

EARTH SCIENCES

Ocean profiling made easy

Understanding the movement and dimensions of undersea currents, internal waves and large mid-ocean eddies is vital to determining the ocean's structure and to forecasting ocean dynamics. The temperature of drifting eddies, for example, alters the transmission of underwater sound, thereby affecting undersea surveillance. Undersea currents affect the migration of fish and can be critical in underwater pipe-laying and drilling. But such currents cannot be measured at the ocean surface or by satellite. Profilers, instruments that are dropped overboard to relay back measurements, have been used, but because of the equipment and expense required and the time needed to retrieve them, profiles have been made in only a few areas.

Now, two researchers from Woods Hole Oceanographic Institution have developed an ocean temperature and velocity profiler that is expendable and is one-tenth the size of currently used instruments. As a result, simultaneous measurements of velocity and temperature at various levels and over a wide area of the ocean can be made. The probe, developed by Thomas Sanford and Robert Drever with navy funding, is about two feet long and two inches in diameter and is estimated to cost a few hundred dollars. It drops freely to the ocean bottom and can record data to a depth of 2,500 feet. It measures the electric current of the sea produced by the motion of the seawater through the earth's magnetic field and sends the voltage to the ship as an FM signal. The first operational use will be this summer during a navy project in the Atlantic.

Precision in earthquake prediction

As earthquake prediction becomes more science than soothing, its tools become more precise. Mark H. Shapiro of the W.K. Kellogg Radiation Laboratory at the California Institute of Technology described a fully automated, microprocessor-controlled radon monitor at the recent meeting of the American Physical Society. Radon is a radioactive gas that is formed by the decay of uranium. Changes in the radon concentration in groundwater and in its emission from hard rock are believed to occur before earthquakes. The Caltech instrument filters and concentrates radon samples from boreholes in hard rock and counts the radioactivity with a Geiger tube. The microcomputer controls the instrument operation, collects the data and responds to calls for the data from a central computer at the Kellogg laboratory. The microcomputer can transmit 10 days worth of stored data in one minute. The central computer then provides daily plots of the radon levels at each monitor site. At present, four sites are operating and more are planned. The first site began operation two years ago in the Transverse Ranges in southern California. The researchers have found "possible precursory signals" as much as 40 to 45 days before one quake and anomalous signals prior to several others.

Finding a source for COS

Carbonyl sulfide (COS) may be a major source of sulfate in the stratosphere, but little is known about the relatively inert chemical (SN: 12/16/78, p. 423). In order to balance the atmospheric budget, researchers need to know if it is natural or human-made. In the April 19 NATURE, two researchers present results that suggest that carbon disulfide (CS₂), which probably comes from the oceans, might be a COS precursor. Nien Dak Sze and Malcolm K.W. Ko of Atmospheric and Environmental Research, Inc., in Cambridge, Mass., compare the ratio of the two chemicals in the atmosphere to that following the laboratory reaction of CS₂. The measurements agree quite closely, though the researchers caution that the results may be only "fortuitous."

BEHAVIOR

Weighing the pooper problem

Residents of a Chicago northside neighborhood may be forgiven if they mistakenly believed some kind of crazed fetishist was stalking about their sidewalks and lawns last year. Hot on the trail of area dogs and their walkers, a researcher dutifully counted and recorded the defecations of such dogs. The researcher then weighed the defecations.

By the end of five weekdays in the 8-by-5-block area, the researcher had recorded 1,147 "fresh samples" of dog feces at a total weight of 19.1 pounds. The results were reported to De Paul University colleagues, some of whom surveyed the comings and goings of dogs and owners from a central stakeout point.

Evidence in hand, psychological researchers Leonard A. Jason, Edwin S. Zolik and Francis Matese noted that only 5 percent of the feces in question were picked up by the owners. The situation, they suggested, could make life uncomfortable for other neighborhood walkers. "It is not uncommon to see inhabitants of various areas in many cities walking with their heads down; this does not signify depression," they say, "but an adaptive, appropriate posture for keeping shoes clean and untainted."

To combat such "rampant dog litter, its attendant flies and repugnant odor," the scientists instituted "two behavioral strategies," each lasting seven days. The first was to place six signs along prominent routes reading: "Protect Children's Health. Pick-up your Dog's Droppings." Dog owners responded to these signs by picking up their dogs' defecations at a 6 percent, rather than 5 percent, rate.

The second strategy, however, met with considerably more success. Each time a dog walker entered a designated neighborhood area, he or she was approached by a research assistant, who said: "Excuse me. Can I talk to you? I am a resident of this neighborhood and am very concerned about keeping this area clean. I would appreciate it if you would use this bag to pick up your dog's defecations." During this phase, 82 percent of the dog owners picked up after their dogs, say the researchers. And during the week after this phase, owners continued to pick up feces at a 63 percent rate. Finally, during a second test week of such prompting, 84 percent of dog owners cleaned up their pets' droppings.

The results contributed to the passage of a pooper scooper ordinance by the Chicago City Council, the researchers report in a recent American Psychological Association newsletter.

Smoking less and enjoying it more?

Teenage smoking has dropped ... and risen. While tobacco smoking has dropped sharply during the last five years, Health, Education and Welfare Secretary Joseph A. Califano Jr. reports that marijuana use is on the increase among young people. "I am deeply disturbed by a key finding in this [annual] report" on marijuana and health, Califano says. The report shows that between 1976 and 1977, the percentage of 12- to 17-year-olds using marijuana increased from 12.4 to 16.1. And between 1975 and 1977, the proportion of high school seniors who used marijuana daily rose from 6 percent to 9 percent.

On the other hand, the percentage of 12- to 18-year-old boys and girls who smoke cigarettes dropped from 15.6 percent in 1974 to 11.7 percent in 1979, according to HEW. And for the first time, teenage girls, with a 12.7 percent rate (1.7 million girls), outnumber teen boys, with a 10.7 percent smoking rate (1.6 million boys).

Califano says the "dramatic increase" in marijuana use "is sheer folly," primarily because scientists know so little about the drug's long-term effects. HEW will begin a "long-range" research plan on marijuana, he says.