earth sciences

MARINE GEOLOGY

Deep Atlantic once shallow

The deepest part of the Atlantic floor was one apparently almost at the surface, two Columbia University scientists report.

Dr. Bruce C. Heezen and Paul J. Fox found the fossil remains of shallow-water life, primarily corals, in rock that is under five miles of water off the eastern end of the Dominican Republic. The rock was dredged from the base of a 25,000-foot underwater limestone cliff forming the south wall of the Puerto Rico Trench.

The corals and other organisms found grow only in shallow reefs and tropical lagoons. This means the area studied once had to be near sea level. Somehow, they say, this portion of the earth's crust sank by more than 20,000 feet during the past 150 million years. The mechanism responsible for such a remarkable subsidence could be related to continental drift and sea-floor spreading, but exactly how is speculative. The deep trenches are generally viewed as sites where old ocean crust is descending into the mantle.

Previously the greatest depth at which shallow-water reef fossils had been found was about 14,000 feet, on the Blake-Bahama Escarpment, to the north.

The new work was carried out in mid-February aboard the research vessel Eastward.

PETROLEUM GEOLOGY

Oil potential in Bering Sea

Geologic structures representing potential sources for oil and gas have been discovered in the Bering Sea, southwest of Alaska.

The finding results from two seismic profiling expeditions carried out in 1969: one in the southern Bering Sea by U.S. Geological Survey scientists aboard the Coast Guard cutter Storis, the other in the northern part by U.S. Coast and Geodetic Survey scientists aboard their ship Surveyor. Both voyages found sedimentary formations of the type in which oil is often found.

Another study last year in the Chukchi Sea, northwest of Alaska, indicated that geologic conditions there warrant further exploration for oil (SN: 12/20, p. 578).

MARINE GEOLOGY

Tightening the continental fit

Computer-aided studies continue to improve the prebreakup fit of the southern continents (SN: 2/28, p. 229). The latest contribution to the picture is a detailed examination of the fit between Antarctica and southeastern Africa by Dr. Robert S. Dietz and Walter Sproll of the Environmental Science Services Administration's Atlantic Oceanographic and Meteorological Laboratories in Miami. It is a continuation of their studies that last year demonstrated the detailed fit between Antarctica and Australia (SN: 5/10, p. 454).

For the new study, reported in the March 21 SCIENCE, the ESSA scientists used the 1,000-fathom depth line, halfway down the continental slopes. The computer fit for all of Gondwanaland reported in January by the British geologists A. Gilbert Smith and Anthony Hallam used a 500-fathom line. The British scientists did not actually fit the continents in the region studied by Dr. Dietz and Sproll; they used data farther north to establish the relationship between Africa and Antarctica. The results, however, are much the same.

Dr. Dietz and Sproll fitted Antarctica's Princess Martha Coast in part to what is now Mozambique. They joined the Weddell Sea margin to South Africa near today's city of Durban. The difficult problem of fitting the Antarctic Peninsula was solved simply: They maintain it did not exist when the supercontinent broke up but was built up sometime later.

METEOROLOGY

Zeroing in on intracloud lightning

Thunderstorms present many difficulties for atmospheric scientists. One is pinpointing the location of their lightning discharges. This is easy enough for normal cloud-to-ground lightning, but lightning strokes between and within clouds are difficult to study and document because weather conditions usually prevent visual and photographic observations.

Scientists at the Environmental Science Services Administration's Boulder, Colo., research laboratories have a technique for observing such intracloud strokes and measuring their height in the atmosphere.

With mobile equipment set up near Boulder to measure the electromagnetic signals radiated by lightning discharges, they have learned that cloud-to-ground lighting produces a single waveform return reflected off the ionosphere. But intracloud flashes cause a double return; downward-directed energy bounces upward off the earth and then is reflected off the ionosphere to the receiver, arriving later than the sky wave from the upward-directed energy.

Measurements of the time lag between the two sky waves combined with other data that give the distance from the receiver to the lightning stroke can yield calculations for the height of the discharge. The new ability to pinpoint intracloud strokes is expected to be useful in many research areas.

SEISMOLOGY

Monitoring microearthquakes

The first seismological station near downtown Los Angeles specifically to monitor very small earth tremors is being developed at the University of Southern California. It should be installed by late summer.

The Inglewood Fault runs through Los Angeles, but previous attempts to monitor its motions have been thwarted by the noises and vibrations of city traffic and other artificial sources.

But improved electronic equipment and modern developments in seismometer design should enable the new instrument to sort out artificial vibrations from those caused by local microearthquakes, says Dr. Ta-liang Teng of the USC Department of Geological Sciences. The department envisions an eventual network of three to five stations throughout the central Los Angeles area specifically to monitor vibrations below a magnitude of 2.5 on the Richter scale.