Surface Temperature Records: Policy Driven Deception?

by Joseph D'Aleo and Anthony Watts

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SURFACE TEMPERATURE RECORDS: POLICY DRIVEN DECEPTION?

by Joseph D'Aleo & Anthony Watts | January 27, 2010

SUMMARY FOR POLICYMAKERS

1. Instrumental temperature data for the pre-satellite era (1850-1980) have been so widely, systematically, and unidirectionally tampered with that it cannot be credibly asserted there has been any significant "global warming" in the 20th century.
2. All terrestrial surface-temperature databases exhibit very serious problems that render them useless for determining accurate long-term temperature trends.
3. All of the problems have skewed the data so as greatly to overstate observed warming both regionally and globally.
4. Global terrestrial temperature data are gravely compromised because more than three-quarters of the 6,000 stations that once existed are no longer reporting.
5. There has been a severe bias towards removing higher-altitude, higher-latitude, and rural stations, leading to a further serious overstatement of warming.
6. Contamination by urbanization, changes in land use, improper siting, and inadequately-calibrated instrument upgrades further overstates warming.
7. Numerous peer-reviewed papers in recent years have shown the overstatement of observed longer term warming is 30-50% from heat-island contamination alone.
8. Cherry-picking of observing sites combined with interpolation to vacant data grids may make heat-island bias greater than 50% of 20th-century warming.
9. In the oceans, data are missing and uncertainties are substantial. Comprehensive coverage has only been available since 2003, and shows no warming.
10. Satellite temperature monitoring has provided an alternative to terrestrial stations in compiling the global lower-troposphere temperature record. Their findings are increasingly diverging from the station-based constructions in a manner consistent with evidence of a warm bias in the surface temperature record.
11. NOAA and NASA, along with CRU, were the driving forces behind the systematic hyping of 20th-century "global warming".
12. Changes have been made to alter the historical record to mask cyclical changes that could be readily explained by natural factors like multidecadal ocean and solar changes.
13. Global terrestrial data bases are seriously flawed and can no longer be trusted to assess climate trends or VALIDATE model forecasts.
14. An inclusive external assessment is essential of the surface temperature record of CRU, GISS and NCDC "chaired and paneled by mutually agreed to climate scientists who do not have a vested interest in the outcome of the evaluations."
15. Reliance on the global data by both the UNIPCC and the US GCRP/CCSP also requires a full investigation and audit.

A QUESTION OF GLOBAL TEMPERATURE

Recent revelations from the Climategate emails, originating from the Climatic Research Unit at the University of East Anglia showed how all the data centers, most notably NOAA and NASA, conspired in the manipulation of global temperature records to suggest that temperatures in the 20th century rose faster than, in reality, they actually did.

This has inspired climate researchers worldwide to take a hard look at the data proffered by comparing it to the original data and to other data sources. This report compiles some of the initial alarming findings.

There has clearly been some cyclical warming in recent decades, most notably 1979 to 1998. However, the global surface-station data is seriously compromised. First, there is a major station dropout and increase in missing data in stations that remained which occurred suddenly around 1990; about the time the global warming issue was being elevated to importance in political and environmental circles. A clear bias was found towards removing cooler higher elevation, higher latitude, and rural stations during this culling process though leaving their data in the base periods from which 'averages' and anomalies are computed.

The data also suffers contamination by urbanization and other local factors such as land-use/land-cover changes and improper siting. There are uncertainties in ocean temperatures; no small issue, as oceans cover 71% of the earth's surface.

These factors all lead to significant uncertainty and a tendency for overestimation of century-scale temperature trends. A conclusion from all findings suggest that global data bases are seriously flawed and can no longer be trusted to assess climate trends or rankings or validate model forecasts. And, consequently, such surface data should be ignored for decision making.

THE GLOBAL DATA CENTERS

Five organizations publish global temperature data. Two – Remote Sensing Systems (RSS) and the University of Alabama at Huntsville (UAH) – are satellite datasets. The three terrestrial institutions – NOAA's National Climatic Data Center (NCDC), NASA's Goddard Institute for Space Studies (GISS), and the University of East Anglia's Climatic Research Unit (CRU) – all depend on data supplied by ground stations via NOAA.

Around 1990, NOAA began weeding out more than three-quarters of the climate measuring stations around the world. They may have been working under the auspices of the World Meteorological Organization (WMO). It can be shown that they systematically and purposefully, country by country, removed higher-latitude, higher-altitude and rural locations, all of which had a tendency to be cooler.

The thermometers were marched towards the tropics, the sea, and airports near bigger cities. These data were then used to determine the global average temperature and to

initialize climate models. Interestingly, the very same stations that have been deleted from the world climate network were retained for computing the average-temperature base periods, further increasing the bias towards overstatement of warming by NOAA.

Around 1990, NOAA began weeding out more than three-quarters of the climate measuring stations around the world. They may have been working under the auspices of the World Meteorological Organization (WMO). It can be shown that they systematically and purposefully, country by country, removed higher-latitude, higher-altitude and rural locations, all of which had a tendency to be cooler.

The world's surface observing network had reached its golden era in the 1960s-1980s, with more than 6000 stations providing valuable climate information. Now, there are fewer than 1500.

Calculating the average temperatures this way would ensure that the mean global surface temperature for each month and year would show a false-positive temperature anomaly – a bogus warming. This method would also ensure that the trend in the temperature change would be enhanced beyond the natural 60-year climate cycles.

The data centers performed some final adjustments to the gathered data before final analysis. These adjustments were often frequent and yet poorly documented. There is even some disagreement about what the surface air temperature really is (see "The Elusive Absolute Surface Air Temperature (SAT)" by Dr. James Hansen here[1].

For the present evaluation, the data was downloaded in its entirety from NOAA's GHCN data servers. It also includes all the descriptor documentation by E.M. Smith, a software engineer who analyzed the data and provided it for review by meteorologists, climatologists, and statisticians.

Every month the world data centers release monthly data with their assessment of the historic ranking of the previous month. NOAA/NCDC, NASA/GISS, and Hadley/CRU, compilers of the three terrestrial global-temperature datasets, announced that December 2009 ranked among the warmest Decembers since 1850. This seemed incongruous in many countries that had suffered a third winter of brutal cold and snow that month.

[1] http://data.giss.nasa.gov/gistemp/abs_temp.html.

The three institutions also announced that 2009 was one of the warmest years on record. (NOAA 5th warmest, NASA tied for 2nd warmest). They do this almost every year now. Many in North America found this hard to believe, given the very cold winter, spring and past summer. October 2009 was the third coldest in 115 years of record-keeping. December 2009 was also very cold, the 14th coldest. The terrestrial institutions also solemnly announced that the 2000s was the warmest decade in the historical record. Some have ignored the inconvenient truths contained within CRU's Climategate emails, and have pronounced that the 2000s was the warmest decade in a millennium or two.

Calculating the average temperatures this way would ensure that the mean global surface temperature for each month and year would show a false-positive temperature anomaly – a bogus warming.

The two satellite data centers – RSS and UAH – have also released their assessments of monthly global temperature. For reasons we will discuss, their results will be less remarkable. This has been the trend in recent years. For instance, NOAA announced that June 2009 was the second warmest June[2] in 130 years, falling just short of 2005. In sharp contrast to this, GISS and the UAH satellite assessments had June virtually at the long-term average (+0.001 C°, or 15th coldest in 31 years) and RSS +0.075 C°, the 14th coldest in 31 years.

This divergence is not new and has been growing. NOAA proclaimed June 2008 to be the eighth-warmest for the globe in 129 years. Meanwhile NASA showed it was the 9th-coldest June in the 30 years of its record.

Some still claim the satellite-measured temperatures are in error. RSS and UAH in 2005 jointly agreed[3] that there was a small net cold bias of 0.03 C° in their satellite-measured temperatures, and corrected the data for this small bias. In contrast, the traditional surface station data have been found to suffer from many warm biases that are orders of magnitude greater in size than the satellite data, yet that fact is ignored.

Some argue that satellites measure the lower atmosphere, not the surface; and the fact that satellites show less warming may be real, but is irrelevant (CCSP[4]). Trying to make a big issue of this point is disingenuous.

When the satellites were first launched, their temperature readings were in relatively good agreement with the surface station data. There has been increasing divergence over time, but the divergence does not arise from satellite errors.

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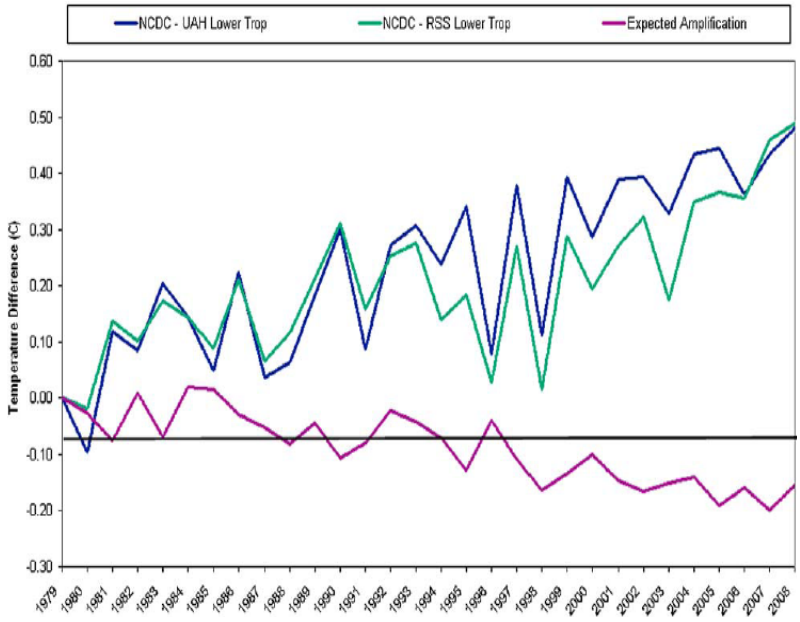
2 http://www.ncdc.noaa.gov/sotc/index.php?report=global&year=2009&month=jun#temp.

3 http://www.marshall.org/article.php?id=312.

4 http://www.climatescience.gov/Library/sap/sap1-1/finalreport/.

Klotzbach[5] *et al.* (2009) find that the divergence between surface and lower-tropospheric measurements, which has probably continued, is consistent with evidence of a warm bias in the surface temperature record.

NCDC Minus UAH (Blue) and RSS (Green) Land Temperature Differences, 1979-2008



NCDC (terrestrial) minus ***UAH (satellite: blue)*** *and minus* ***RSS (satellite: green)*** *lower-troposphere annual land temperature differences, 1979-2008. The* ***expected difference (purple)*** *given the model amplification lapse-rate factor of 1.2 is also shown. All differences are zeroed to 1979.*

In this paper we will explain why all press releases from NOAA's NCDC, NASA's GISS, and Hadley/CRU should henceforth be ignored. The terrestrial datasets have become seriously flawed and can no longer be trusted for climate trend assessment.

