WORLD Climate Report

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A BI-WEEKLY REPORT ON GLOBAL CLIMATE CHANGE

July breaks hot air record!

File this story under "First reported in the new publication *World Climate Report*."

Not one day passed between July 12 and 31 without a major network or print story about the deadly heat wave. Few attempted to link it with global warming or the greenhouse effect because the implication was so obvious that even the greatest of nonbelievers could feel it.

About 36 hours after the end of the month, on the afternoon of August 2, researchers at the National Climatic Data Center in Asheville, North Carolina, plowed all the numbers for the lower 48 states through the computer. Compared to all other years in the last century, July 1995 was exactly 50th in terms of warmth. It doesn't get any more average than that.

June, of course, was cool and wet across much of the nation, meaning that the first two-thirds of summer 1995 were hardly as warm as some may have been tempted to believe.

DOWN AND OUT IN CHI-TOWN

July's heat wave, noteworthy more for its duration than its intensity in most locales in the eastern U.S., was truly deadly in Chicago, where residents expired in unprecedented numbers. The national media documented long lines of hearses and bodies stacked up outside of morgues filled to capacity. According to Cook County Medical Examiner Edmund R. Donoghue, a tremendous number of these deaths were *caused* by the heat wave.

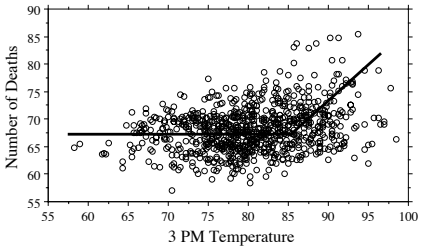

Figure 1. Chicago total daily mortality in summer (June, July, and August) versus 3 p.m. temperature for the period 1964–88. Note that total deaths increase on warm days above the baseline value.

How much was the heat to blame? How unusual was this July's heat wave compared to past events? Can we expect more of the same (or worse!) as global warming sets in? And what roles did air conditioning and the availability of electricity play?

As a given, it was blazingly hot in the upper Midwest. Daily record highs were set from Iowa through Wisconsin. On July 14, Chicago's Midway Airport, surrounded by miles of blacktop, set its all-time record high temperature of 106°F, while the slightly more countrified O'Hare merely tied its record at 104°F.

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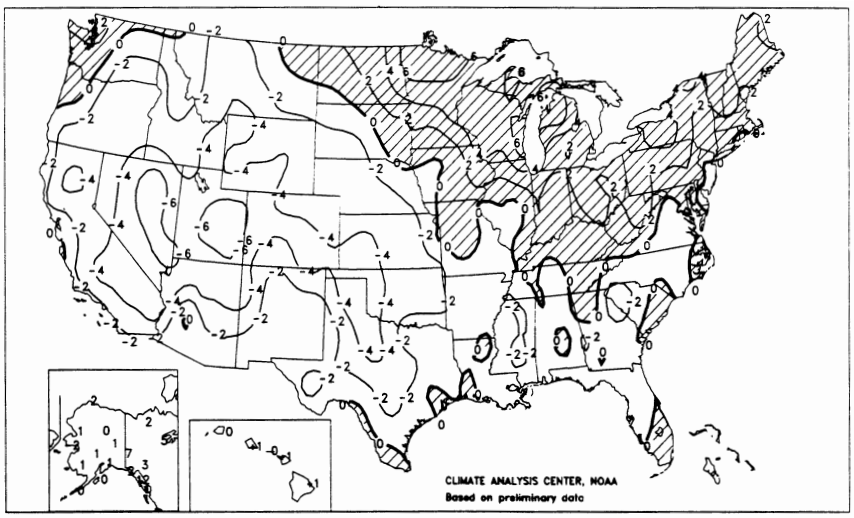
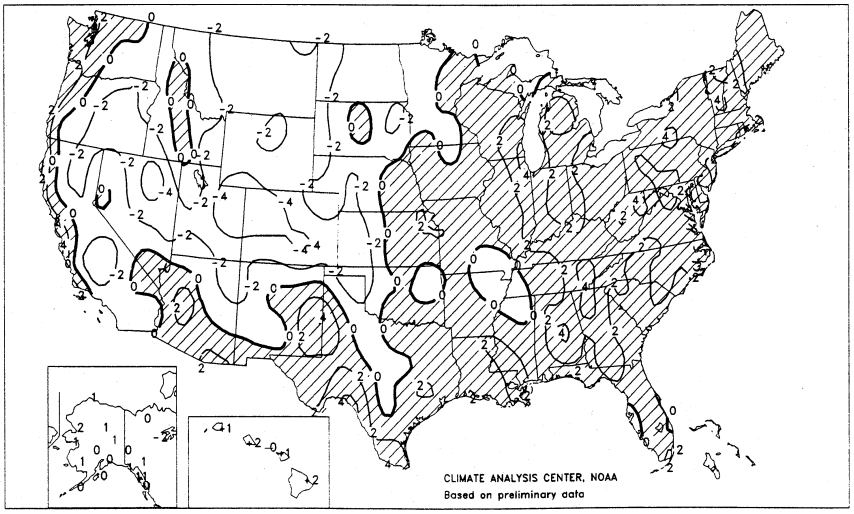


