

Earth Sciences

Cheryl Simon reports from San Francisco at the American Geophysical Union and American Society of Limnology and Oceanography meeting

Top-side view of lightning's splendor

Like a huge wishbone in the sky, a spectacular Y-shaped lightning discharge slashed across the tops of clouds during a thunderstorm last winter in Brazil. The discharge, which occurred during what scientists call a "relatively small" winter storm, was tens of miles long. It was photographed at night by astronaut Kenneth Mattingly II during the June-July 1982 flight of the space shuttle Columbia. The image, obtained as part of the shuttleborne Nighttime-Daytime-Optical Survey of Lightning experiment, was taken with a 16 mm camera system, and a special system designed to record optical impulses of lightning either by night or by day.

While lightning discharges have been well-recorded from ground observations, the photos taken during shuttle flights are "the first attempt to supply detailed photos of the extent or structure of lightning" from above storms, says atmospheric scientist Bernard Vonnegut of the State University of New York at Albany. He collaborated on the experiment with Otha H. Vaughan of NASA's Marshall Space Flight Center at Huntsville, Ala., and Marx Brook of the New Mexico Institute of Mining and Technology at Socorro, N.M.

The researchers were familiar with casual observations by astronauts who reported seeing lightning discharges that spanned vast stretches of clouds. Vonnegut says he hopes that the photographs will increase knowledge of the extent of the discharges and help explain "surprisingly large" amounts of charge brought to the ground during cloud-to-ground strikes. The researchers suspect that the Y-shaped discharge observed over Brazil was a cloud-to-ground strike.

One interesting observation from space is that lightning discharges appear to be initiated simultaneously at places as far as 1,000 miles apart, he says. "If you know that this happened, for example, in 40 milliseconds, you can calculate the speed of communication" of electrical signals. In future shuttle missions, the researchers hope to coordinate ground observations of lightning with those from space. Eventually, Vonnegut says, it may be possible to compile a library of observations from space. These images, then, will be used in comparisons with ground measurements of lightning discharges.

Lake Michigan's slow recovery

Just as it took years for massive quantities of phosphate pumped into the Great Lakes to exhibit their effect on the complex ecosystems, subsequent restrictions on phosphate input are slow to rectify existing damage. William Y.B. Chang and Ronald Rossman of the University of Michigan Great Lakes Research Division in Ann Arbor report that concentrations of phosphate (one of the primary nutrients for lake biota) have dropped, but not enough to stop the increase in two species of blue-green algae in the nearshore reaches of Lake Michigan. When blue-green algae are abundant in waters used for drinking, they impart a foul taste and clog pipes. The desired effect of phosphate reduction is a decrease in blue-green algae, and an increase in the population of diatoms, a minute form of algae that is a critical part of the food web. Chang says that diatoms have not recovered yet because concentrations of the dissolved silica the diatoms need to construct their cell walls have not yet returned to normal levels relative to phosphate.

The phosphate restrictions now in force are designed to reverse the process of eutrophication—an increase in nutrients in the lake waters. "In freshwater environments, control of phosphate can reverse eutrophication," said Chang. "We hope that the lake will go back to its earlier state." While the reversal effort has been highly successful in some smaller lakes, Lake Michigan's condition is described by Chang as "transitional."

The observation is one result of an ongoing study of the ecology of the nearshore area of Lake Michigan.

Biomedicine

Blood-borne agent in immune deficiency

Direct evidence linking blood transfusions and blood products with acquired immune deficiency syndrome (AIDS) has been reported by the Centers for Disease Control. The mysterious disease, first found among homosexual men (SN: 11/14/81, p. 309) and then discovered in some drug addicts, Haitians and hemophiliacs (SN: 9/25/82, p. 202), has tallied 788 cases and 295 deaths. But the cause of the disease has not yet been determined, although physicians suspect an infectious agent, such as a virus, is responsible.

The new evidence comes from a 20-month-old boy who received blood from 19 donors to counter Rh disease shortly after his birth. The child later developed unexplained immune system problems and serious bacterial infections, including *Mycobacterium avium-intracellulare* (see below), common in adult AIDS victims. Investigators recently found that one of the 19 blood donors, apparently in good health at the time of the donation, later was reported to have AIDS, from which he died in August 1982.

Because there is no definitive test for AIDS and it has seldom been seen in children, the investigators are cautious about their correlation. "If the infant's illness described in this report is AIDS, its occurrence following the receipt of blood products from a known AIDS case adds support to the infectious-agent hypothesis," the CDC says in its Dec. 10, 1982 MORBIDITY AND MORTALITY WEEKLY REPORT. The report suggests that the infectious agent is present in the blood of a victim before the onset of any symptoms of illness and the incubation period for such illness can be relatively long.

Previous suggestion that AIDS could be transmitted in blood and blood products came from three cases in heterosexual hemophiliacs. In the recent report, the CDC also described four more confirmed cases of AIDS in hemophiliacs, including a child, and one more suspected case in a child with severe hemophilia. Because hemophiliacs receive blood products that are combined from many sources, it has not been possible to link these cases directly with an affected donor. The CDC concludes that AIDS may pose a significant risk for patients, including children, with hemophilia. A national survey of hemophilia treatment centers is underway to estimate the prevalence of AIDS-associated diseases and to provide active surveillance of AIDS among hemophiliacs.

... and rare infection implicated

The course of AIDS often involves infection by a bacterial strain common in the environment but seldom causing human disease, report physicians at the University of California at Los Angeles School of Medicine. At the UCLA Center for the Health Sciences, the bacteria called the *Mycobacterium avium-intracellulare* complex (MAC) infected eight out of nine patients who died of AIDS. Because the patients also suffered from additional infections, it is not clear what role these bacteria play in either altering immunity or in causing death. But Phillip Zakowski and colleagues suggest in the Dec. 10 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION a "vigorous" search for mycobacteria be made in all homosexual men who show signs of AIDS.

A discouraging note was added in an accompanying editorial by Henry Masur of the National Institutes of Health. He says that prompt diagnosis of mycobacterial infection has rarely helped patients with AIDS. The organisms are usually resistant to drugs and so patients die despite aggressive drug treatment. "Since patients with AIDS are susceptible to such a wide range of devastating infections and neoplasms [cancers], however, real progress in this syndrome will probably be made by elucidating the mode of transmission of AIDS and the mechanisms of immunosuppression," he concludes.