1996: Year of warmth and weather reversals

Recalling last year's icy winter and mild summer, residents of the eastern United States and Europe might guess that 1996 was a cool year around the globe. Actually, those regions were out of step with the planet as a whole, which posted near-record high temperatures, report British and U.S. researchers.

The balminess of 1996 followed record-breaking warmth in 1995, 1991, and 1990, making the 1990s the hottest decade in more than a century. Although climate scientists refrain from attributing the rising global temperatures to greenhouse gas pollution, they say the trend is consistent with their predictions.

Averaged around the globe, Earth's surface temperature in 1996 was among the top 10 since reliable measurements began in 1860, say researchers at the University of East Anglia in Norwich, England, and the British Meteorological Office in Bracknell. These scientists track temperature readings taken by more than 1,000 weather stations on land and a similar number of ships and buoys at sea. Although their data for December remain preliminary, they calculate that the globe in 1996 was 0.21°C warmer than average, which they define as the mean temperature between 1961 and 1990.

The values for 1996 fell short of the record year, 1995, which hit 0.40°C above the average, says Phil Jones of East Anglia.

Researchers at NASA's Goddard Institute for Space Studies in New York find that 1996 sits within the top five warmest years in their record of temperatures reaching back to 1866. The NASA scientists track measurements of surface temperatures taken at some 2,000 meteorological stations on land and satellite records of ocean temperatures for recent years. They find that the global temperature in 1996 was 0.32°C above the average for 1951 through 1980.

A different picture of climate emerges from satellite measurements that reflect conditions between the ground and an altitude of 7 kilometers. In the 18-year-long record of satellite data, 1996 registered as the eighth coldest year, says John Christy of the University of Alabama in Huntsville. The atmosphere last year was slightly cooler than average, relative to the years 1982 through 1991.

The discrepancy between surface and atmospheric data has persisted for several years, making it difficult for scientists to interpret the climate's recent behavior. The British record shows Earth's surface warming at a rate of 0.17°C per decade, whereas the satellite records show the atmosphere cooling slightly, at 0.035°C per decade.

Because the satellite measurements track a broad layer of the atmosphere, they need not match what is happening at Earth's surface, says James Hurrell of the National Center for Atmospheric Research in Boulder, Colo. "They give different perspectives. There is no reason to expect that the trends should be the same over the short period since 1979. But over the long haul, we would expect the temperature trends to come into better agreement," he says.

One area of accord between satellite and surface data is the pattern of temperatures that developed last year. A temporary climatic pattern known as La Niña—the reverse of El Niño—chilled the central equatorial Pacific.

Cool weather also dominated in the central and eastern United States, northern Europe, and parts of Canada and Russia. Much of the rest of the globe, including Greenland, was warm. This pattern represents a reversal of the one that has dominated since 1980.

Computer climate models predict that the buildup of heat-trapping pollution will warm Earth's surface over time, though natural variations can make individual years warm or cold. A consensus of scientists projected last year that the average global surface temperature will climb somewhere between 1°C and 3.5°C by the year 2100.

In the short term, James E. Hansen of NASA predicts, the globe will set a new temperature record before the end of the century. —*R. Monastersky*

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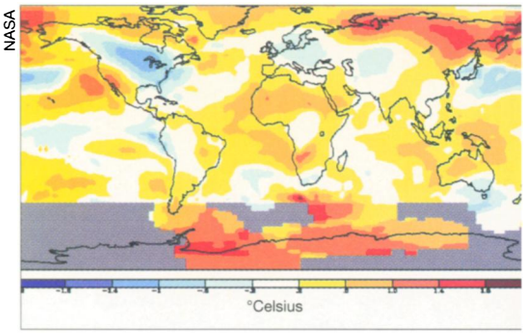

A map of average surface temperatures in 1996 shows cool regions in blue and warm regions in red.

Brain structure sounds off to fear, anger

More than 20 years ago, a small clump of tissue called the amygdala was removed from a woman's brain to control her epileptic seizures. While the surgery succeeded in quelling the electric storms in her head, it also drained her of the ability to perceive signs of fear and anger in others' voices, a new study finds.

Prior clinical reports had suggested that the amygdala orchestrates the recognition of fearful and angry facial expressions (SN: 12/17/94, p. 406). The new study suggests that this almond-shaped structure handles various types of sensory information related to social threats, argue neuropsychologist Andrew W. Young of the Medical Research Council Applied Psychology Unit in Cambridge, England, and his colleagues.

"A plausible hypothesis is that impaired recognition of fear and anger after amygdala damage reflects involvement of the amygdala in the appraisal of danger and the emotion of fear," the scientists report in the Jan. 16 NATURE.

The woman studied by Young's group displayed marked difficulty in understanding vocal intonations used to express emotions, particularly fear and anger. For instance, when listening to a recording of single words with neutral meanings (such as "carpet") spoken with intonations intended to convey any of several emotions, she almost never identified anger or fear. A troublesome number of errors also occurred for happy and sad intonations.

Nonverbal expressions of fear and anger, such as growls and screams, also eluded her comprehension, although she usually recognized sounds that signify happiness, sadness, disgust, and surprise.

The woman had no hearing defects and demonstrated a full understanding of the circumstances under which people experience various emotions, the researchers note.

"I'm not surprised by these new findings," says psychiatrist Leslie A. Brothers of the West Los Angeles Veterans Affairs Medical Center. "I suspect the amygdala is important for interpreting all types of signals people use to communicate what they're thinking, not just those concerned with fear and anger."

Psychologist Lawrence F. Cahill of the University of California, Irvine welcomes Young's report. Unlike Brothers, he views the amygdala primarily as a site for interpreting emotions and rendering emotional events into highly memorable forms.

A related study, published in the Dec. 1, 1996 JOURNAL OF NEUROSCIENCE, indicates that parts of the right hemisphere allow for the recognition of negative emotions independently of the amygdala, at least in adults.

Of 37 people who had suffered cerebral damage, mainly due to strokes, only those whose injuries involved one of two right-brain areas—one that interprets visual input and one that perceives body states—showed difficulty in recognizing fear and anger in faces. None of these people had amygdala damage, note neuropsychologist Ralph Adolphs of the University of Iowa College of Medicine in Iowa City and his coworkers. —*B. Bower*