June temperature departures from average (°F) for the contiguous United States.



July temperature departures from average (°F) for the contiguous United States. These were made available about 36 hours after the end of the month, and yet there was no news coverage about how, in spite of all of the reports of heat, it was the "most average" July of the last century, ranking 50th in the last 100 years.

By July 20, Donoghue identified 436 heat-related deaths in Cook County—almost double the average number (240) of heat-related deaths commonly found in the entire United States in a year, and more than occurred in the entire country during the memorable heat wave in the summer of 1988. Of the 436 deaths, Donoghue claimed that heat was the primary cause in 45 cases and a secondary or contributing factor in the other 391. According to his criteria, a death is heat-related if the body core temperature is greater than 105°F or if the body is found in an excessively hot environment.

On July 18, Donoghue stated that "these

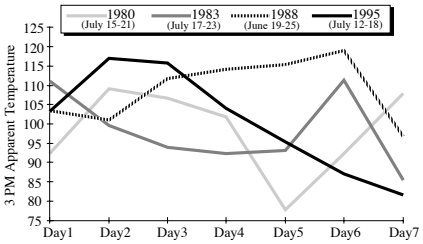


Figure 2. Chicago 3 p.m. apparent temperatures during four major heat waves in the last 15 years (data from O'Hare Airport).

people were probably very near death and their date of death was just moved up by the heat. How long they would have lived, we can't tell you." But two days later, he became convinced that heat played a major role. "All of these people would have survived if not for the heat."

Donoghue's tallies came under scrutiny from Mayor Richard Daley, who claimed that his criteria for saying heat caused the deaths were too liberal. Conversely, Barbara Richardson, coroner of nearby Lake County, told the *Chicago Tribune* that "there's no way you're going to get me to say that definitely these were heat deaths. If it's 20 degrees below zero and someone dies of a heart attack, is that a cold death or a heart attack death?"

So the crucial question is how to define a heat-related death. To try to sort this out, *World Climate Report* interviewed climatology professor Laurence S. Kalkstein of the University of Delaware, a principal investigator of the EPA's Climate and Human Health Program and one of the world's leading experts on weather-related mortality. We asked Kalkstein if he thought these deaths were weather-related. He remarked, "I believe in a broad definition of any death directly or indirectly caused by hot weather. These could be heart attacks, strokes, or respiratory failure." Kalkstein has noticed a general broadening of the definitions beginning with the 1993 heat wave in the Midwest.

In his EPA-funded research, Kalkstein determined that on most days weather is not a factor in deaths. Death rates rise only when a certain temperature threshold is exceeded. This threshold temperature varies from city to city and doesn't even exist in some places, where the residents and their environment are adapted to hot conditions. For example, in Phoenix, a city designed for excessive heat (air conditioning is prevalent, power is inexpensive, and most homes are one-story ranches), there is no increased mortality on even the most extreme days.

To examine historic weather/mortality relationships, we plotted the total number of daily deaths in Chicago from 1964–1988 versus 3 p.m. temperature from June through August (Figure 1). On most days, these variables are unrelated. But at higher temperatures deaths tend to exceed the mean mortality value. According to Kalkstein's method, these "excess" deaths are considered "heat-related." This does not, of course, mean that each person died as a direct consequence of the heat, but it does provide a first estimate of heat's impact on mortality.

Apparent vs. Real Temperature

One commonly-used measure of human discomfort is the *apparent temperature*—how warm a person "feels" based upon the temperature and humidity. As humidity increases, the human body has greater difficulty cooling off by evaporation. Based on 3 p.m. apparent temperatures, we compared other Chicago heat waves since 1980 and selected the four most oppressive events (Figure 2). This year's heat wave was like a hot week in 1983 when afternoon apparent temperatures easily exceeded 100°F.

