earth sciences

GEOLOGY

Jurassic sediments

In reconstructions of the supercontinent Pangaea, fits for the Caribbean-Bahamas region have generally been inconclusive.

Dr. Bruce C. Heezen and Paul J. Fox of Columbia University's Lamont-Doherty Geological Observatory and G. Leonard Johnson of the U.S. Naval Oceanographic Office dredged near the base of a feature which most reconstructions place in this confused region, the Demerara Plateau off the northeast coast of South America.

The sandstone samples, the scientists report in the Dec. 25 SCIENCE, came from a depth of 4,400 meters. They are the oldest sediments yet recovered from the deep-sea margin of the South Atlantic.

The types and associations of faunal remains in the sediments, the researchers say, place their age at about 140 million years and indicate that they were deposited in a shallow-water environment.

The scientists conclude that the crust beneath the Demerara Plateau had already been created by the time of the initial stages of rifting when the newly created Atlantic began to founder.

SEA-FLOOR SPREADING

Minor center of spreading in Melanesia

Clues to the location of sea-floor spreading centers often come from earthquake epicenter data. Some researchers have suggested that an area between New Guinea and the Solomon Islands, characterized by much seismic activity, might be a center of spreading. But its precise location has been uncertain.

Dr. J. S. Milsom of the Imperial College of Science and Technology in London, armed with new epicenter data, concludes that the center of spread is the Woodlark Basin, which extends between the southern tip of New Guinea and the island of New Georgia.

This location had previously been suggested by an Australian geologist, S. W. Carey, but the idea did not have many supporters. The data also support Carey's theory that the basin had opened about a hinge point near its western end, reports Dr. Milsom in the Dec. 10 JOURNAL OF GEOPHYSICAL RESEARCH. This explains the absence of a clearly defined central rift, he says.

SEA-AIR INTERACTION

Some results from BOMEX

Field work for the massive data-collection project BOMEX, the Barbados Oceanographic and Meteorological Experiment, was conducted from May through July 1969 (SN: 7/5/69, p. 15). Most of the data analysis is being carried out over a period of several years.

One finding, however, is that the day-night temperature variations in the upper 30 meters of the sea account for a daily interchange of energy that approximates the amount of solar radiation that the sea surface receives daily.

The movement of heat upward from the sea-air interface, the researchers found, is accomplished by very small wind eddies, only tens of meters in diameter, while moisture is transported aloft by much larger eddies, measuring hundreds of meters.

BOMEX measurements of the visible radiation reflected by the ocean reveal that it is only about half the amount that had previously been assumed. The ocean reflects only about three percent of the visible radiation that strikes its surface, the researchers found.

GEOMAGNETISM

Magnetic field variations

The intensity of the ancient geomagnetic field can be calculated by comparing the degree of natural magnetism remaining in objects with the degree of magnetization induced in a known field.

Dr. Kazuhiro Kitazawa of the University of Tokyo's Ocean Research Institute has used this method to obtain values for the magnetic field in Japan over the past 10,000 years.

In the Dec. 10 JOURNAL OF GEOPHYSICAL RESEARCH, Dr. Kitazawa reports that the geomagnetic field reached its peak intensity 2,000 years ago, with a maximum value 1.6 times that at present. The minimum, only half the intensity of the present field, occurred about 5,500 years ago.

It is still uncertain whether or not the change is truly periodic, the researcher says, but it does appear to conform to a regular curve.

Since the amount of carbon 14 in the atmosphere depends on the intensity of cosmic rays, he adds, C-14 ages may be affected if the cosmic-ray effect depends on the magnetic field. Dr. Kitazawa calculated the change in the C-14 concentration in the atmosphere from the magnetic variations and found that it agreed with values from tree-ring samples.

PLATE TECTONICS

Small plate in Scotia Sea

The boundary between the South American and Antarctic crustal plates has never been precisely defined. The intensity and pattern of seismicity in the Scotia Sea, southeast of Argentina, is such that seismicity alone cannot be used to determine plate boundaries.

Dr. P. F. Barker of the University of Birmingham in England combined the pattern of earthquake epicenters and magnetic anomalies in the Scotia Sea to derive a model for plate boundaries and relative motions in that area.

He postulates, in the Dec. 26 NATURE, the existence of a spreading center to the west of the South Sandwich Islands. This, along with a nearby trench and fracture zones, he says, defines a new lithospheric plate beneath the Scotia Sea that is overriding the Atlantic oceanic crust.

Dr. Barker also tentatively proposes that the pole of relative motion of the Antarctic and South American plates lies in the extreme South Pacific.

The origin of the Scotia Ridge has long been disputed. It abounds, says Dr. Barker, with geological structures inconsistent with their present isolated condition. He suggests that the ridge may once have been a continuous continental connection between West Antarctica and South America.