Michael Mann in a Climategate email to Phil Jones of CRU and Gavin Schmidt of NASA wrote: "As we all know, this isn't about truth at all, it's about plausibly deniable accusations." But Albert Einstein said: "Anyone who doesn't take truth seriously in small matters cannot be trusted in large ones either."

In this paper we will explain why all press releases from NOAA's NCDC, NASA's GISS, and Hadley/ CRU should henceforth be ignored. The terrestrial datasets have become seriously flawed and can no longer be trusted for climate trend assessment.

[5] http://pielkeclimatesci.files.wordpress.com/2009/11/r-345.pdf.

THE GOLDEN AGE OF SURFACE OBSERVATION

In this era of ever-improving technology and data systems, one would assume that measurements would be constantly improving. This is not the case with the global station observing network. The Golden Age of Observing was several decades ago. It is gone.

NOAA's NCDC, in Asheville, NC, is the source of the Global Historical Climate Network (GHCN) and of the US Historical Climate Network (USHCN).

These two datasets are relied upon by NASA's GISS in New York City and by Hadley/CRU in England.

Since all three use the same data, all three have experienced the same degradation in data quality in recent years.

In the following email, CRU's Director at the time, Phil Jones, acknowledges that CRU mirrors the NOAA data:

> "Almost all the data we have in the CRU archive is exactly the same as in the GHCN archive used by the NOAA National Climatic Data Center."

And NASA's GISS uses the GHCN, applying its own adjustments, as it explains:

> "The current analysis uses surface air temperatures measurements from the following datasets: the unadjusted data of the Global Historical Climatology Network (Peterson and Vose, 1997 and 1998), United States Historical Climatology Network (USHCN) data, and SCAR (Scientific Committee on Antarctic Research) data from Antarctic stations."

Roger Pielke Sr. in this post[6] on the three data sets notes:

> "The differences between the three global surface temperatures that occur are a result of the analysis methodology as used by each of the three groups. They are not "completely independent". Each of the three surface temperature analysis suffer from unresolved uncertainties and biases as we documented, for example, in our peer reviewed paper[7]"

Dr. Richard Anthes, President of the University Corporation for Atmospheric Research, in testimony to Congress[8] in March 2009, noted:

> "The present federal agency paradigm with respect to NASA and NOAA is obsolete and nearly dysfunctional, in spite of best efforts by both agencies."

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6 http://pielkeclimatesci.wordpress.com/2009/11/25/an-erroneous-statement-made-by-phil-jones-to-the-media-on-the-independence-of-the-global-surface-temperature-trend-analyses-of-cru-giss-and-ncdc/.

7 http://pielkeclimatesci.files.wordpress.com/2009/10/r-321.pdf.

8 http://www.ucar.edu/oga/pdf/Anthes%20CJS%20testimony%203-19-09.pdf.

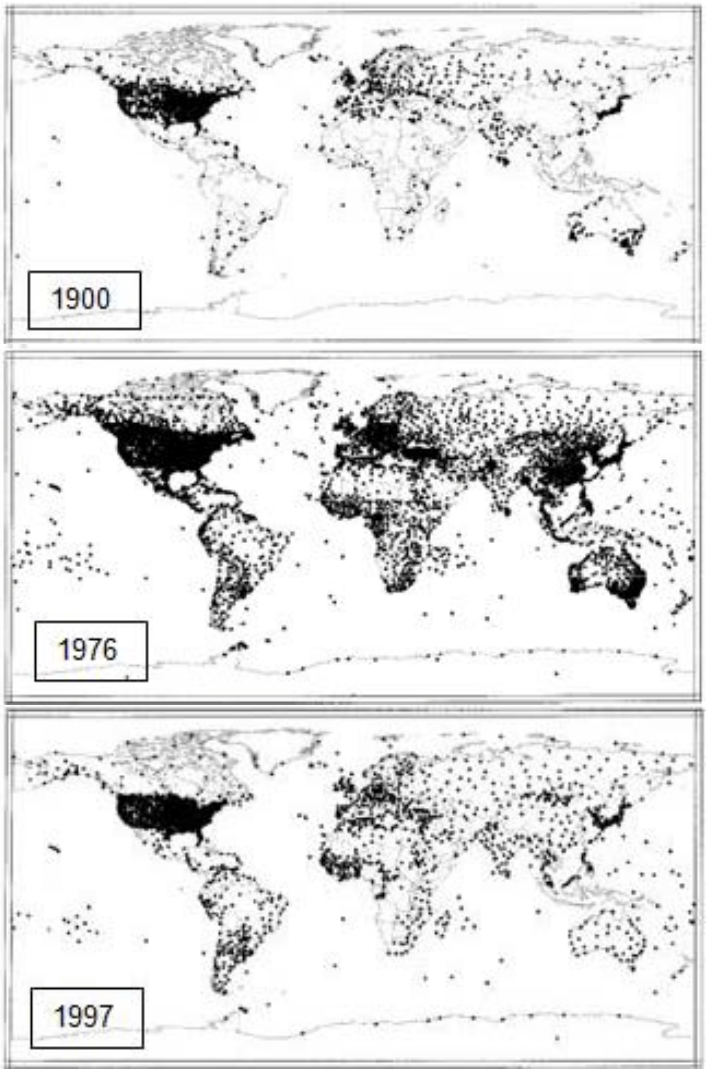
VANISHING STATIONS

Perhaps one of the biggest issues with the global data is the disappearance of temperature monitoring stations from the networks after 1990. More than 6000 stations were in the NOAA data base for the mid- 1970s, but just 1500 or less are used today. NOAA is said to be adding additional US stations now that USHCN v2 is available, which will inflate this number, but make it disproportionately U.S.

The stations that dropped out were mainly rural, at higher latitudes and altitudes. This tended to make them cooler stations, introducing a warming bias and making any accurate assessment of warming impossible.

There was a major disappearance of recording stations in the late 1980s to the early 1990s. The following figure compares the number of global stations in 1900, the 1970s and 1997, showing the increase and then decrease (Peterson and Vose[9]).

Perhaps one of the biggest issues with the global data is the disappearance of temperature monitoring stations from the networks after 1990. More than 6000 stations were active in the mid-1970s. 1500 or less are in use today.

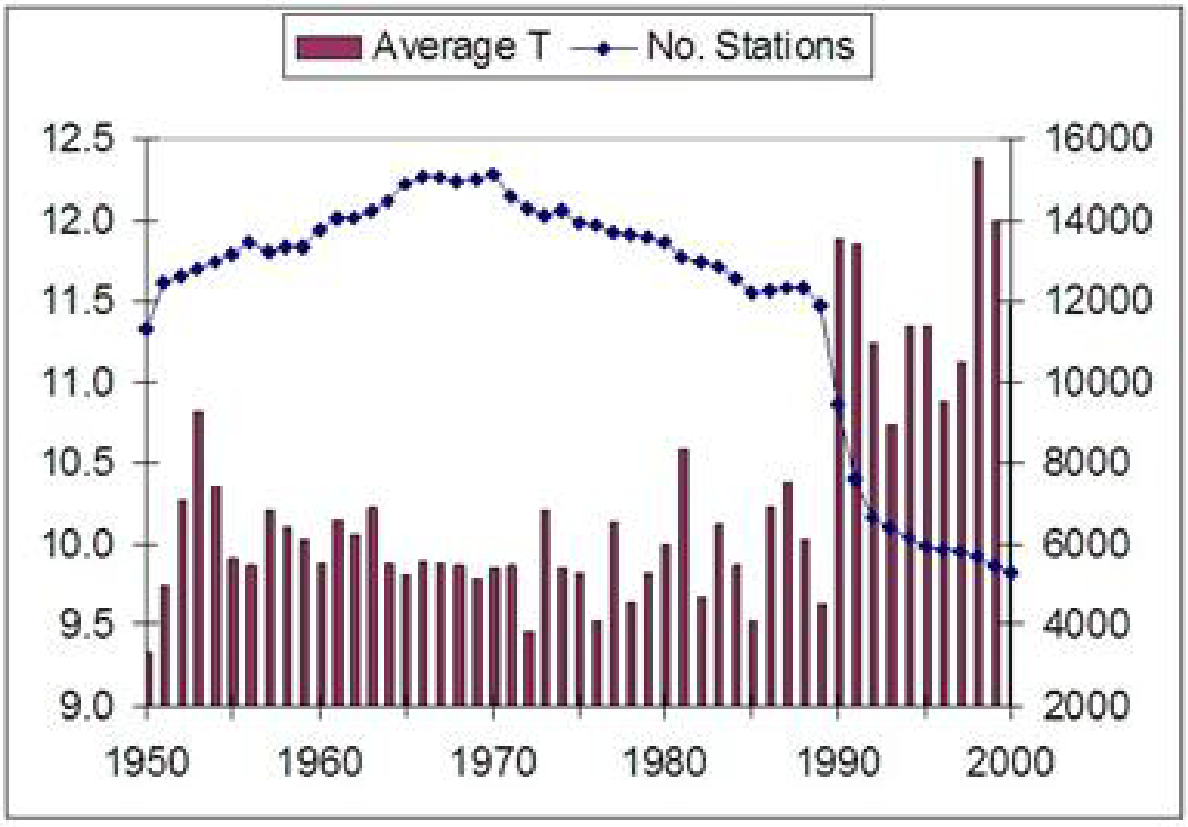


[9] http://www.ncdc.noaa.gov/oa/climate/ghcn-monthly/images/ghcn_temp_overview.pdf.

Dr. Kenji Matsuura and Dr. Cort J. Willmott at the University of Delaware have prepared this animation[10]. See the lights go out in 1990, especially in Asia .

