

Temperature For World Rises Sharply In the 1980's

By Philip Shabecoff, Special To the New York Times

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The collage consists of several elements: a newspaper article snippet with a coral photo, a line graph showing a sharp upward trend in temperature anomalies from the 1950s to the late 1980s, and a large advertisement for Computer Era's Macintosh sale. The ad lists various models and prices, such as the Macintosh Plus at \$1569 and the PowerMate 2 at \$1695. It also includes contact information for Computer Era stores in New York and Los Angeles.

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Average global temperatures in the 1980's are the highest measured since reliable records were first kept over 130 years ago, according to reports now coming in from scientists around the world.

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Temperatures have been rising more or less steadily for much of the last century. But, in the view of some scientists, a sharper rise detected in the 1980's is the most persuasive evidence yet that carbon dioxide and other industrial gases are trapping heat in the atmosphere and warming the earth as if it were a greenhouse.

In interviews, meteorologists and others engaged in plotting global climate trends were cautious about blaming the greenhouse effect for the recent sharp increase, saying mathematical models of the phenomenon project much sharper increases than have so far occurred.

But several agreed that if the pattern persisted into the next decade, it would almost certainly mean that an era of global warming, caused by humans and certain to affect them in major ways, has begun.

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How hot is the world now? The scientists do not offer a straightforward response, saying that the vast amount of data is still being studied and that comparisons cannot be precise. But the data gathered by American, British and Soviet scientific teams generally show a faster warming so far in the 1980's than in the century before. And most of the readings agree that the three or four warmest years on record occurred in this decade.

One of the scientists, Dr. James E. Hansen of the National Aeronautics and Space Administration's Institute for Space Studies in Manhattan, said he used the 30-year period 1950-1980, when the average global temperature was 59 degrees Fahrenheit, as a base to determine temperature variations. He said his readings showed that the average global temperature rose about as much since the base period as it did from the 1880's to the base period - about half a degree in both cases. He stressed that these were estimates and that it would take millions of measurements to reach an accurate global average.

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Mathematical models project that at the current rate of buildup of the gases thought to cause the greenhouse effect, the average global temperature will rise from the 59-degree base by 3 to 9 degrees Fahrenheit by about 2030, with increases substantially greater at higher latitudes but lower increases near the Equator.

Dr. Hansen said the temperature was increasing in this decade even as natural factors were keeping surface temperatures lower than they might have been. These

factors, he said, are relatively low radiation from the sun and high volcanic activity, which produces particles that tend to filter out some solar radiation.

As the earth warms, experts predict major changes in climatic patterns and a gradual rise in sea levels as the warming oceans expand and polar ice melts. Coastal flooding, dust bowls, sharply reduced crops, and dying forests could result in some regions. On the other hand, some relatively barren areas might become farmlands.

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Tom Wigley, director of the Climatic Research Unit at the University of East Anglia in Britain, said that his data, taken from stations on the ocean as well as on land, found that 1987 was "the warmest year on record" and that the three warmest years in the record were 1987, 1983 and 1981.

He said in a telephone interview, that while some of his data supported the predictions of the greenhouse models, others did not. For one thing, he said, the temperature levels in the higher latitudes of the Northern Hemisphere did not rise as fast as the models predicted. 'Hard to Deny'

But he said that if "the next 10 years are as warm or warmer, it would be very hard to deny the greenhouse effect," adding, "It is very hard to deny now."

"Chances are the greenhouse effect is not as strong as some people say, but you can't say it isn't happening at all," he said.

Both Dr. Wigley and Dr. Hansen said temperatures taken by Soviet scientists were similar to theirs.

Temperatures in the United States in this century did not rise as fast as global temperatures; several explanations are possible, including a different climate circulation over the country and pollution particles that block solar radiation. Still, measurements by the National Climatic Data Center of the National Oceanic and Atmospheric Administration show that the last few years were substantially warmer than any year since the 1950's in the United States.

Thomas Karl, research meteorologist for the center, said that 1986 and 1987 "were both unusually warm" in this country with an average of 54 degrees Fahrenheit for both years.

"Our data are not inconsistent with the greenhouse effect," Mr. Karl said, but "I am more cautious than others. I found you can get in a heap of trouble if you look at a climate time series and draw an inference. You can get swings that last for 10 or 20 years." Gradual Rise Since 1800's

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Global temperatures had already shown a gradual rise since the late 1800's. The century-long warming trend is still considered a "real mystery," although the

greenhouse effect is probably part of the answer, said Alan Hecht, director of the National Climate Program, a Federal office.

Dr. Hecht noted that the earth was now in the later stages of an interglacial period, meaning the temperatures should be growing cooler as a new ice age approached.

He said the amount of carbon dioxide in the atmosphere had risen from 280 parts per million to 340 parts per million over the last century, probably because of the burning of fossil fuels and the destruction of forests whose trees use carbon dioxide.
A Lag in Temperature Rise

Given that increase of carbon dioxide, global temperatures should have increased by almost 2 degrees Fahrenheit over the century, under the assumptions of most of the models. But in fact they increased only about 1 degree, said Michael E. Schlesinger, associate professor of atmospheric sciences at Oregon State University.

One possible explanation, he said, is that "the models are more sensitive than nature." A more likely explanation, however, is a lag between the emission of greenhouse gases and the greenhouse effect because much of the extra heat is stored in the oceans rather than moving immediately to the atmosphere.

Dr. Schlesinger said testing the greenhouse models required not just taking readings of global temperatures but also plotting their geographical distribution. He said that he and colleagues were doing that now and that the results were so far mixed.

Meanwhile, human activity is sending carbon dioxide and other gases that trap radiation from the sun, including chlorofluorocarbons, methane and nitrous oxides, into the atmosphere at faster rates. If the models are correct, that means that global temperatures will rise sharply. Chlorofluorocarbons are also believed to be destroying the stratospheric ozone that shields the earth's surface from ultraviolet radiation from the sun.

Michael Oppenheimer, an atmospheric physicist with the Environmental Defense Fund, a group based in New York, said, "If the last few years are taken seriously it means the world is now warming very rapidly and, at the beginning of the next century, the climate warming will be the major environmental problem of the globe." A version of this article appears in print on March 29, 1988, Section C, Page 1 of the National edition with the headline: Temperature For World Rises Sharply In the 1980's. [Order Reprints](#) | [Today's Paper](#) | [Subscribe](#)

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