earth sciences

METEOROLOGY

New light on an old superstition

The belief that the moon somehow influences the earth's weather has been a peculiarly persistent one, but has generally been dismissed as mere superstition.

Recently, however, scientific interest in extraterrestrial effects on weather has revived (SN: 9/5, p. 207).

Dr. Mae DeVoe Lethbridge of the Pennsylvania State University has studied meteorological records from 108 weather stations in the United States for the years 1930 to 1933 and 1942 to 1965. Statistical analysis of these data showed a peak in thunderstorm frequency on the second day after the full moon.

Writing in the Sept. 20 JOURNAL of GEOPHYSICAL RESEARCH, Dr. Lethbridge suggests that the earth's geomagnetic tail, which trails out into space, could provide a mechanism for the observed increase, since the full moon passes through the tail. The moon's gravitational force may cause displacement of the earth's magnetic field lines, perhaps permitting particles that would otherwise be excluded to enter the atmosphere.

TREE RINGS

Dating surface faults

Surface faulting associated with major earthquakes leaves its mark on trees along the fault either directly, by tilting or felling them, or indirectly, by altering their environment.

Dr. Robert Page of Columbia University's Lamont-Doherty Geological Observatory believes that recent episodes of faulting can be dated by examination of these trees, since tectonic disturbances would produce changes in the sequence of annual growth rings.

To test this hypothesis, he studied trees along a fault zone in southeastern Alaska, where a major earthquake occurred in 1958. He found that trees tilted by the quake displayed marked eccentricity in the rings. A sudden increase in exposure to sunlight, caused by felling of neighboring trees, resulted in increased growth rate.

Dr. Page concludes that tree-ring analysis may prove to be a valuable dating technique, especially for events that occurred less than 1,000 years ago, where the widely used radiocarbon method is less accurate.

But, he cautions, the effects of faulting on tree growth will vary markedly from one region to another, and there are procedural difficulties with the selection of trees and proper identification of annual rings.

SEA-FLOOR SPREADING

Grain of the ocean crust

As ocean crust is generated at ridge crests, it acquires a surface grain. But how long this grain survives after leaving the ridge has been unknown.

Drs. Frederic Naugler and David Rea of the Environmental Science Services Administration's Pacific Oceanographic Laboratories have found topographic grain conforming to magnetic anomaly patterns in parts of the sea floor 78 million years old.

ESSA surveys of a large area of the sea floor between the Hawaiian and Aleutian Islands, the researchers report in the October GEOLOGICAL SOCIETY OF AMERICA BULLETIN, give strong evidence that the crust has retained much of the topographic character imparted to it at birth. Of even greater significance, say the researchers, is the existence of this grain in magnetically quiet areas, such as a zone north of the Hawaiian Ridge.

This topographic grain, the scientists conclude, provides an additional tool for determining the direction of spreading that generated older crusts. In magnetically quiet areas it may be the only tool.

TECTONICS

Sea-floor feature formation

The effects of variations in the rate of sea-floor spreading on the topography of the ocean bottom have received little attention.

Drs. Tjeerd van Andel and G. Ross Heath of Oregon State University have analyzed detailed seismic and magnetic profiles of a small section of the Mid-Atlantic Ridge. These data, collected on a Scripps Institution of Oceanography expedition, show that the rate of sea-floor spreading in that part of the South Atlantic accelerated twice, about 40 million and 4.5 million years ago, and decelerated at least twice, 38 million and 20 million years ago.

The researchers also found numerous faults in the area. There had previously been little evidence for the existence of such faults.

Writing in the first issue of MARINE GEOPHYSICAL RESEARCHES, published in Holland, the researchers conclude that variations in rate of spread, accompanied by uplift and normal faulting, can account for some topographical irregularities.

But the bottom profiles also reveal a great deal of topographical asymmetry—features occurring on one side of the ridge but not on the other. These cannot be accounted for by sea-floor spreading, and may be caused, the researchers suggest, by volcanos, or by intrusions from layers under the crust.

EARTHQUAKE PREDICTION

Recurrence curve for San Andreas

A number of seismologists have calculated probable intervals of earthquake recurrence. Most of these calculations suffer from the limitation, however, that they are based on data from relatively short periods of geological time—perhaps only 30 years.

Dr. Robert E. Wallace of the National Center for Earthquake Research in Menlo Park, Calif., has derived a recurrence curve for the San Andreas Fault based on data for a long geological period.

In the October GEOLOGICAL SOCIETY of AMERICA BULLETIN, Dr. Wallace reasons that recurrence intervals of earthquakes should depend on the long-term offset rate along the fault, stress-releasing tectonic creep rate, amount of displacement caused by past earthquakes and behavior of different segments of the fault.

Dr. Wallace substituted values for these variables into an equation incorporating them and derived estimates for recurrence of earthquakes along the San Andreas Fault. According to Dr. Wallace, an 8-magnitude earthquake should occur every 102 years; a 7-magnitude, every 15 years, and 6-magnitude, every 5 years.