Total Chicago mortality was similar in all four heat waves over seven-day periods, but in this latest episode, heat-related mortality soared on two days, July 17 and 18.

So what caused this surge in deaths? A closer examination of the daily deaths in 1995 may provide a clue. According to records from the Cook County Medical Examiner's Office (adjusted to Chicago's population), only 14 people died in the city on Saturday, July 15, and only 36 died on Sunday. (The previous record low number of daily deaths in the last 30 years was 46!)

The low numbers are exceedingly suspicious, especially because two days earlier Chicago set a record high temperature! Suddenly, bodies were piling up in the morgues on Monday and Tuesday.

Apparently someone wasn't counting the bodies over the weekend, because we know for certain that the Saturday and Sunday death totals of 14 and 36, respectively, were impossibly low. Even under average conditions, this would leave 106 unfetched corpses by midnight Sunday, or the amount associated with a major plane crash, when temporary morgues are set up to meet demand. It's therefore not surprising that by Monday, there were traffic jams caused by ambulance drivers attempting to get their cargo into the coolers.

The alleged "weather-related" (excess) deaths on Monday and Tuesday were 276, but clearly a very large number (over 100) died over the weekend and weren't reported at that time. In fact (using Kalkstein's threshold temperature method) the number of excess deaths, spread out over the week of the heat wave, is 120. This is higher that the heat-related deaths in the 1983 event by 40, but it is also 316 fewer than the 436 reported to the press.

Given the fact that both 1983 and 1995 were similar from the point of view of apparent temperature, one is left to search for the "differences" that killed 40 more people.

The role of air conditioning is obviously a key component.

TWO EXTREMES—TOO LITTLE POWER

We note that the last weather event so extreme—the remarkably cold morning of January 19, 1994 in the Midwest and mid-Atlantic regions—was also accompanied by rolling brownouts. Is nature trying to tell us something about how marginal our electrical capacity is in the face of real, rather than computer-modeled, emergencies?

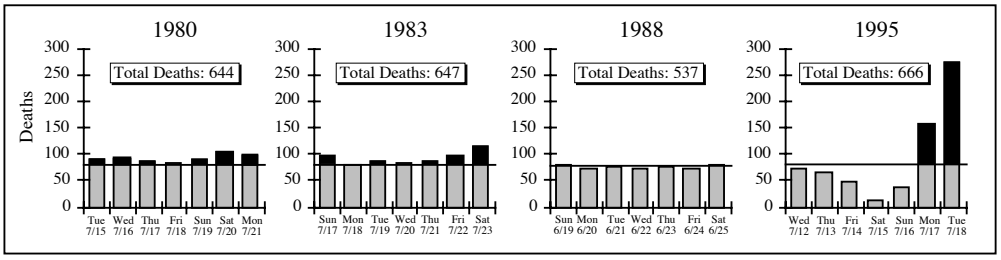


Figure 3. Daily total deaths in the city of Chicago during four recent heat waves. The average number of deaths per day is 78 (horizontal line) and the number of "heat-related" deaths is indicated by the solid bar.

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While Kalkstein has stated that air conditioning is "probably a moderate factor—air conditioning has mitigated heat-related mortality by about 25%," we don't think his observation is accurate in this instance. Most of Chicago's dead were found in homes that were not air conditioned, so heat was listed as a secondary factor on the death certificates.

The heat wave also increased demand for electricity. July 15 marked the third consecutive day of record electrical power consumption for Commonwealth Edison, which had to utilize back-up oil or natural gas-fired units from Northern Illinois to supply additional power. Even so, there was a considerable power outage at the beginning of the heat wave over the North Side, where, owing to economic differences, heat-related mortality is usually less than in the poorer South Side. Had the outage not occurred, there would have been more relative mortality south of the Loop.

In these times of greenhouse-warming passion, we asked Kalkstein the trillion dollar question. His reply, "There is no evidence that this has anything to do with global warming."

But what of the future? Kalkstein has done EPA-funded research on future mortality based on warming scenarios developed from General Circulation Models (GCMs). Under the assumption that the models are correct (a rather dangerous assumption, as many of our readers are well aware), "heat-related mortality will increase significantly." Should we then build more power plants to prepare for future demands, we asked Kalkstein? "I have no opinion on more power plants. Of course, we need more air conditioning."

