earth sciences

METEOROLOGY

Climatic effects of particulates

One of the least understood effects of man's activities on the atmosphere is the degree to which particulates, such as smoke and dust, may cause long-term changes in climate by blocking out some of the incoming solar radiation (SN: 11/15, p. 458). The basic problem is a shortage of data.

The results of a study reported last week at the Internal Solar Energy Conference in Melbourne, Australia, indicate that particulates may be reducing the available solar energy by one percent in the summer and by slightly more in the winter.

The calculations, carried out by Dr. Earl W. Barrett of the Environmental Science Services Administration Research Laboratories in Boulder, Colo., are based on actual measurements of particulate concentrations in the relatively clean atmosphere at Boulder.

His computations show that suspended particulates could alter the pattern of latitudinal variations in incoming energy in such a way that the general circulation of the atmosphere could be changed. The change would be a strengthening of the westerly winds in the middle latitudes—a distinctly winter-like circulation.

He reiterates the call of other atmospheric scientists for world-wide studies on whether the amount of particulate pollution is increasing, and if so, at what rate it is occurring.

METEOROLOGY

Simulating a tropical cyclone

Several scientists have been developing numerical-dynamical models to simulate the life history of tropical cyclones, notably Drs. Katsuyuki Ooyama of New York University (SN: 3/22/69, p. 284) and Stanley L. Rosenthal of the National Hurricane Research Laboratory in Miami.

Dr. Rosenthal described a model last year that simulated the life cycle of tropical storms with some degree of reality. The most prominent deficiency was a rather coarse resolution of 20 kilometers between grid points that had been adopted for computational economy.

In February's MONTHLY WEATHER REVIEW Dr. Rosenthal reports results of an experiment with 10-kilometer resolution. He finds that it yields a storm with more realistic structure. The most noteworthy improvement is the appearance of a distinct region in the center, analogous to the eye of a real hurricane. Rainfall, kinetic energy production and efficiency all seem to be more realistic than in the earlier model, which tended to overestimate these factors.

HURRICANE MODIFICATION

No better data on Debbie

Three months ago scientists for Project Stormfury announced results suggesting that seeding of Hurricane Debbie in August had helped reduce her force (SN: 12/13, p. 551). Winds diminished on the two days in which seeding was conducted but reintensified on the day in which no seeding was done. The data were encouraging, but no cause-effect case could be proved.

At that time the project director, Dr. R. Cecil Gentry of the Environmental Science Services Administration, said further analysis in the coming months might produce more definite results. He says now that despite much more work with the data, the same degree of uncertainty exists.

"The sequence of changes in Debbie look very impressive, but we're still not able to say with certainty—and I guess we never will—that the seeding caused the effects," he says. "However, it certainly looks suggestive."

So the next advance toward stronger evidence cannot be expected until late summer and fall, when project scientists are hoping for several hurricanes suitable for further experimental seeding.

OCEANOGRAPHY

Strontium 90 in the oceans

Over the past decade the fallout into the oceans of strontium 90, deposited in the stratosphere by nuclear explosions, has become a matter of considerable interest and debate.

Two major questions are: whether this nuclide has been deposited at a greater rate in the oceans than on land, and whether it has penetrated rapidly to considerable depth. Some measurements indicate that ocean fallout may be three to four times that of fallout on land.

The Feb. 20 JOURNAL of GEOPHYSICAL RESEARCH carries reports of two separate studies on the subject. One, at Crater Lake, Oreg., sought to determine whether the character of a wet surface tends to enhance fallout into the sea. Dr. H. L. Volchok and Melvin Feiner of the Atomic Energy Commission in New York, H. J. Simpson and Dr. W. S. Broecker of Lamont-Doherty Geological Observatory, Drs. N. E. Noskin and V. T. Bowen of Woods Hole Oceanographic Institution and Dr. Eric Willis of Isotopes Inc. found the answer to be no. No substantial difference in the efficiency of fallout collection can be attributed to the mere presence of a large water surface.

The other study, in Lake Michigan, by Drs. Lester Machta, Kosta Telegadas and D. L. Harris of the Environmental Science Services Administration, reached the same conclusion.

Investigations of the ocean-fallout controversy must now turn to other possible enhancement mechanisms, such as interactions at the sea-air interface or unique meteorological phenomena over the oceans.

TECTONICS

Americas plate may be two

In the concept of plate tectonics (SN: 11/8, p. 430), North and South America and the western Atlantic Ocean floor, except for the Caribbean (SN: 2/7, p. 153), are generally regarded as a single crustal plate.

Two scientists from the University of Miami School of Marine and Atmospheric Sciences, Drs. M. M. Ball and C. G. A. Harrison, propose in the Feb. 20 SCIENCE that it is in fact two plates, separated along an east-west line between the Lesser Antilles to the Mid-Atlantic Ridge. Their proposal is based on considerations of the size of the single plate and certain patterns of seismicity near the postulated boundary.