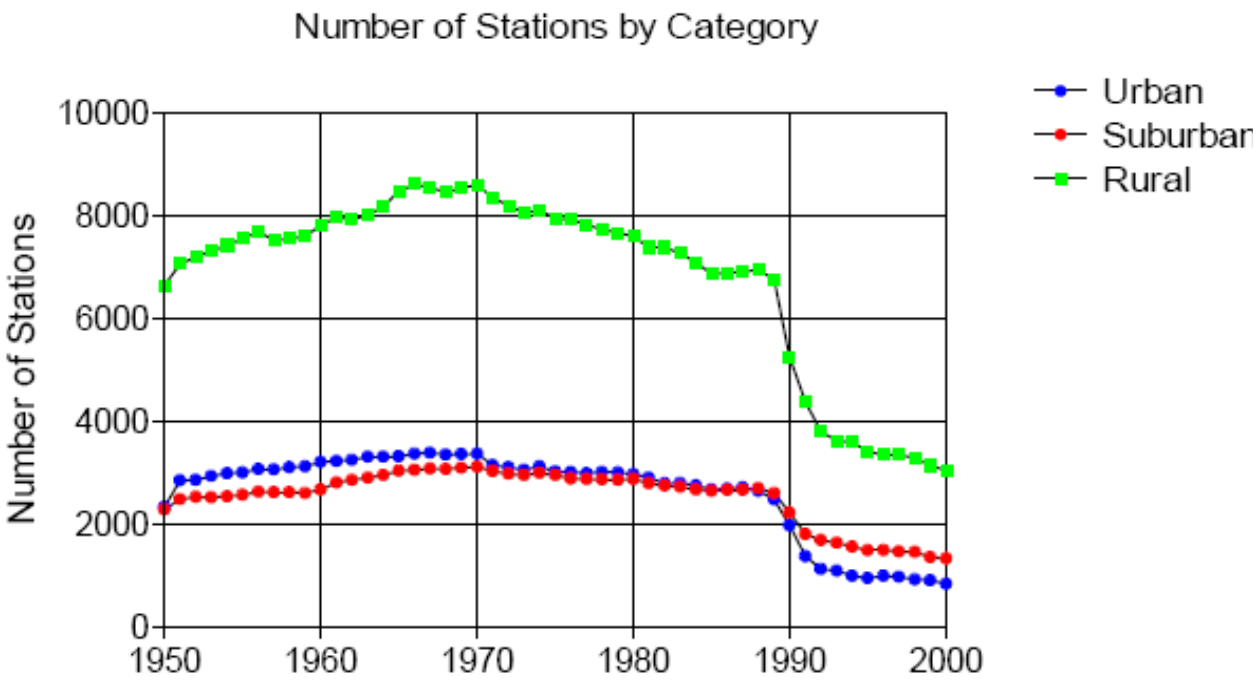
The following chart[11] of all GHCN stations and the average annual temperature show the drop focused around 1990. In this plot, those stations with multiple locations over time are given separate numbers, which inflates the total number. While a straight average is not meaningful for global temperature calculation (since areas with more stations would have higher weighting), it illustrates that the disappearance of so many stations may have introduced an upward temperature bias.

As can be seen in the figure, the straight average of all global stations does not fluctuate much until 1990, at which point the average temperature jumps up. This observational bias can influence the calculation of area-weighted averages to some extent. A study by Willmott, Robeson and Feddema ("Influence of Spatially Variable Instrument Networks on Climatic Averages, *Geophysical Research Letters* vol. 18 No. 12, pp2249-2251, Dec. 1991) calculated a +0.2C bias in the global average owing to pre-1990 station closures.



The number of stations that dropped out tended to be disproportionally rural –

[10] http://climate.geog.udel.edu/~climate/html_pages/Ghcn2_images/air_loc.mpg.
[11] http://www.uoguelph.ca/~rmckitri/research/nvst.html.



(Station count represent every station reported by GHCN - analyses above from Jonathan Drake.)

Global databases all compile data into latitude/longitude-based grid squares and calculate temperatures inside the squares using data from the stations within them or use the closest stations (weighted by distance) in nearby boxes.

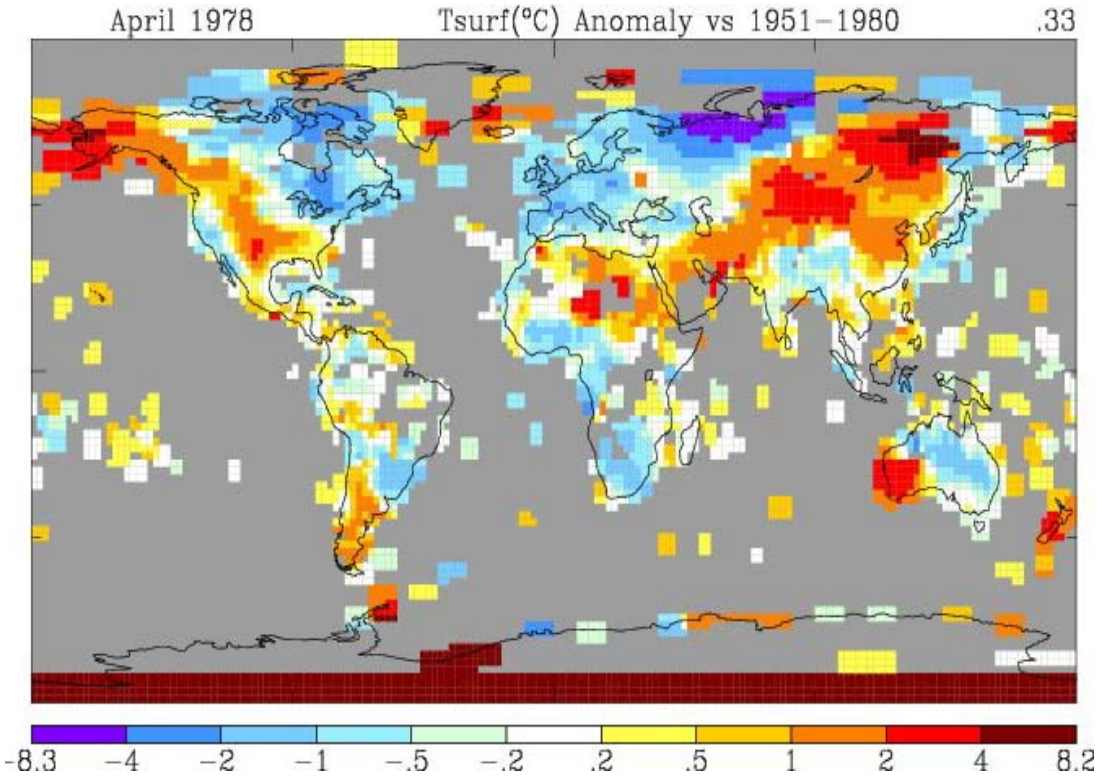
This exhaustive study[12] by E.M. Smith has documented that (indeed) the station changes were increasingly biased towards lower latitudes, lower elevations and urban locations.

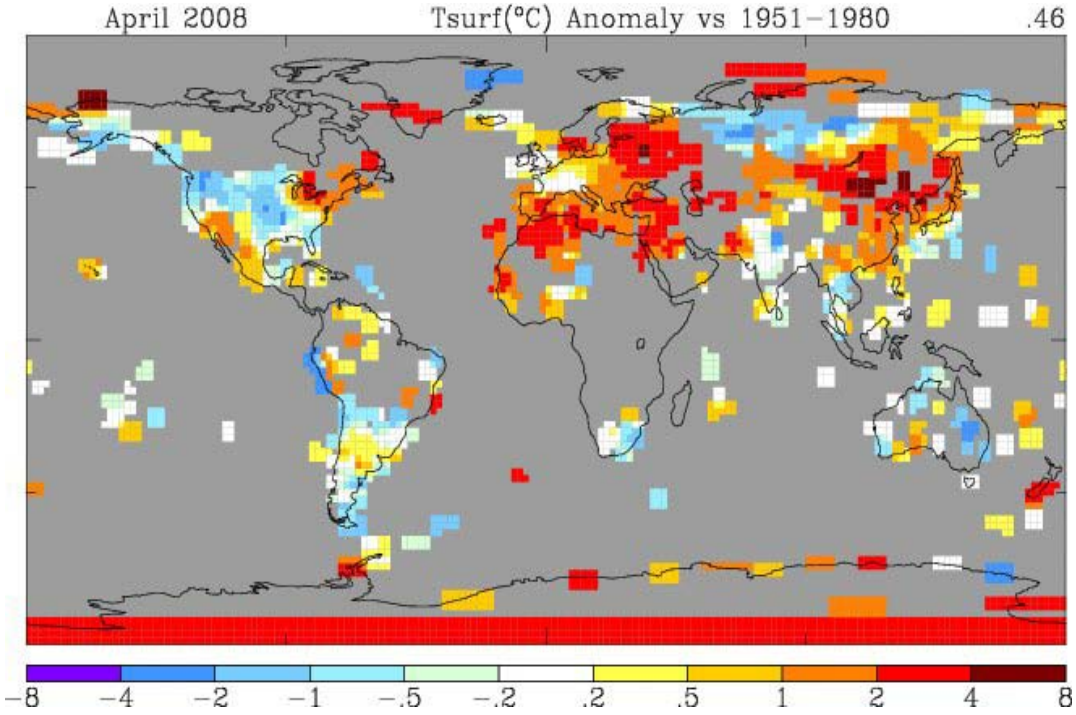
As a result, a grid square which at one time had rural or higher elevation and higher latitude stations will now find its mean temperature increasingly determined by the warmer urban, lower-elevation or lower-latitude stations within that square or distant squares. Curiously, the original colder data was preserved for calculating the base period averages, forcing the current readings to appear anomalously warm.

This is why global data suggests that the greatest warming has occurred in Siberia and Canada, where the greatest dropout in stations has occurred.

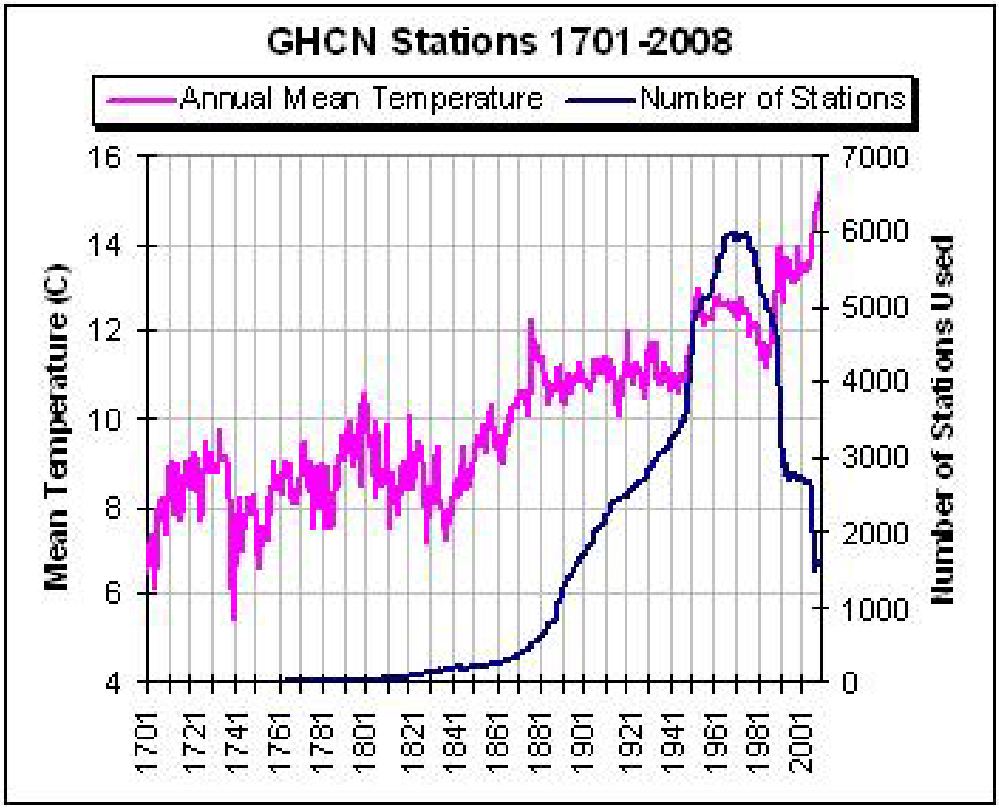
See the huge dropout of data in Africa, Canada and Siberia in the two maps from NASA GISS with 250 km smoothing from 1978 to 2008 –

[12] http://chiefio.wordpress.com/2009/11/03/ghcn-the-global-analysis/.





