motion made. Island chains and aseismic ridges, formed by plate motion over mantle hot spots, show the direction of motion of the plates over the mantle. It has been found that by adding a single constant to this relative motion synthesis, a system of absolute plate motion over the mantle can be established which satisfies the relative motion data and the island chain /aseismic ridge trend data. This evidence is used to support a theory of deep mantle convection whereby plumes rising beneath the hot spots provide the driving force for continental drift.

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TECTONICS AND STRATIGRAPHY OF DEAD SEA REGION

The Dead Sea rift is a key structural element in a region of tectonic complexity. It is a linear system of faults extending from the Gulf of Aqaba 1,200 km northward to the Taurus Mountains where it veers eastward, and disappears into the overthrust belt. Near the Dead Sea the fault has left-lateral offset of 130 km. The offset diminishes northward. In the Beka'a Valley an eastern branch divides, curves northeastward and loses identity in the Anti-Lebanon and Palmyra folds; a western branch continues northward.

The nature of the fault has been debated for 100 years, but recent exploration in Jordan and Israel provides control for isopach-lithofacies maps which clearly indicate offset strandlines of Cambrian, Triassic, and Cretaceous strata.

Principal movement on the rift occurred in late Oligocene or early Miocene time. The system has been one of weakness since the Precambrian as indicated by a strong north-south joint system in Paleozoic and Precambrian rocks. Offset stream drainage indicates Holocene movement. Oligocene and older rocks spread across northeast Egypt-Sinai without interruption but Miocene-Pliocene strata are confined to a trough in the Gulf of Suez with a meridian width up to 120 km.

The Dead Sea rift is conjugate with the Gulf of Suez–Red Sea block fault (graben) system. The northwest and northeast orientation of these faults is the result of a regional stress couple acting meridionally—the strike of the Dead Sea rift. Marginal foundering increased the width of the Red Sea.

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CLAY MINERAL COMPOSITION OF BEAUFORT SEA SEDIMENTS, ARCTIC OCEAN

Clay mineral composition of the less than 2- and 4-μ size fractions of Beaufort Sea sediments was analyzed by X-ray diffraction techniques. In all except one sample illite is the predominant (51.58–89.46%) clay mineral, kaolinite is present in significant amounts (10.54–42.82%), and chlorite is almost absent. These observations are interesting because of the generally accepted view that kaolinite is a "low latitude" clay mineral and chlorite a "high latitude" one. The presence of kaolinite in the Beaufort Sea is explained by the polycyclic nature of its sediments which have their primary source in kaolinite-rich Mesozoic sedimentary rocks of the North Slope. This explanation is indicated by the large (36.79%) amount of kaolinite in the Colville, the largest river draining from those rocks to the Beaufort Sea. The shore ice, presumably deriving its entrapped sediment from the hinterland, also contains large amounts of kaolinite. It is concluded that a part of this kaolinite is ice rafted to the deeper Beaufort Sea.

The use of clay minerals as a key for the inference of paleoclimates of source rocks on the basis of earlier generalizations may lead to erroneous conclusions, as attested by the present results. For a correct interpretation of paleoclimates it is suggested that clay-mineral data be substantiated by additional data, such as paleontologic and chemical.

Preliminary studies suggest that most illite of Beaufort Sea has formed by illitization of an illite-montmorillonite (?) type mineral.

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TRANSLOCATION OF CHEMICAL CONSTITUENTS AND PEDOGENESIS IN EARLY EOCENE WILLWOOD FORMATION IN NORTHWESTERN WYOMING

Chemical data on a 4-ft red mudstone, in association with intense color mottling, high fossil content, and great lateral extent, indicate the development of a soil (paleosol) within the red-banded, fluviatile Eocene Willwood Formation in northwestern Wyoming. Quantitative analyses of free iron, aluminum, and manganese from a vertical section through the mudstone indicates zones of concentration at the 16–30 in. and 35–42 in. intervals from the top. Mudstone textural analysis indicates increased amounts of fine clay (less than 10 Φ) in the 16–30-in. level. Organic carbon content throughout the profile is unusually high compared with similar Willwood mudstones. Carbonate minerals are essentially absent. The distribution of free aluminum through the profile displays a strong statistical correlation ($r = +.748$) to fine clay distribution, whereas free iron ($r = +.094$), free manganese ($r = -.160$), and organic carbon ($r = +.004$) show essentially no correlation to fine clay content.

Pedogenesis was characterized by organic matter concentration and mobile chemical constituent translocation to lower levels within a parent material of alluvium. Solution and movement resulted primarily from a shallow, fluctuating groundwater table, which produced alternating oxidizing and reducing conditions. Low concentration values and deeper movement of manganese compared with iron may reflect its higher solubility in the reduced state. Mobile ion concentration at the 35–42 in. level probably resulted from minor water table fluctuations directly above an underlying, more permeable sandstone. A significant reduction in the rate of sediment accumulation appears to be the major factor allowing for *in-situ* development of a soil upon the Willwood alluvial plain.

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ORIGIN OF TUFFS IN STANLEY GROUP, OUACHITA MOUNTAINS, ARKANSAS AND OKLAHOMA

Five major tuff sequences (8–120 ft thick) are interbedded with marine graywacke and shale in the 11,000 ft-thick Mississippian Stanley Group. They are present in the basal 1,500 ft and upper 350 ft of the highly folded flysch group. These widespread sequences are thickest and best exposed in the southern Ouachitas, but are traceable to the central Ouachitas.