earth sciences

METEOROLOGY

Rainmaking in reverse

Last year a statistical team from the University of California at Berkeley reported on the analysis of the five-year Whitetop cloud seeding project in southern Missouri and northern Arkansas. The surprising conclusion was that the seeding had produced not an increase, but a net 20 percent reduction in rainfall (SN: 4/12, p. 354).

The same group has continued its studies, seeking to determine how variations in daily weather conditions might have affected the results. They report in the PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES for November that the 20 percent decrease was an average of two effects. On days with predominantly westerly winds aloft there was no detectable effect of seeding on rainfall. But on days when the winds were predominantly from the east, there was 46 percent less rain on seeding days than on days when there was no seeding.

On days of easterlies the natural afternoon rainfall tends to occur two hours later than on days when the wind is from the west; the data suggest that a too-early seeding of an incipient storm destroys its ability to produce rain.

The study clearly implies that the 20 percent reduction of rainfall over the entire 100,000-square-mile area of the study was caused by seeding. If the seeding had been operational rather than experimental, the total loss of rainwater in the area would have been 8 million acre-feet per summer. This would have been a harsh blow to the agriculture-dependent economy, the Berkeley group points out.

The findings were reported by Drs. Jeanne L. Lovasich Jerzy Neyman, Elizabeth L. Scott and Jerome A. Smith.

ASTROGEOLOGY

History of iron meteorites

One theory for the origin of iron meteorites is that they are fragments of the metallic core of a large planetary body that broke up. The more common stony meteorites, in this view, are portions of the material surrounding the core.

Dr. Robert B. Gordon of Yale University has been studying the mechanical properties of one iron meteorite, Gibeon, considered representative of the class. Ordinarily, laboratory experience with the fragmentation of metals indicates, metals will break up only by what is known as ductile fracturing. But he has found no evidence of this type of fracturing and its accompanying plastic deformation in iron meteorites.

This leads him to conclude that most iron meteorites are not fragments of some larger metal mass, such as a planetary core, but existed as separate metal pieces surrounded by stony material in the parent body. The parent body structure, he suggests in the Jan. 10 JOURNAL OF GEOPHYSICAL RESEARCH, thus consists of meteorite-sized pieces of metal embedded in a stony matrix that is continuous through the body. When one of the bodies collides with another, the stony part of each is shattered, releasing the metal pieces.

GEOCHEMISTRY

Fallout of black spherules

For more than a century scientists have collected microscopic black magnetic spherical particles in ocean sediment samples, dust falling to the earth's surface, and more recently in samples collected high in the atmosphere. Most of the spherules are between 5 and 15 microns in size; they are generally presumed to be extraterrestrial in origin, most likely the burned-out remains of meteors. But studies have been so fragmentary that interpretations of origins and influx rates are uncertain.

In the Jan. 10 JOURNAL OF GEOPHYSICAL RESEARCH Dr. O. Vittori of the Institute of Physics of the Atmosphere in Bologna, Italy, reports a study of airborne magnetic particles collected by an electromagnetic device placed on a mountain in Italy.

The chemical analysis of his samples agreed closely with that of samples collected at other stations around the world. The result suggests that most ferromagnetic fallout is independent of sampling locality. This supports the view that they are extraterrestrial, rather than volcanic or industrial, in origin. He calculates the rate at which the particles are falling on the earth as about 10^{-15} grams per square centimeter per second.

OCEANOGRAPHY

Suspended matter close in

Appreciable amounts of suspended matter in the surface waters of the Atlantic Ocean off the Eastern United States are restricted to within a few kilometers of the coast, a detailed study has found. Samples were taken at 600 stations from Cape Cod to the Florida Keys. The findings show that suspended matter moves mainly alongshore rather than directly seaward from the mouths of rivers and estuaries.

Soot, fly ash, processed cellulose and other pollutants were found to be widespread, particularly off the area bordered by Long Island and New Jersey and in the Straits of Florida. The cellulose fibers found in abundance in the Florida Straits, the investigators decided, are from toilet paper in the refuse dumped from ships in the heavily traveled shipping lane through the area.

The work is reported in the Jan. 23 SCIENCE by Drs. Frank T. Manheim and Robert H. Meade of the U.S. Geological Survey and Gerard C. Bond of Williams College.

PALEOMAGNETISM

Timing the continental split

It is now widely accepted that Africa and South America were once part of the same continent. Scientists are trying to refine their estimates of exactly when the split-up occurred.

The first paleomagnetic study made with Jurassic-age rocks in South America is reported in the Jan. 17 NATURE by Drs. D. A. Valencio and J. F. Vilas of the University of Buenos Aires.

Their work indicates that the breakup began in Lower Jurassic times, 175 million to 195 million years ago.