

# ***95 Is Hottest Year on Record As the Global Trend Resumes***

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The earth's average surface temperature climbed to a record high last year, according to preliminary figures, bolstering scientists' sense that the burning of fossil fuels is warming the climate.

Spells of cold, snow and ice like the ones this winter in the northeastern United States come and go in one region or another, as do periods of unusual warmth. But the net result globally made 1995 the warmest year since records first were kept in 1856, says a provisional report issued by the British Meteorological Office and the University of East Anglia.

The average temperature was 58.72 degrees Fahrenheit, according to the British data, seven-hundredths of a degree higher than the previous record, established in 1990.

The British figures, based on land and sea measurements around the world, are one of two sets of long-term data by which surface temperature trends are being tracked.

The other, maintained by the NASA Goddard Institute for Space Studies in New York, shows the average 1995 temperature at 59.7 degrees, slightly ahead of 1990 as the warmest year since record-keeping began in 1866. But the difference is within the margin of sampling error, and the two years essentially finished neck and neck.

The preliminary Goddard figures differ from the British ones because they are based on a somewhat different combination of observations around the world.

One year does not a trend make, but the British figures show the years 1991 through 1995 to be warmer than any similar five-year period, including the two half-decades of the 1980's, the warmest decade on record.

This is so even though a sun-reflecting haze cast aloft by the 1991 eruption of Mount Pinatubo in the Philippines cooled the earth substantially for about two years. Despite the post-Pinatubo cooling, the Goddard data show the early 1990's to have been nearly as warm as the late 1980's, which Goddard says was the warmest half-decade on record.

Dr. James E. Hansen, the director of the Goddard center, predicted last year that a new global record would be reached before 2000, and yesterday he said he now expected that "we will still get at least a couple more" by then.

#### Editors' Picks

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Dr. Hansen has been one of only a few scientists to maintain steadfastly that a century-long global warming trend is being caused mostly by human influence, a belief he reiterated yesterday.

Other experts would go no further than the recent findings of a United Nations panel of scientists in attributing the continuing and accelerating warming trend to human activity - specifically the emission of heat-trapping gases like carbon dioxide, which is released by the burning of coal, petroleum products and wood.

The United Nations panel concluded, for the first time, that the observed warming is "unlikely to be entirely natural in origin" and that the evidence "suggests a discernible human influence on climate."

Previously, few scientists apart from Dr. Hansen had been willing to go even that far, contending that the relatively small warming so far could easily be a result of natural climate variability. Even now, most experts say it is unclear whether human activity is responsible for a little of the warming or a lot.

"I think we're beginning to see it," Dr. Phil Jones of the Climatic Research Unit at East Anglia said of the human influence on climate, adding that he agreed with the United Nations report.

"I don't think you can say much from one year's values," he said, "but this figure from '91 to '95 is quite illuminating." He said it was nearly half a degree above the 1961-90 benchmark average of 58 degrees.

Both the 1995 record high temperature and the strikingly warm half-decade of the early 1990's are "consistent with the sort of expectation we have of the interplay between natural and manmade influences," said Dr. Tom M. L. Wigley of the National Center for Atmospheric Research in Boulder, Colo.

If things had not turned out that way, he said, "we would have been pretty surprised and maybe a little concerned" about the United Nations panel's conclusion. Nevertheless, he said, "it's not the sort of thing you want to over-interpret or overemphasize."

Dr. Wigley was a member of a subcommittee of the United Nations panel that dealt specifically with the question of detecting a human role in climate change.

The panel predicted that the heat-trapping gas emissions would cause the average global temperature, now approaching 60 degrees Fahrenheit, to rise by a further 1.8 to 6.3 degrees, with a best estimate of 3.6 degrees, by 2100.

By comparison, the world is 5 to 9 degrees warmer now than in the last ice age more than 10,000 years ago. The predicted warming, if it materializes, would likely cause widespread climatic disruption, the United Nations panel said.

The margin of seven-hundredths of a degree by which the 1995 global average exceeds that of 1990, according to the new British data, sounds small. But it represents an increase of nearly half a degree from the post-Pinatubo low, in 1992. As scientists had previously predicted, the recovery from the Pinatubo cooling became obvious last year, though no record was set.

The 1995 figure is all the more remarkable, Dr. Hansen said, because it was established at a time when two natural warming influences were neutralized. The solar energy cycle was at a low ebb, and the warming effect of El Nino, the pool of warm Pacific water that appeared in early 1995, was offset by a turn to cooler-than-normal conditions in the tropical Pacific later in the year.

A different picture emerges from an analysis of satellite measurements of global temperature by Dr. John R. Christy of the University of Alabama and Dr. Roy Spencer of NASA's Marshall Space Flight Center in Huntsville, Ala. While their data show temperature fluctuations roughly paralleling those in the surface measurements, the values are lower: 1995 was only an ordinary year compared with the data set's 1982-91 average.

But that was a warm period to start with, said Dr. Christy. And, Dr. Jones said, the satellite measurements combine temperature readings for the entire lower atmosphere, rather than measuring just at the surface, while the most prominent warming -- over the Northern Hemisphere continents -- does not extend very far upward. That explanation of the difference in the data sets "makes sense," Dr. Christy said, adding, "Of course we only live in the bottom" of the atmosphere.

In the past, skeptics about global warming have cited the satellite data. But Dr. Christy said that even the rate of warming measured from the satellites has begun to move into the range scientists expect to result from human-caused warming.

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