earth sciences

Gathered last week at the annual meeting of the American Geophysical Union in Washington

GEOLOGY

Sahara once at South Pole

For several years geologists have suspected that the South Pole of some 450 million years ago was situated near northwest Africa. Now there is no doubt.

"There is no question about it," says Dr. Rhodes W. Fairbridge of Columbia University. "The territory that was the earth's south polar region in the Upper Ordovician period is now the central Sahara."

An international field conference of earth scientists from 11 countries visited areas of reported glacial indicators in the Sahara in January. The scientists confirmed to their complete satisfaction claims of a major continental glaciation. Great parallel grooves running hundreds of miles across rock exposed in the sand showed the result of the glaciation—the kind that occurs only under a polar ice cap.

The scientists also found sedimentary and fossil evidence tracing the desert's icy history. The area once covered by the ice cap extends 4,000 kilometers—from Morocco, through Mauritania, Algeria and Niger to Libya and Chad. The Sahara moved to its present position from the South Pole by movement of the earth's crust and upper mantle around the globe. The earth's axis did not shift. It is believed to have remained relatively stationary through the earth's history.

TECTONICS

Ocean underthrusting near Amchitka

Two seismic reflection profiles were made in September across the Aleutian Trench south of Amchitka Island. Earthquake mechanism studies have also been carried out near Amchitka.

This evidence, say Drs. Mark L. Holmes and Dean A. McManus of the University of Washington, and Roland von Huene of the U.S. Geological Survey, indicates that the Pacific sea floor is moving northwestward under the Aleutian Arc, along a plane dipping 15 to 20 degrees some 40 kilometers beneath the islands.

GEOCHEMISTRY

Fluctuations in atmospheric carbon 14

In recent years scientists have begun to question an earlier assumption that the level of carbon 14 in the atmosphere is constant (SN: 8/30, p. 159). The issue is important; the method of radiocarbon dating assumes constancy.

The first detailed study of annual carbon 14 levels has now found that the isotope's atmospheric concentration varies in a cyclic manner over the 11-year solar cycle. A maximum in carbon 14 precedes a minimum in solar activity by one year.

The most serious implication of the finding is that if these variations in atmospheric carbon 14 have occurred throughout recent geological time, the radiocarbon ages of short-lived materials such as grain, leaves and tree-rings may be in error by up to 150 years.

It may also mean the meteorological concept of a constant mixing rate between the stratosphere and the troposphere may also be in error. Drs. M. S. Baxter of the State University of New York at Stony Brook and Alan Walton of the University of Glasgow say the unexpected negative correlation is most probably due to variable mixing of these two layers of the atmosphere as a result of changes in heating by solar radiation.

SEISMOLOGY

Possible island arc in formation

Within the past few million years several centers of sea-floor spreading are known to have become active and several island arcs to have become inactive. Dr. Lynn R. Sykes of the Lamont-Doherty Geological Observatory thus decided to search for places where island arcs—large, curved groups of islands such as those bordering the Pacific Ocean—may be in the earliest stages of formation.

An incipient arc may be present in the northeast Indian Ocean between Ceylon and Australia, he believes. This zone is the most seismically active area in the oceans that has not so far been identified as either a ridge, a fault or an arc.

The large width of the zone of shallow shocks and the relatively large number of earthquakes greater than magnitude 7 suggest, he says, that this feature is an arc that is developing as the movement of India and Australia with respect to the Eurasian plate is slowing down following continental collision.

GEOLOGY

Reassembling the Mediterranean

Earlier this year Drs. A. Gilbert Smith and Anthony Hallum of the Sedgwick Museum in Cambridge published their computer fit of Gondwanaland, the once-continuous mass of southern continents (SN: 2/28, p. 229).

Dr. Smith has since done a preliminary reassembly of the continental fragments around the Mediterranean Sea. In his reconstruction, the Balearic Islands are attached to Spain; Corsica and Sardinia to them and to France; Italy to Corsica and Sardinia and also to North Africa; Yugoslavia, Greece and Turkey to Italy and much of the eastern Mediterranean rim. The fit is poor in some local areas, he says.

If the reassembly is valid and if fragmentation was initiated by late Triassic to early Jurassic opening of the central Atlantic Ocean, says Dr. Smith, then the Mediterranean is of Jurassic, Cretaceous and possibly Tertiary age—from 50 million to 180 million years old—and should not be regarded as a remnant of the Tethys. The Tethys is the ancient seaway that formerly extended from Portugal through the Alps, southeast Europe, Iran, the Himalayas to Southeast Asia and the Pacific. The Mediterranean has been considered a remnant of that waterway.