E.M. Smith's compiled data also confirmed the big dropout globally around 1990 and the accompanying discontinuity in the mean temperature of the remaining data sets. This suggests again at least part of the recent warming is due to the distribution changes of the stations.



SEE FOR YOURSELF

Look for yourself following these directions using the window into the NOAA, GHCN data provided by NASA GISS here[13].

Point to any location on the world map (say, central Canada). You will see a list of stations and approximate populations. Locations with less than 10,000 people are assumed to be rural (even though Oke has shown that a town of 1,000 can have an urban warming bias of 2.2C).

You will see that the stations have a highly variable range of years with data. Try to find a few stations where the data extends to 2009. If you find some, you may see gaps in the graphs. To see how incomplete the dataset is for that station, click in the bottom left of the graph *Download monthly data as text*.

For many, many stations you will see the dataset in a monthly tabular form has many missing data months mostly after 1990 (designated by 999.9).

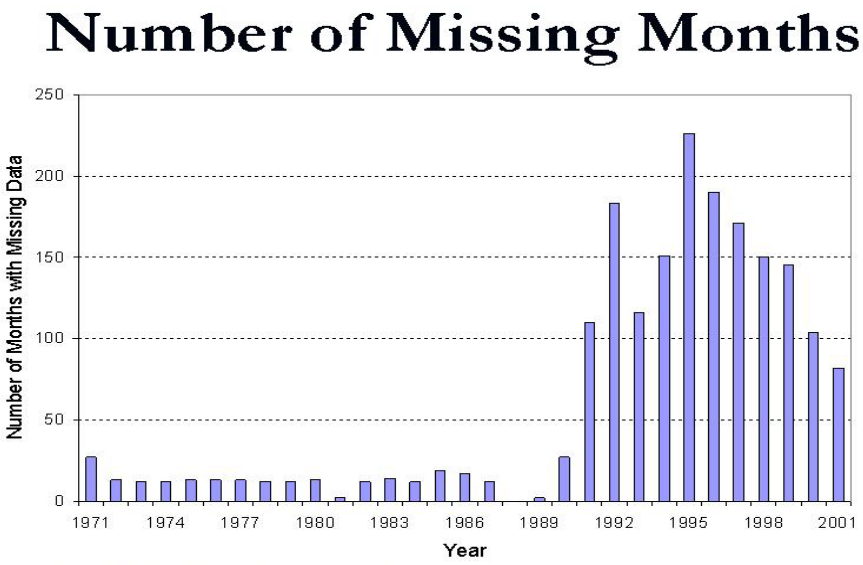
The following is an illustration of this –

[13] http://data.giss.nasa.gov/gistemp/station_data/.

SVERDLOVSK, RUSSIA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1987	-18.6	-8.3	-5.5	0.9	14.9	20	19.3	16.2	8.6	2.1	-11.2	-11.5
1988	-12.7	-9.6	-2.6	4.8	10.3	19.5	22.6	18.3	9.7	3.9	-7	-9.9
1989	-15.1	-9.6	-0.3	1.5	11.9	21.4	22.8	14.2	10.2	2.8	-4.2	-10.2
1990	-14.2	-6.8	0.1	5.3	9.6	999.9	19	16.4	999.9	1.2	-5	-8.3
1991	999.9	-12.6	-7.1	9.2	15.5	999.9	17.6	13.6	10.6	7.2	-3.6	-13.6
1992	-12	-9.2	-4.1	1.8	10.1	14	16.3	13.8	10.9	2.1	-5.3	999.9
1993	-8.9	-11.8	-6	3.2	10.8	17.9	18.6	16.5	5.8	2.4	-13.2	-9.9
1994	-10.2	-17.2	999.9	999.9	11.4	999.9	999.9	14.9	11	6.6	-7	-14
1995	-10.2	-4.2	-0.6	10.7	13	17	999.9	16.9	999.9	3.9	-3.7	-12.7
1996	-14.1	-11.2	-3.9	0.6	12.2	19.1	19.2	999.9	7.1	1.9	-2.3	-10.2
1997	-18.4	-9.4	-2.1	6.2	12	16.7	15.9	14	11.2	5.9	-7.3	-14.7
1998	-11	-14.8	-3.3	-1.4	11.8	18.5	21.6	17.6	8.3	3.5	-12.7	-7.1
1999	-12.6	-7.8	-8.6	4.8	9	15.1	20.2	15.6	9.3	7	-10.4	-6.4
2000	-12.9	-6.9	-1.7	7.2	8.3	19.1	20.5	999.9	8.9	2.3	-6.5	-12.2
2001	-12.1	-14.9	-3.4	6.8	13	14.6	17.9	999.9	10.7	0.6	-4.6	-12.3
2002	-9.2	-4.2	-1	3	9.3	14	19	13.1	11.1	2.1	-3.7	-18.5

These facts suggest that the golden age of observations was in the 1950s to 1980s. Data sites before then were more scattered and did not take data at standardized times of day. After the 1980s the network suffered from loss of stations and missing monthly data. To fill in these large holes, data was extrapolated from greater distances away.



For the 110 Russian weather stations reporting weather data continuously from 1971 to 2001, the total number of missing monthly observations each year (McKitrick and Michaels)

STATION DROPOUT WAS NOT RANDOM

RUSSIA

The Ria Novosti agency reported that the Moscow-based Institute of Economic Analysis (IEA) issued a report[14] claiming that the Hadley Center for Climate Change had probably tampered with Russian climate data:

> "The IEA believes that Russian meteorological station data did not substantiate the anthropogenic global-warming theory. Analysts say Russian meteorological stations cover most of the country's territory and that the Hadley Center had used data submitted by only 25% of such stations in its reports. The Russian station count dropped from 476 to 121 so over 40% of Russian territory was not included in global temperature calculations for some other reasons rather than the lack of meteorological stations and observations."

The data of stations located in areas not listed in the Hadley Climate Research Unit Temperature UK (HadCRUT) survey often show no substantial warming in the late 20th century and the early 21st century.

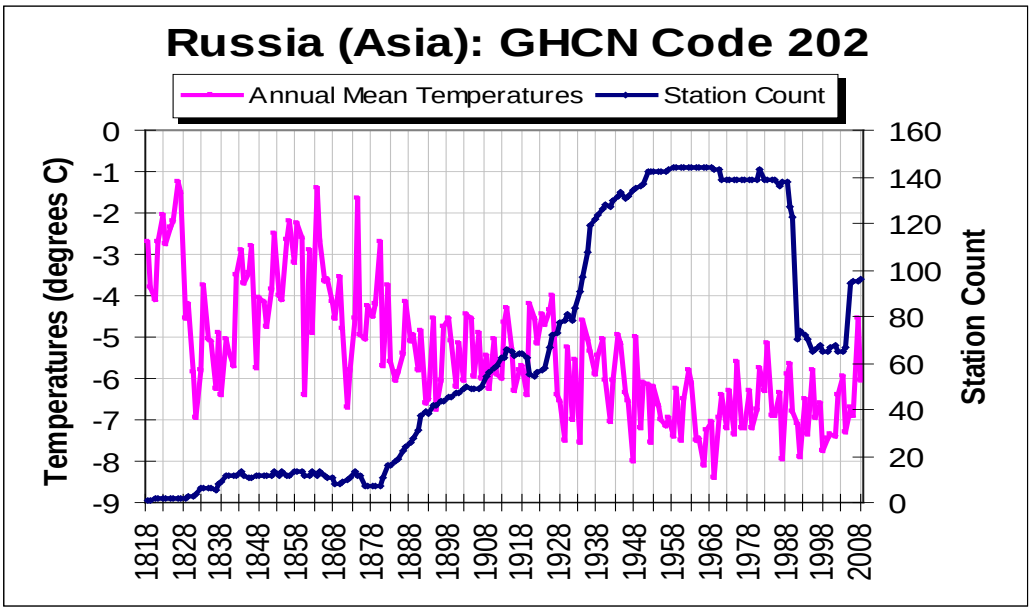
The HadCRUT database includes specific stations with incomplete data, highlighting apparent global warming, rather than stations with uninterrupted observations. The Russians concluded that climatologists used the incomplete findings of meteorological stations far more often than those providing complete observations. These stations are located in large populated centers that are influenced by the urban warming effect:

This created 0.64C greater warming than was exhibited by using 100% of the raw data. Given the huge area Russia represents, 11.5% of global land surface area, this significantly affected global land temperatures.

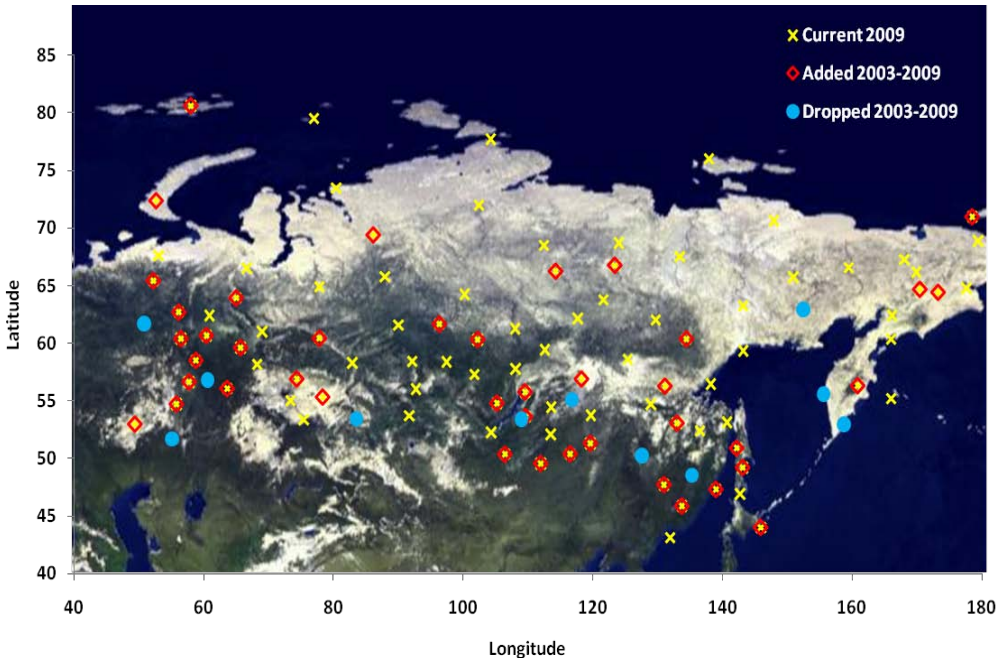
In cold countries like Russia and Canada the rural stations in the Polar Regions were thinned out leaving behind the lower latitude more urban cities (more here[15]). The data from the remaining cities was used to estimate the temperatures to the north. As a result the computed new averages were higher than the averages when the cold stations were part of the monthly/yearly assessment. Note how in the GHCN unadjusted data, regardless of station count, temperatures have cooled in these countries. It is only when data from the more southerly, warmer locations is used in the interpolation to the vacant grid boxes that an artificial warming is introduced –

It is only when data from the more southerly, warmer locations is used in the interpolation to the vacant grid boxes that an artificial warming is introduced.

