

Listening in on oceanic warming

Starting this fall, a new sound will be spread throughout the Pacific Ocean. The extremely faint hum will serve as the centerpiece of a major experiment designed to discern whether greenhouse gas pollution in the atmosphere is warming the world's oceans.

The experiment relies on a concept called acoustic thermometry, which involves repeatedly measuring the time it takes a sound pulse to travel thousands of kilometers through water. Because sound moves faster in warm water than in cold, this method can detect over a period of time whether the temperature of the ocean is gradually increasing. Walter Munk of the Scripps Institution of Oceanography in La Jolla, Calif., will direct the 30-month, \$35 million project, funded by the Department of Defense.

While many scientists have experimented with sending sounds through the ocean, Munk and his colleagues performed the most ambitious test of this concept two years ago, when they emitted a low-frequency hum from Heard Island, in the southern Indian Ocean (SN: 1/26/91, p.53). Munk's group demonstrated that it could detect the faint sound up to 18,000 kilometers away, at stations on the east and west coasts of North America.

For the new study, Munk and his colleagues will set up sound sources on the U.S. West Coast and in the Hawaiian Islands. They plan to establish receiving stations in New Zealand, Japan, Tahiti, and the Kuril Islands in the North Pacific, says one of the experiment's participants, Robert Spindel of the University of Washington in Seattle. The sources will emit a modulated tone at a power of 250 to 1,000 watts.

Though not very loud, the hum can travel great distances because it moves within a sound channel — a layer of water in which sound travels slowest. Located hundreds of meters below the surface, this slow layer lies between the warm surface waters and the denser waters below. If sound traveling in the slow layer strays up or down, it is refracted back into the channel, an effect that allows the sound to cross the ocean.

Crude calculations suggest that greenhouse gases accumulating in the atmosphere should be warming the ocean by about 0.005°C a year at a depth of 1,000 meters. Oceanographers would have trouble detecting such subtle warming with traditional methods because regional temperature variations would overshadow it, Munk says. But acoustic thermometry should enable them to discern such a trend, he explains, because the method provides a measure of average temperatures over large distances, removing the interference from local variations. If the Pacific thermometry experiment proves successful, Munk's group hopes to set up sources and receivers throughout all the world's oceans.

The volcanic mirror over Earth

Analysis of satellite measurements made after the eruption of Mt. Pinatubo has yielded the first unambiguous evidence that volcanic debris makes Earth's atmosphere more reflective to sunlight, which cools the climate.

Scientists have long theorized that sulfur from volcanic eruptions produces small sulfuric acid droplets in the atmosphere that can reflect sunlight back toward space. But satellite measurements since 1976 had not shown clear evidence of that effect until after the Mt. Pinatubo eruption in June 1991, one of the largest volcanic blasts of this century. In the March 5 SCIENCE, Patrick Minnis of NASA's Langley Research Center in Hampton, Va., and his colleagues report that instruments aboard the Earth Radiation Budget Satellite detected a 3.8 percent increase in sunlight reflected by Earth's atmosphere in the months following the eruption. That significant boost in reflectivity temporarily reduced Earth's surface temperature by 0.5°C.

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When cows get hungry for news

Looking for more and more creative ways to cope with old newspapers, some recyclers have proposed using them as bedding in cow barns. But when Bossie gets a hankering for a snack, she might eat yesterday's news, and that concerned a team of scientists headed by Barbara S. Shane at Louisiana State University in Baton Rouge. The researchers realized that newsprint "contains a galaxy of chemical compounds, including whiteners and fillers . . . dioxins which can be formed in the bleaching process [SN: 2/18/89, p.104], naphthenic oils used to solubilize the inks, and the inks themselves." Because many of these contaminants accumulate in fat, they may be shed into cows' milk and consumed by children.

Shane's team of environmental, veterinary, and toxicological scientists decided to investigate how much risk that might pose by conducting mutagenicity assays on the milk from four Holsteins before and after the cows ate a diet containing 10 percent newsprint for two weeks.

A finding of newsprint-derived mutagens in two milk samples suggests the chemicals "were transferred through the food chain," the researchers report in the February JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY. Their assays also detected dioxins, though none of the most toxic forms, such as TCDD. Overall, however, the team found mutagens sporadically, and then in low concentrations. As a result, Shane's group concludes, drinking a glass of milk from these newsprint-noshing cows poses less of a health risk than drinking coffee or tea.

Nevertheless, the researchers resist sanctioning newsprint for dairy-cow bedding. Many of the chemicals that can end up in newsprint have never undergone testing for human toxicity, they note. Even if the animals excreted such chemicals completely, they point out, the toxicants might still pose an environmental hazard if they were transferred to soil through manure. Finally, recyclers don't always reject soiled papers or those with inks known to contain toxic heavy metals. Indeed, the researchers report witnessing one commercial operator who was shredding a rat-poison box for use in cattle bedding.

Nutty way to head off heart disease

Last summer, researchers at Loma Linda (Calif.) University reported epidemiological data suggesting that Seventh Day Adventists who rarely eat nuts suffer heart attacks and coronary deaths at roughly twice the rate of those who typically eat nuts five times a week (SN: 7/25/92, p.52). Now those researchers may have discovered why. By comparing the results of two four-week-long dietary intervention trials in 18 men, they found that eating moderate quantities of walnuts, without increasing total dietary fat and calories, "decreases serum-cholesterol levels and favorably modifies the lipoprotein profile in normal [healthy] men."

Both experimental diets derived 30 percent of their calories from fat — a level recommended by the American Heart Association and 14 percent lower than the typical U.S. diet, which contains 35 percent fat. Writing in the March 4 NEW ENGLAND JOURNAL OF MEDICINE, Joan Sabaté and his co-workers reported that substituting walnuts for two-thirds of the fat in such a relatively low-fat diet further lowers cholesterol concentrations in the blood by more than 10 percent.

Since the walnut diet contained roughly three times the ratio of polyunsaturated to saturated fat found in the other low-fat diet, some drop in cholesterol should have been anticipated, says David Kritchevsky of the Wistar Institute in Philadelphia. More unexpected, he says, was the magnitude of the walnuts' apparent effect. Ordinarily, the higher an individual's starting cholesterol, the more likely it is to respond to diet. And averaging just 182 milligrams of cholesterol per deciliter of blood, initial cholesterol readings in these men were fairly low.

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