So did the Cook County coroner fall victim to political winds beyond the heat wave? Dr. Ross Zumwalt, Albuquerque's medical examiner and vice president of the National Association of Medical Examiners, expressed skepticism over the Chicago tallies, and noted that his colleagues face increasing pressure to be aware of environmental hazards like pollution and heat, "drawn into it by concerns of the public, communities, and the press."

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Kalkstein, L.S. and R.E. Davis (1989) Weather and human mortality: An evaluation of demographic and interregional responses in the United States. *Ann. Assoc. Amer. Geogr.*, 79, 44-64.

Steadman, R. G. (1979) The assessment of sultriness. Part I: a temperature-humidity index based on human physiology and clothing science. *J. Appl. Meteor.*, 18, 861-873.

Chicago Tribune, July 14 - July 22, 1995

ACKNOWLEDGEMENTS

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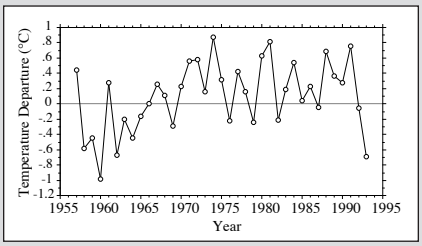
ANTARCTIC WARMING: NEW OLD NEWS

"In recent months, an iceberg nearly as large as Rhode Island broke off an Antarctic ice shelf, apparently because of rising temperatures there..." R. Monatsersky, *Science News*, June 10, 1995.

This speculation will no doubt be bolstered by a report in the *Geophysical Research Letters*. British researcher Phil Jones demonstrates that there's been a statistically significant warming of Antarctica since widespread records began in 1957. However, he goes on to state that "all of this warming occurred before the early 1970s."

Indeed. We ran trend analyses of his data *backwards*, beginning in 1993. Is there a statistically significant warming trend, say, between 1970 and 1993? No. How about 1965-93? No. In fact, only data that begins prior to 1961 induces the trend that Jones describes. Inasmuch as the record begins in 1957, this means almost all of the warming occurred over 30 years ago.



Temperature readings averaged over Antarctica between 1957 and the end of 1993. All of the warming ended, statistically speaking, three decades ago.

It's also interesting that this paper talks about warming trends at certain stations, but then states that "few of the trends are significant." This means that they cannot be mathematically distinguished from a flat line with no trend. So why say that there's any warming in these records? Under general scientific guidelines, there is none.

Note that our analysis of the overall record does not include the very cold year of 1994. That's because most of the data was available only from ocean stations surrounding Antarctica, rather than from stations on the continent. One is left, though, to speculate how to associate the calving of a Rhode Island-sized berg with warming, when it occurred following two of the coldest years in the entire record?

Of additional note: Over a decade ago, a 'berg broke off that was described as "Delaware sized."

Jones. P.D., 1995. Recent variations in mean temperature and the diurnal temperature range in the Antarctic. *Geophysical Research Letters* 20, 1345-1348.

R I O R U M O R S

An irregular feature describing actions pertaining to the Framework Convention on Climate Change, signed at the Rio Earth Summit in 1992.

THE CLINTON/GORE CLIMATE PLAN FAILS....WHAT'S NEXT?

In October 1993, President Clinton announced a voluntary program that would bring the U.S. into compliance with the goal of the Rio Treaty, which is to reduce net carbon dioxide emissions to 1990 levels by the year 2000.

Critics scoffed and were called cynics. Eight months later, the Natural Resources Defense Council said that we were exceeding our emission goals because the price of oil was too low and there was too much economic growth.

Even so, U.S. negotiators agreed last April in Berlin to commit the nation to a course of mandatory emission reductions beyond the 1990 level which will be announced over the next 18 months.

By 1994, net carbon emissions from the U.S. reached an annual level of 1,400 million metric tons (mmt), or a 4.1% increase over the 1990 base. As Skip Laitner of the Northern Virginia-based Economic Research Associates told this *Report* about the Clinton/Gore plan, "It's not going to be done."

In fact, Laitner told us, the actual rise in net carbon emissions is closer to 5% because the original administration calculations of the 1990 base were a little too high. As noted by Laitner's group, "the jump in carbon emissions largely results from a 9.1% increase in economic activity since 1990."

THE BIG RUMOR

Washington policy wonks, both elephantine and asinine, all agree that the flat income tax is going to be a big issue in the 1996 campaign. Will the administration respond by keeping the graduated tax, but proposing a lower median tax rate than the Republicans, while making up the revenue shortfall with a tax on energy or carbon? How else to comply with the Rio Treaty, which has force of law?