[14] http://en.rian.ru/papers/20091216/157260660.html.
[15] http://chiefio.wordpress.com/2009/10/27/ghcn-up-north-blame-canada-comrade/.

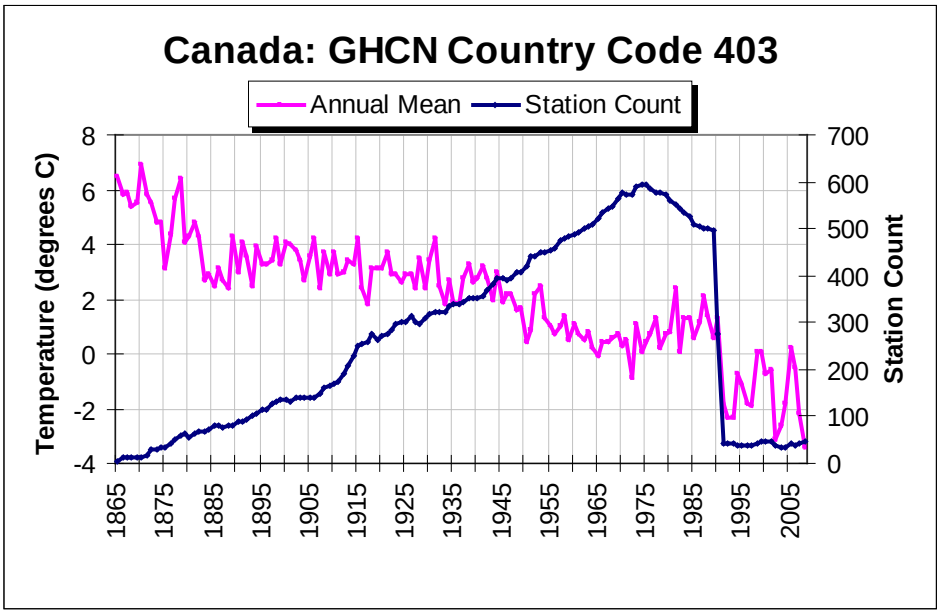


The changes in the distribution continue. E.M. Smith shows how the number of added stations since 2003 was primarily in the south below the normal winter snowpack –



CANADA

In Canada, the number of stations dropped from 600 to less than 50. The percentage of stations in the lower elevations (below 300 feet) tripled and those at higher elevations above 3000 feet were reduced by half. Canada's semi-permanent depicted warmth comes from interpolating from more southerly locations to fill northerly vacant grid boxes, even as a simple average of the available stations shows an apparent cooling.



Just one thermometer remains for everything north of the 65th parallel. That station is Eureka, which has been described as "The Garden Spot of the Arctic" thanks to the flora and fauna abundant around the Eureka area, more so than anywhere else in the High Arctic. Winters are frigid but summers are slightly warmer than at other places in the Canadian Arctic.

Just one thermometer remains for everything north of the 65th parallel. That station is Eureka, which has been described as "The Garden Spot of the Arctic".

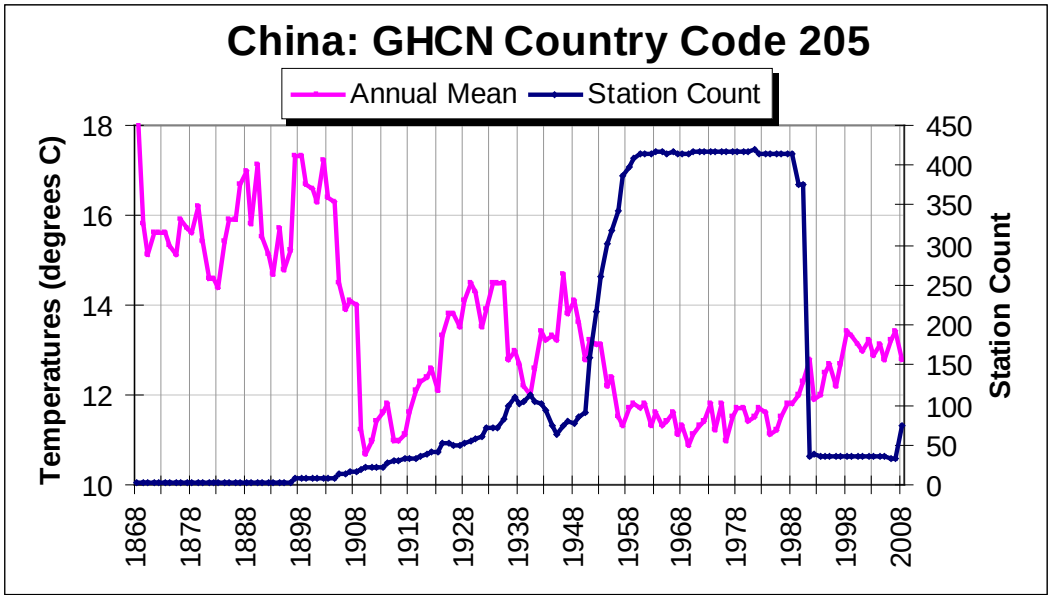
NOAA GHCN used only 35 of the 600 Canadian stations in 2009, down from 47 in 2008. A case study later in this report by Tim Ball will show weather data is available elsewhere from airports across Canada and indeed hourly readings can be found on the internet for many places in Canada (and Russia) not included in the global data bases. Environment Canada reported in the National Post here[16], that there are 1400 stations in Canada with 100 north of the Arctic Circle, where NOAA uses just 1. See E.M. Smith's analysis here[17].

CHINA

China's station count jumped from 1950 to 1960, held steady to about 1990, then collapsed. China had 100 stations in 1950, over 400 in 1960, then only 35 by 1990. Temperatures showed the results of the station distribution changes, likely the result of urbanization. Dr. Phil Jones et al (2009) showed a contamination of temperatures in China of 0.1C per decade (1C per century).

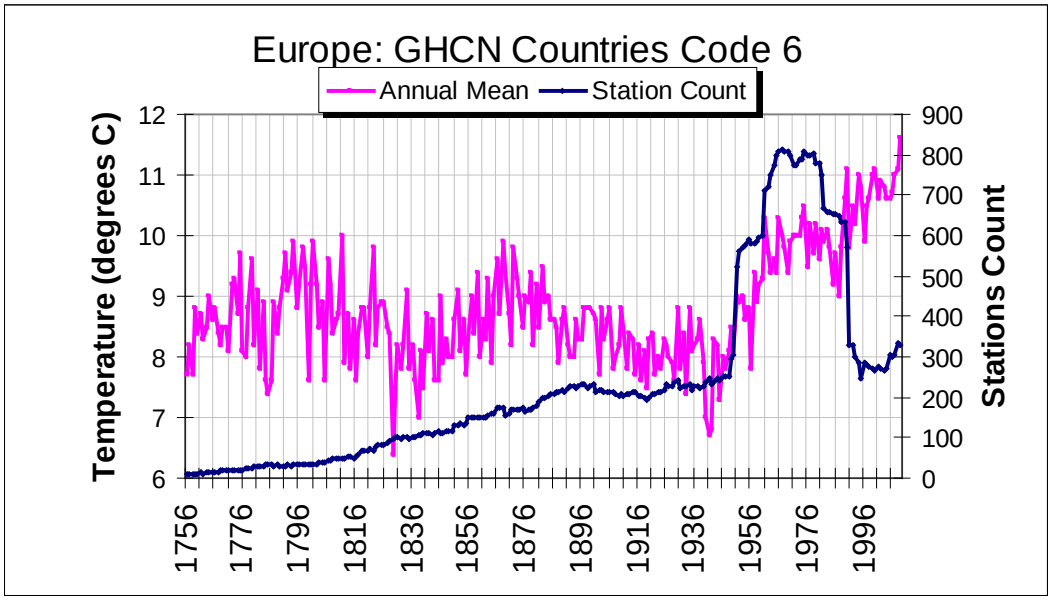
[16] http://www.nationalpost.com/news/story.html?id=2465231#ixzz0dY7ZaoIN.
[17] http://chiefio.wordpress.com/2009/11/13/ghcn-oh-canada-rockies-we-dont-need-no-rockies/.

See E.M. Smith's The Dragon Ate the Thermometers *here*[18].



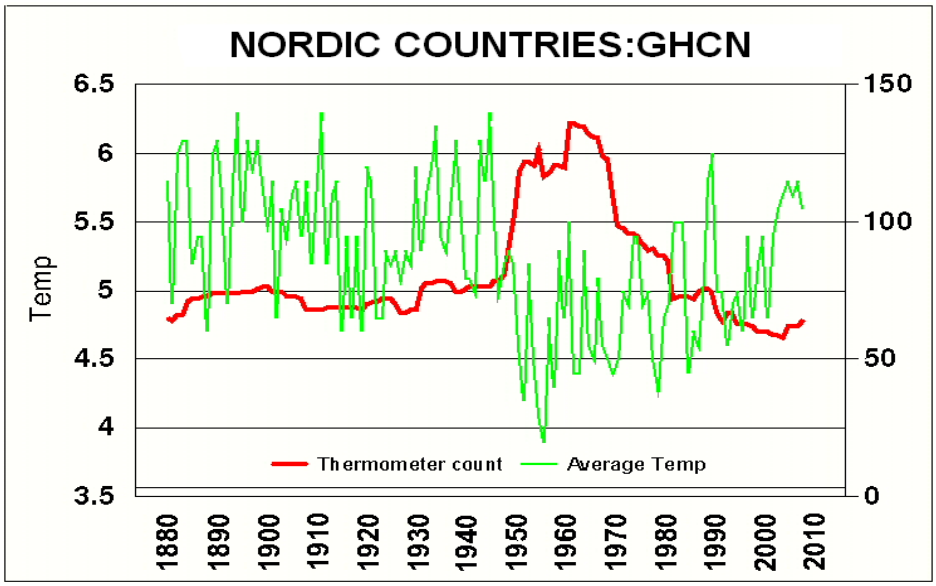
EUROPE

In Europe higher mountain stations were dropped, leaving behind more coastal cities. The thermometers increasingly moved to the Mediterranean and lower elevations with time. This enhances the urbanization and cyclical warming. The dropout in Europe as a whole was almost 65%. In the Nordic countries it was 50%.



