

Global warming lurks principally at night

Cool evenings are getting rarer these days. Measurements at 5,400 weather stations around the globe reveal that global warming in the last half century has raised nighttime temperatures far more than daytime ones, according to a team of international meteorologists.

Between 1950 and 1993, globally averaged minimum temperatures rose at a rate of 0.186°C per decade, whereas maximum temperatures increased at only 0.088°C per decade, according to David R. Easterling of the National Climatic Data Center in Asheville, N.C., and his colleagues in the United States, England, Russia, New Zealand, and Australia. The scientists report their findings in the July 18 SCIENCE.

The nighttime warming has shrunk the gap between maximum and minimum temperatures. In a few spots, such as the southern United States and eastern Canada, daytime maximum temperatures have also dropped, further reducing the daily temperature range there.

The new results back up a finding 6 years ago by Easterling's colleagues, who studied just the United States, China, and the former Soviet Union. For the current study, Easterling's group expanded its data set to cover much more of the Southern Hemisphere, including stations in South America, New Zealand, Indonesia, and Australia.

Critics of the earlier study wondered whether urban growth around meteorological stations had caused the enhanced nighttime warming. Cities generally remain warmer at night than nearby rural areas do because concrete and asphalt store heat during the day and radiate it at night. When Easterling's group removed from its data the 1,300 stations near large urban centers, the results changed by only about 10 percent. "This shows it's not just due to urban warming. It's a real effect," says Easterling.

Meteorologists cannot say whether greenhouse gas pollution has caused the enhanced nighttime warming, although the results match some greenhouse computer simulations, says Alan Robock of the University of Maryland at College Park. He and his colleagues found that when greenhouse gases warm the climate, the atmosphere holds more water vapor. That extra water vapor blocks some incoming sunlight and thus limits the magnitude of greenhouse warming during the day. It does not weaken greenhouse warming at night.

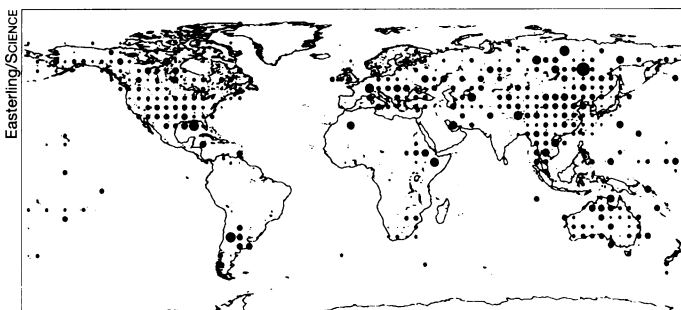
Increasing cloudiness could also explain the trend. Some

clouds reduce daytime temperatures and raise nighttime temperatures.

The higher nighttime temperatures, exaggerated in winter, could benefit society by trimming heating costs and the number of plant-damaging frosts. Scientists who study climate and agriculture, however, point out that warmer nights can stimulate the growth of harmful insects and weeds. They can also reduce yields by spurring plants to burn energy faster at night. Moreover, such climate change further limits the places where farmers can plant winter wheat, which requires cold temperatures, says Cynthia Rosenzweig of NASA's Goddard Institute for Space Studies in New York.

—R. Monastersky

Blue dots show where the daily temperature range has decreased; red dots show increases. Large dots indicate a 0.5°C change per decade, medium dots a 0.3° change, and small dots a 0.1° change.



Squirts for squirts: Flu spray guards kids

A squirt up the nose could provide a shot in the arm for the flu vaccination program. A new study reveals that a nasal spray vaccine prevents influenza in healthy children, who are 2 to 10 times more likely to get the disease than adults and who often spread the virus to others.

Only 1 percent of 1,070 children treated with the nasal vaccine developed flu last winter, compared to 18 percent of the 532 children who received a spray with no active ingredient, announced the National Institute of Allergy and Infectious Diseases (NIAID) in Bethesda, Md., and Aviron, a pharmaceutical company in Mountain View, Calif., this week.

"This is a new public health tool with which to control influenza," says research team member Robert B. Belshe of Saint Louis University School of Medicine. "If we vaccinate at school, we might eliminate the major mechanism of transmission in the community."

Although the currently licensed injectable flu vaccine works for healthy children, public health strategists have traditionally targeted people who are at highest risk of complications from influenza—those over 65 and those with one of several chronic diseases. Aviron plans to make the nasal vaccine available for wide-

spread use in 1999, pending approval by the Food and Drug Administration.

Scientists don't know how effective the nasal vaccine alone is in the elderly, but results from a 1992 study at the University of Rochester (N.Y.) indicate that a combination of the two vaccines improves protection in this population, says Dominick A. Iacuzio, influenza program officer at NIAID.

The new study employs a virus that reproduces in the relatively cool nasal passages but not in the warmer environment of the lungs. As a result, the vaccine strain induces immunity but not disease. Scientists have been refining such cold-adapted flu viruses for over 30 years, since they were first isolated by Hunein F. Maassab at the University of Michigan School of Public Health in Ann Arbor.

Like the injectable version, the nasal vaccine stimulates antibody production in the blood. In addition, it signals cells in the mucous lining of the upper airway to manufacture a kind of antibody that they alone can make. Both antibody types may be important in preventing flu, says Belshe. "This should confer a more complete immune response than the currently used vaccine."

Influenza virus disguises itself with a

new coat every year. Consequently, scientists need a way to make a vaccine that's effective against each emerging strain.

For the nasal vaccine, they mix the emerging virus with a master strain that grows at temperatures so low the wild virus can't reproduce. When the two strains are cultivated together, new viruses—with some properties of each—occasionally arise. Scientists then grow the old and new viruses at low temperatures, thus disabling the wild strain, and inactivate the master strain by using compounds that bind to its surface. This leaves a virus that reproduces only under cool conditions and has the emerging strain's coat.

While the new study is "first-rate," says epidemiologist Raymond A. Strikas of the Centers for Disease Control and Prevention in Atlanta, it would be expensive to vaccinate millions of children, and the health and economic benefits won't be clear until more studies are conducted. He also points out that the investigators did not compare the nasal and injected vaccines.

"The real benefit is that we're likely to get more people to take it," Iacuzio says.

Sandy Prichard, the St. Louis mother of two young participants in the study, agrees. "I didn't dread bringing them to the doctor like I do when they're going to get a shot," she says.

—E. Strauss