Easy to sell, too: revenue neutral, progressive, and it helps us all live better and more ecologically sound lives! And the more efficient we are, the less tax we pay!!

EARTH track

TEMPERATURE UPDATE

World Climate Report will continually provide monthly updates of Northern and Southern Hemisphere temperatures. We compare them to what was forecast to have occurred by now according to the most sophisticated computer models used in the last (1992) United Nations update on climate change.

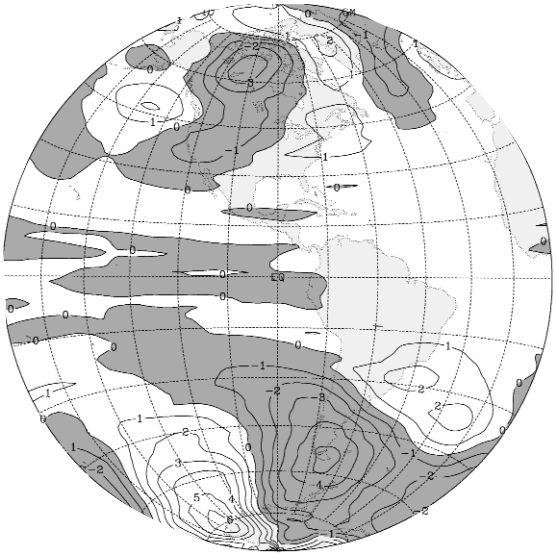
We think it's important to use those predictions as a background because, frankly, if no warming were predicted to have occurred, in all likelihood global warming wouldn't have become an issue. This lets you see how well the forecasts that stand behind the Rio Treaty on global warming are doing. Over the next few months we'll elaborate on this comparison.

The observed temperatures we show are hemispheric averages measured by a series of satellites that sense the mean temperature of the lowest layers of the atmosphere with an accuracy of 0.01°C. Coverage is much greater than that for ground-based weather records, which are especially scarce over the oceans and in cold or rough terrain. The record starts in January 1979, and is now in its 17th year.

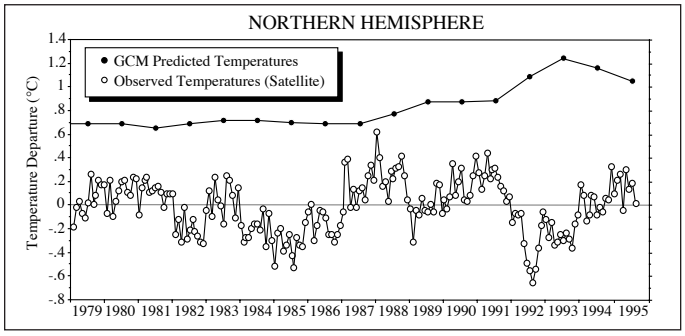
Note: Your eyes do not deceive you. There is no warming trend in the satellite-based data.

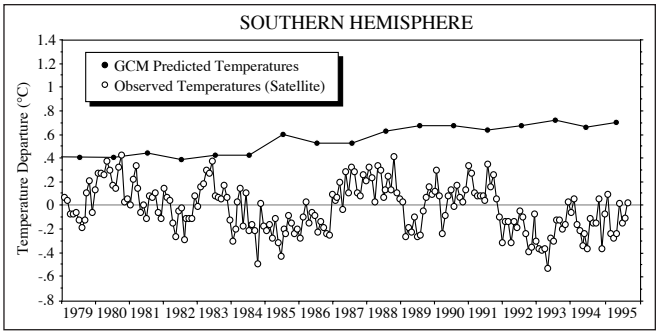
July 1995: Global temperatures averaged 0.01°C above the satellite mean. (Readings are referenced to a long-term average of 0.00.) The Northern Hemisphere anomaly (rounded) was +0.02°C, while the Southern Hemisphere was +0.01°C. Statistically speaking, these numbers are no different than zero, and represent a slight (.04°C) decline from June departures from normal. Given current concentrations of greenhouse gases, the computer models used to base the Rio Treaty say the temperature anomalies should be +1.05°C and +0.70°C, respectively.

The most remarkable aspect of July temperatures is how small the band of above-normal Northern Hemisphere temperatures was, stretching from Japan, through Russia, on to Europe, and then widening out to eastern North America. Because these are the news capitals of the planet, the warm readings were evidence of "global warming." In fact, much of the planet was below average, especially in the Southern Hemisphere.



Northern Hemisphere satellite (open circles) and predicted temperatures (closed circles) by the model that based the United Nations' treaty on Climate Change.





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