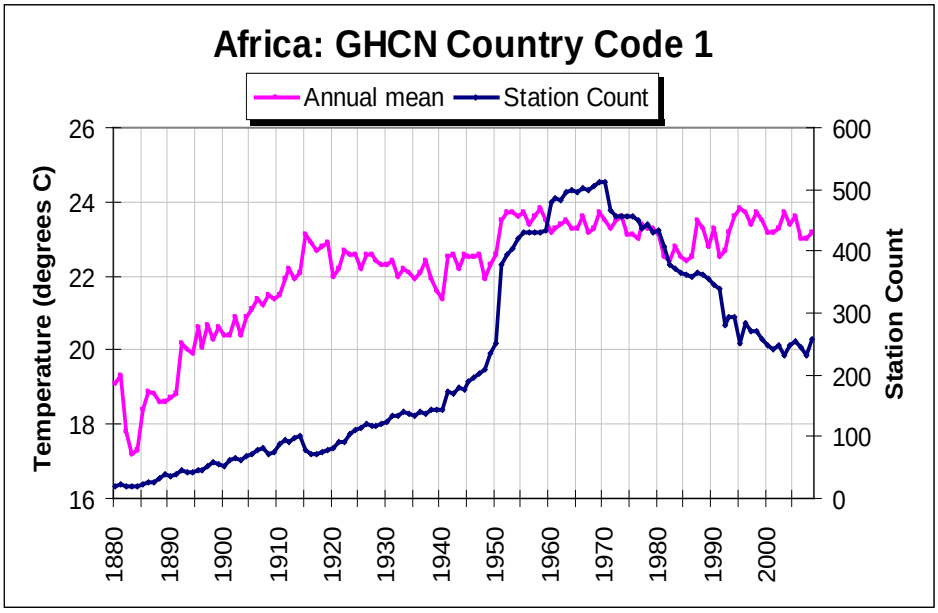
[18] http://chiefio.wordpress.com/2009/10/28/ghcn-china-the-dragon-ate-my-thermometers/.

Notice how in the Nordic countries the coldest period coincided with the greatest station density, with a warm-up after the drop-off.



AFRICA

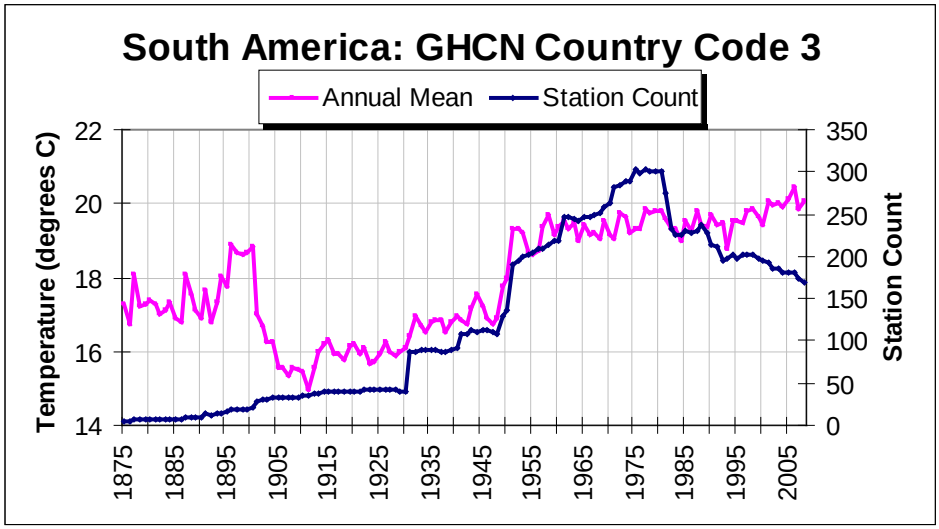
Africa is hot, but it is not getting hotter. It's hard to have "global warming" when Africa is not participating. And this stability is despite clear attempts to redact thermometers from cool areas like the Morocco coast, and move them into the hot area like toward the Sahara: See analysis here[19].



[19] http://chiefio.wordpress.com/2009/12/01/ncdc-ghcn-africa-by-altitude/.

SOUTH AMERICA

Throughout South America the higher elevation stations disappeared, while the number of coastal stations increased. The 50% decline in stations and changing distributions may help explain some of the warming since 1990, an enhanced increase in temperature appeared in South America after 1990.



In this posting[20], E.M. Smith showed how the Andes disappeared from the data base. Take for example Bolivia (here[21]). There has not been any thermometer data for Bolivia in GHCN since 1990. Monthly and annual anomaly charts show warmth over Bolivia. How does NOAA and NASA find heat in Bolivia when there is NO data from the last 20 years? Easy. They "makes it up" from "nearby" thermometers up to 1200 km away. So what is within 1200 km of Bolivia? The beaches of Chile, Peru and the Amazon Jungle.

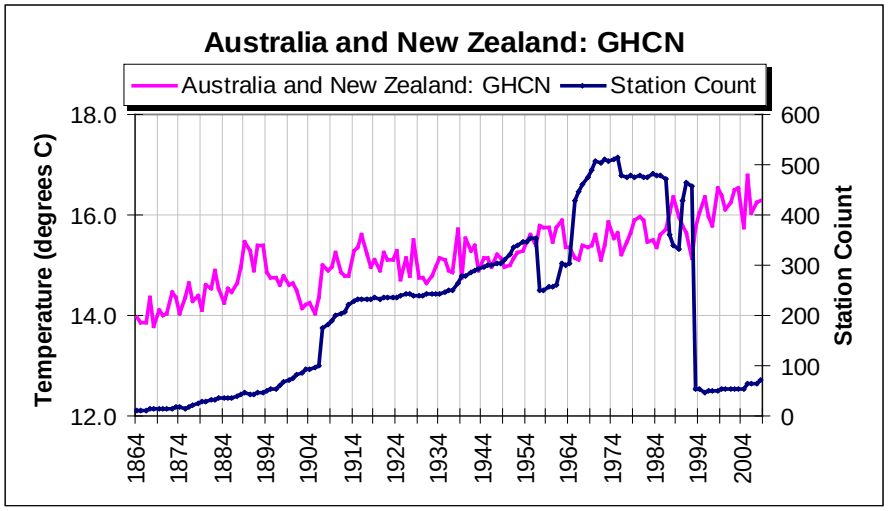
NEW ZEALAND AND AUSTRALIA

Smith found that in New Zealand the only stations remaining had the words "water" or "warm" in the descriptor code. Some 84% of the sites are at airports, with the highest percentage in southern cold latitudes.

In Australia, Torok *et al.* (2001)[22] observed that in European and North American cities urban-rural temperature differences scale linearly with the logarithms of city populations. They also learned that Australian city heat islands are generally smaller than those in European cities of similar size, which in turn are smaller than those in North American cities. The regression lines for all three continents converge in the vicinity of a population of 1000 people, where the urban-rural temperature difference is approximately 2.2 ± 0.2°C, essentially the same as what Oke (1973) had reported two decades earlier.

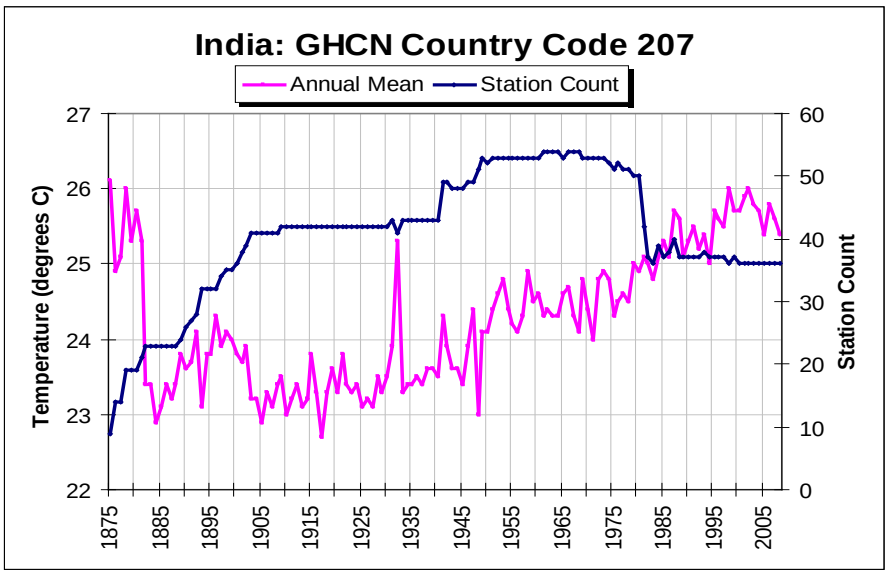
[20] http://chiefio.wordpress.com/2009/11/16/ghcn-south-america-andes-what-andes/.
[21] http://chiefio.wordpress.com/2010/01/08/ghcn-gistemp-interactions-the-bolivia-effect/.
[22] http://www.co2science.org/articles/V5/N20/C3.php.

Smith finds the Australian dropout[23] was mainly among higher-latitude, cooler stations after 1990, with the percentage of city airports increasing to 71%, further enhancing apparent warming. The trend in "island Pacific without Australia and without New Zealand" is dead flat. The Pacific Ocean islands are NOT participating in "global" warming. Changes of thermometers in Australia and New Zealand are the source of any change.



INDIA

India saw a dropout after 1990 though there was never much of an observing network of climate sites in the first place. The dropout may have accelerated the warming that is very probably the result of strong population growth/urbanization.

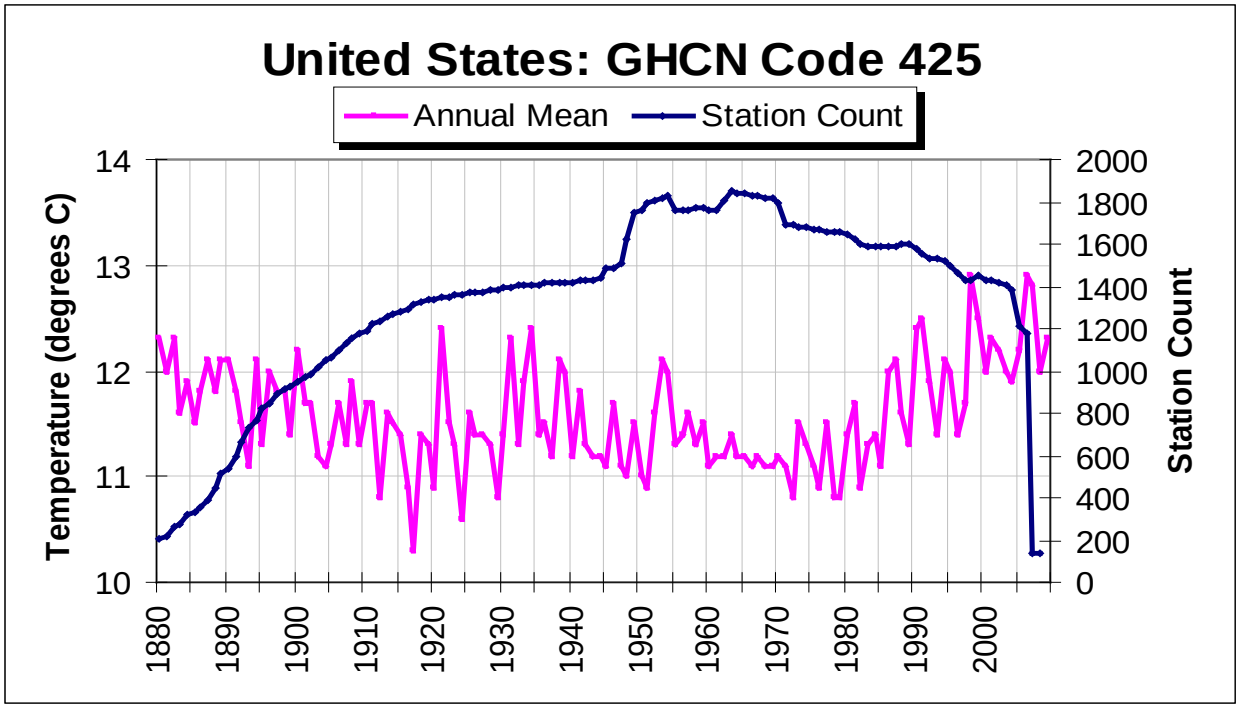


[23] http://chiefio.wordpress.com/2009/10/23/gistemp-aussy-fair-go-and-far-gone/.

