms. Antidune structures of up to 0.8 m (2.5 ft) amplitude migrated sourceward and developed from free-surface flows that lay in or close to a supercritical condition. Sigmoidal, upflow-migrating bed forms, up to 2 m (6.5 ft) in amplitude and with internal angles up to 65°, formed in response to high aggradation flows. Stoss-side truncations of low-angle dune forms are also very common. The depositional products of the passage of one pyroclastic flow can be identified by erosional surfaces between bed sets.

To produce and preserve these bed forms we must appeal to special conditions of deposition. These conditions include steep slopes, excessive sediment load, velocities of 30-100 m/sec, flow densities of 1.0-1.2 for the particle and gas mixture, and minimum bed load thicknesses of 1-2 m (3-6 ft), equivalent to individual flow units. Turbulence, which plays an important role in the formation of these bed forms, is believed to be enhanced by the increase in velocity and possible thinning of the flows as they rushed down the steep, rough slopes of Mount St. Helens.

Data from bed-form measurements and grain-size analysis are presented to document and help understand the development of these bed-forms. These data will be compared to and contrasted with other cross-stratification types in primary pyroclastic flows from the Laacher See volcano of West Germany and Tambora volcano in Indonesia.

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Are There Petroleum Resources in Antarctica?

There are no known petroleum resources in Antarctica, but exploration and exploitation are possible within one or two decades. Only super-giant fields would be potentially economic. In 1984 the U. S. Geological Survey ship, R/V *Lee*, collected CDP seismic reflection data over the Ross Sea-Victoria Land margin; other countries have made similar seismic and aeromagnetic surveys of the continental margin in recent years. Results from these research studies in combination with earlier work are summarized as follows:

(1) West Antarctica is probably the most prospective for petroleum because of large areas of unmetamorphosed postrift-age sedimentary rock. In East Antarctica, subglacial sedimentary basins are likely adjacent to mountain ranges and within the probable failed rift near Prydz Bay.

(2) Because of the moving grounded ice sheet several kilometers thick covering most of Antarctica, the only practical areas for possible petroleum exploration are the continental margins, most likely those bordering the Ross, Amundsen, Bellingshausen, and Weddell seas in west Antarctica, and Prydz Bay in east Antarctica.

(3) Sparse geophysical data suggest more than 8 km (5 mi) of sedimentary rock beneath the Ross Sea and 14-15 km (8-9 mi) beneath the Weddell Sea continental shelves. According to Kimura, the Bellingshausen basin probably contains more than 3 km (2 mi) of sedimentary rock, and Stagg reported about 5 km (3 mi) of sedimentary rock in the Prydz Bay area.

(4) Shallow cores (DSDP) containing gas shows from the Ross Sea continental shelf indicate Oligocene and younger glacio-marine sedimentary rocks, thickening to about 6 km (4 mi), according to Hinz. Cretaceous or Jurassic sedimentary rocks might occur in the deepest parts of the section. Jurassic and younger sedimentary rocks are probably present beneath the continental shelf and adjacent glaciated areas of East Antarctica.

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Future of Personal Computer as an Interactive Geological Graphics Work Station

Personal computers are assured an increasingly important role in geology. While their cost plummets, communication speed and computation power increase exponentially. As a result, it is now possible to meet at a reasonable cost, geologists' high demands for rapid data access, precise graphic displays, and sophisticated programs. Most important, these powerful miniature computers make possible the professional's "work station" and the "shared resource" concept, ideas that will redefine the geologic exploration industry. Through the personal computer work station, the geologist will share computation power, programs, data, and work results with associates, and draw upon the capabilities of large central systems as needed. These electronic libraries ("information resources") will instantaneously research, retrieve, and deliver most required raw-data files and programs to the geologists' work station on a rental basis. Geoscientists place high demands on computer memory, graphics, and speed, but personal computers and shared resources will meet the task. Technology is at hand to provide historical data for more than 250,000 wells or hundreds of digitally coded, precise images on one small, inexpensive laser disk. Data from historical files can be superimposed on the image of a related log that comes from another file. This technology is available today, and the cost is reasonable. Applying the geologist's innovative ideas is now the major challenge.