UNITED STATES

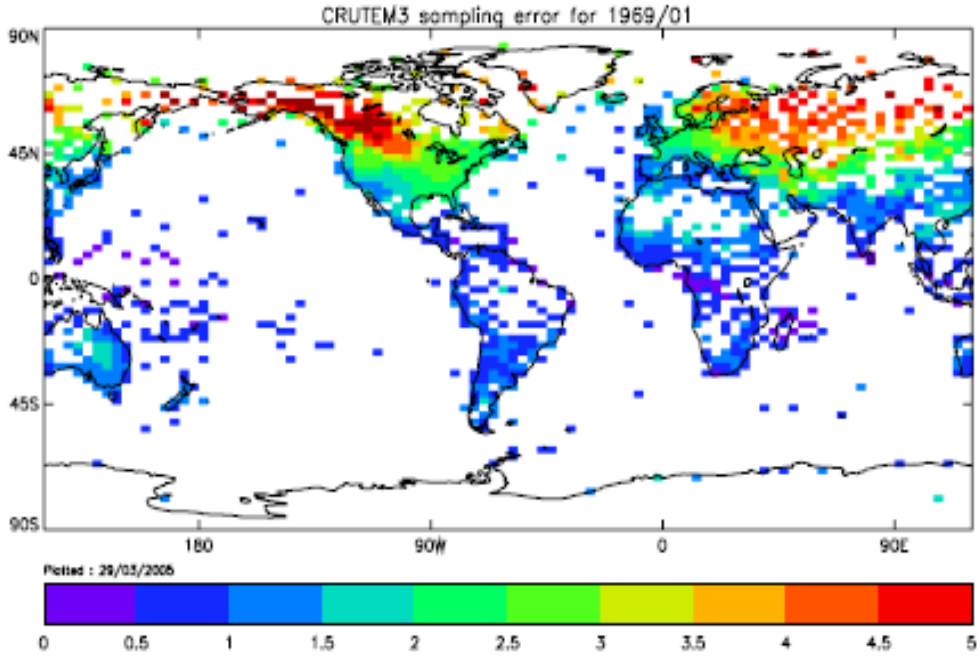
We shall discuss the US climate network, USHCN, later. It is among the most stable databases. Yet Anthony Watts, Roger Pielke Sr. and others have clearly shown that it is not without its problems.

Amazingly, the same NCDC that manages the USHCN dropped out 90% of all the climate stations in GHCN version 2. E.M. Smith found that most of the stations remaining are at airports and that most of the higher-elevation mountain stations of the west are gone. In California the only remaining stations were San Francisco, Santa Maria, Los Angeles and San Diego.



The data density issue raises the uncertainty for the accuracy of grid boxes in regions with few temperature monitoring stations. In other words the coldest places — having sparse distributions of stations due to their omission from consideration by NCDC — have the greatest sampling errors.

The following graphic powerfully illustrates this was a factor even before the major dropout. Brohan (2005) showed the degree of uncertainty in surface temperature sampling errors for 1969 (here for CRUTEM3). The degree of uncertainty exceeds the total global warming signal.



Source *here*[24].

ADJUSTMENTS AND NON-ADJUSTMENTS FURTHER CONTAMINATE DATA

Ronald Coase, Nobel Laureate in economics for 1991, once said: *"If we torture the data long enough, it will confess."*

In addition to the slow degradation of the observing system, there has been a coordinated effort to manipulate instrumental data. This manipulation has produced an exaggerated warming that is blamed on man's influence. We do not deny there was a period of global warming from 1979 to 1998 owing to the natural cycles of the oceans and sun, which had produced a similar warming from around 1910 to 1940. Similarly there was a cooling period from the 1940s to the late 1970s owing to changes in the oceans and solar activity.

In addition to the slow degradation of the observing system, there has been a coordinated effort to manipulate instrumental data. This manipulation has produced an exaggerated warming that is blamed on man's influence.

I will be the first to admit that man does have some climate effect, but the effect is largely localized. As we will show, half or more of the reported warming since 1900 is attributable to land use changes and urbanization.

[24] http://strata-sphere.com/blog/wp-content/uploads/hadcrut3_gmr_defra_report_200503.pdf.

The Climategate whistleblower proved what those of us dealing with data for decades already knew. The data were not merely degrading in quantity and quality: they were being manipulated. The IPCC and the scientists supporting it have worked to remove the pesky Medieval Warm Period, the Little Ice Age, and the period emailer Tom Wigley referred to as the "warm 1940s blip." They have also worked to pump up the recent warm cycle that ended in 2001. And inexplicably, adjustments cooled many locations in the early record, which augmented the apparent trend.

The Climategate whistleblower proved what those of us dealing with data for decades already knew. The data were not merely degrading in quantity and quality: they were being manipulated.

Ian "Harry" Harris, a programmer at the Climate Research Unit, kept extensive notes of the defects he had found in the data and computer programs that the CRU uses in the compilation of its global mean surface temperature anomaly dataset. These notes, some 15,000 lines in length, were stored in the text file labeled "Harry_Read_Me.txt", which was among the data released by the whistleblower with the Climategate emails. This is just one of his comments –

> "[The] hopeless state of their (CRU) database. No uniform data integrity, it's just a catalogue of issues that continues to grow as they're found...I am very sorry to report that the rest of the databases seem to be in nearly as poor a state as Australia was. There are hundreds if not thousands of pairs of dummy stations, one with no WMO and one with, usually overlapping and with the same station name and very similar coordinates. I know it could be old and new stations, but why such large overlaps if that's the case? Aarrggghhh! There truly is no end in sight.
>
> "This whole project is SUCH A MESS. No wonder I needed therapy!!
>
> "I am seriously close to giving up, again. The history of this is so complex that I can't get far enough into it before by head hurts and I have to stop. Each parameter has a tortuous history of manual and semi-automated interventions that I simply cannot just go back to early versions and run the updateprog. I could be throwing away all kinds of corrections - to lat/lons, to WMOs (yes!), and more. So what the hell can I do about all these duplicate stations?

"This whole project is SUCH A MESS. No wonder I needed therapy!!"

INSTRUMENT CHANGES AND SITING

The World Meteorological Organization (WMO), a specialized agency of the United Nations[25], grew out of the International Meteorological Organization (IMO), which was founded in 1873. Established in 1950, the WMO became the specialized agency of the United Nations (in 1951) for meteorology, weather, climate, operational hydrology and related geophysical sciences.

According to the WMO's own criteria, followed by the NOAA's National Weather Service, temperature sensors should be located on the instrument tower at 1.5 meters (5 feet) above the surface of the ground. The tower should be on flat, horizontal ground surrounded by a clear surface, over grass or low vegetation kept less than 4 inches high. The tower should be at least 100 meters (110 yards) from tall trees, or artificial heating or reflecting surfaces, such as buildings, concrete surfaces, and parking lots.

Very few stations meet these criteria.

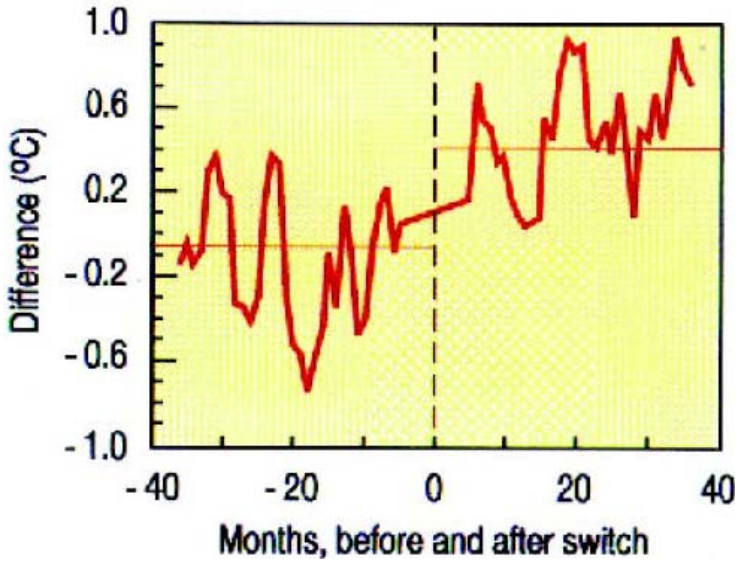
ALONG COMES 'MODERNIZATION'

Albert Einstein used to say, "Not everything that can be counted counts, and not everything that counts can be counted." We might add some things that count should be counted.

The modernization of weather stations in the United States replaced many human observers with instruments that initially had major errors, or had "warm biases" (HO-83) or were designed for aviation and were not suitable for precise climate trend detection Automates Surface Observing Systems (ASOS) and the Automated Weather Observing System (AWOS). Also, the new instrumentation was increasingly installed on unsuitable sites that did not meet the WMO's criteria.

Dr. Ben Herman at the University of Arizona confirmed in working with the climate station in Tucson, AZ that the new HO-83 thermometer had a significant warm bias. This observation was based on the work by Gall et al. (1992) and Jones (1995). Stephen McIntyre has summarized in The HO-83 Hygro-thermometer[26] the findings by Tom Karl at *al in* 1995 of a sudden jump in temperature of about 0.5°C after the new thermometer was introduced. This discontinuity caused by the introduction of the HO-83 apparently was not adjusted for in the USHCN database for the period from the 1980s to the late 1990s, when the instruments were replaced.

[25] http://www.unsystem.org/en/frames.alphabetic.index.en.htm#w.
[26] http://www.climateaudit.org/?p=1954.



Effects of changing from the HO-63 to the HO-83 thermometer series on maximum temperature in the United States. Source: Karl et al., 1995.

During recent decades there has been a migration away from old instruments read by trained observers.

Then there was the "upgrade" to automated surface observing systems at airports. ASOS[27] was designed mainly for aviation purposes. It has an error tolerance of +/-0.9F for air temperature.

Temperature Sensor's Range, Accuracy, and Resolution

Parameter	Range	RMSE	Max Error	Resolution
Ambient Temperature	-80°F to -58°F	1.8°F	± 3.6°F	0.1°F
	-58°F to +122°F	0.9°F	± 1.8°F	
	+122°F to +130°F	1.8°F	± 3.6°F	
Dew Point Temperature	-80°F to -0.4°F	3.1°F to 7.9°F	4.5°F to 13.9°F	0.1°F
	-0.4°F to +32°F	2.0°F to 7.9°F	3.4°F to 13.9°F	
	+32°F to +86°F	1.1°F to 4.7°F	2.0°F to 7.9°F	

During recent decades there has been a migration away from old instruments read by trained observers. These instruments were in shelters that were properly located over grassy surfaces and away from obstacles to ventilation and heat sources.

Today we have many more automated sensors located on poles cabled to the forecast stations or airports where they can be monitored or transmitted.

[27] http://www.nws.noaa.gov/asos/aum-toc.pdf.

The installers of these instruments were often equipped with nothing more than a shovel. They were on a tight schedule and with little budget. They often encountered paved driveways or roads between the old sites and the buildings. They were in many cases forced to settle for installing the instruments close to the buildings, violating the government specifications in this or other ways.

Pielke and Davey (2005) found a majority of stations, including climate stations in eastern Colorado, did not meet WMO requirements for proper siting.

They extensively documented poor siting and land-use change issues in numerous peer-reviewed papers, many summarized in the landmark paper Unresolved issues with the assessment of multi-decadal global land surface temperature trends[28] (2007).

In a volunteer survey project, Anthony Watts and his more than 650 volunteers www.surfacestations.org found that over 900 of the first 1067 stations surveyed in the 1221 station US climate network did not come close to meeting the specifications. Only about 3% met the ideal specification for siting. They found stations located next to the exhaust fans of air conditioning units, surrounded by asphalt parking lots and roads, on blistering-hot rooftops, and near sidewalks and buildings that absorb and radiate heat. They found 68 stations located at wastewater treatment plants, where the process of waste digestion causes temperatures to be higher than in surrounding areas. In fact, they found that 90 percent of the stations fail to meet the National Weather Service's own siting requirements that stations must be 30 meters (about 100 feet) or more away from an artificial heating or reflecting source.

In a volunteer survey project, Anthony Watts and his more than 650 volunteers found that over 900 of the first 1067 stations surveyed in the US climate network did not come close to meeting the specifications. Only about 3% met the ideal specification for siting.

The average warm bias for inappropriately-sited stations exceeded 1 C° using the National Weather Service's own criteria, with which the vast majority of stations did not comply.

Here[29] was a report from last spring with some of the earlier findings. Some examples from these sources:

[28] http://pielkeclimatesci.files.wordpress.com/2009/10/r-321.pdf.
[29] http://wattsupwiththat.files.wordpress.com/2009/05/surfacestationsreport_spring09.pdf.

USHCN weather station at Hopkinsville, KY (Pielke et al., 2006). The station is sited too close to a building, too close to a large area of tarmac, and directly above a barbecue.

Max/Min temperature sensor near John Martin Reservoir, CO (Davey, 2005)

A station at Tucson, AZ, in a parking lot on pavement.
(Photo by Warren Meyer, courtesy of surfacestations.org.)

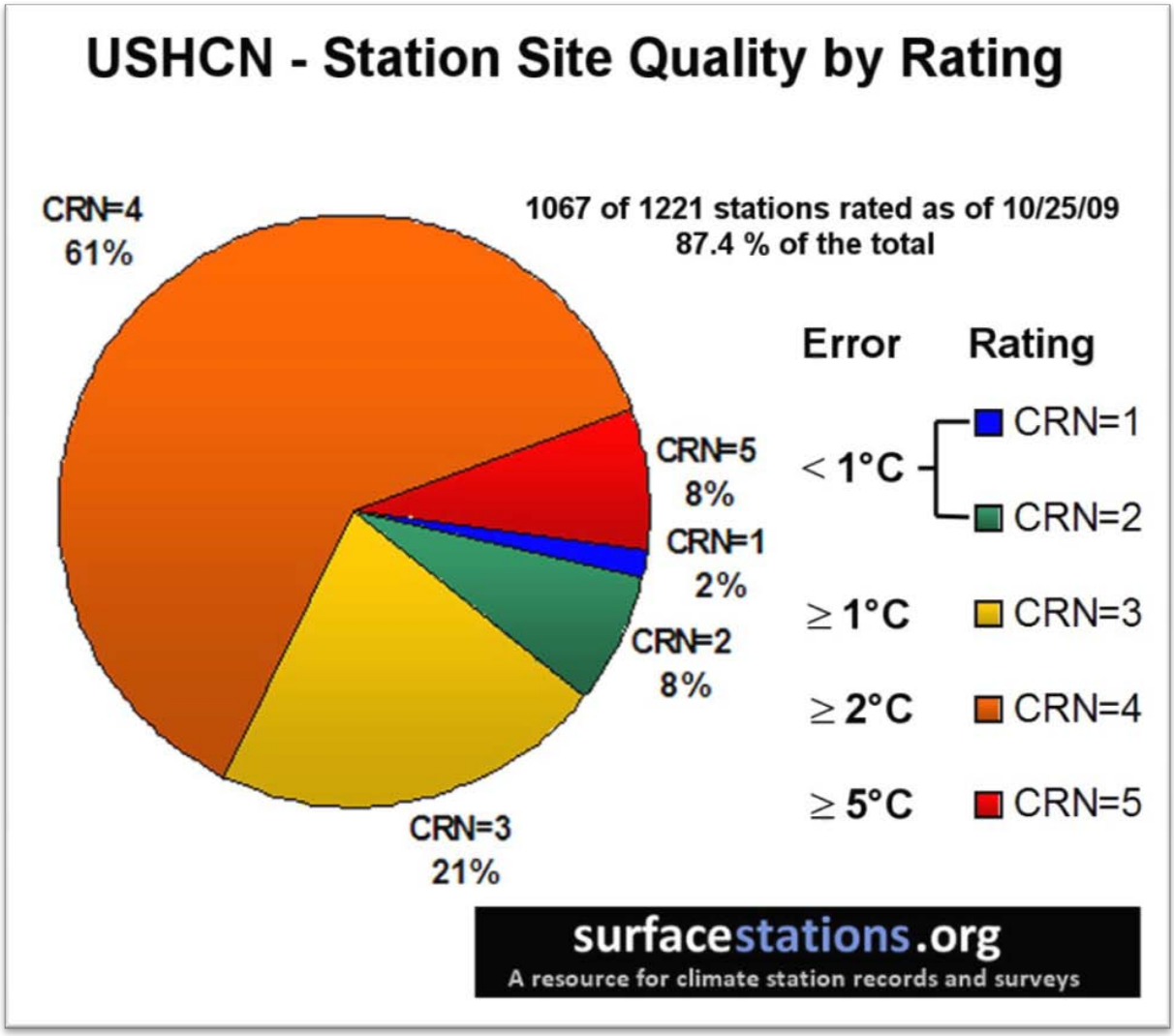
Numerous sensors are located at waste treatment plants. An infrared image of the scene shows the output of heat from the waste treatment beds right next to the sensor.
(Photos by Anthony Watts, surfacestations.org.)

Wickenburg, Arizona next to a building on a paved surface.
(Photo by Warren Meyer, courtesy of surfacestations.org.)

Waterville, WA, over volcanic cinders, near parking.
(Photo by Bob Meyer, courtesy of surfacestations.org.)

As of October 25, 2009, 1067 of the 1221 stations (87.4%) had been evaluated by the surfacestations.org volunteers and evaluated using the Climate Reference Network (CRN) criteria[30]. 90% were sited in ways that result in errors exceeding 1C according to the CRN handbook.

This siting issue remains true even by the older "100 foot rule" criteria for COOP stations, specified by NOAA[31] for the US Cooperative Observer network where they specify "The sensor should be at least 100 feet (~ 30 meters) from any paved or concrete surface."



[30] http://www1.ncdc.noaa.gov/pub/data/uscrn/documentation/program/X030FullDocumentD0.pdf.
[31] http://www.nws.noaa.gov/om/coop/standard.htm.

There are many instruments globally at airports, some in areas affected by jet exhaust.

(Photo from Bing Maps, located by Paolo Mezzasalma, annotated by Anthony Watts.)

Dr. Vincent Gray, IPPC Reviewer for AR1 through IV published on some issues related to temperature measurements here[32].

Two years ago, Joe D'Aleo asked Tom Karl about the problems with siting and why they could not speed up the plans for a Climate Reference Network (CRN - at that time called NERON). He said he had presented a case for that to NOAA but had it turned down with the excuse from high levels at NOAA that the surface stations did not matter because we had satellite monitoring. The Climate Reference Network was capped at 114 stations but will not provide meaningful trend assessment for about 10 years. NOAA has recently reconsidered and now plans to upgrade about 1000 climate stations, but meaningful results will be even further in the future.

In monthly press releases no satellite measurements are ever mentioned, although NOAA claimed that was the future of observations.

[32] http://icecap.us/images/uploads/Gray.pdf.

ADJUSTMENTS NOT MADE, OR MADE BADLY

HEAT FROM POPULATION GROWTH AND LAND-USE CHANGES

URBAN HEAT ISLAND

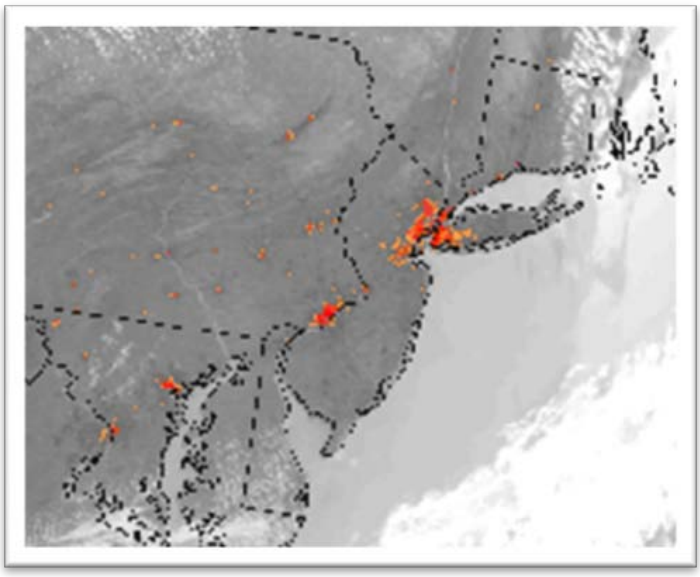
Weather data from cities as collected by meteorological stations are indisputably contaminated by urban heat-island bias and land-use changes. This contamination has to be removed or adjusted for in order to accurately identify true background climatic changes or trends. In cities, vertical walls, steel and concrete absorb the sun's heat and are slow to cool at night. More and more of the world is urbanized (population increased from 1.5 B in 1900 to 6.7 B in 2010).

Weather data from cities as collected by meteorological stations are indisputably contaminated by urban heat-island bias and land-use changes.

The urban heat-island effect occurs not only for big cities but also for towns. Oke (who won the 2008 American Meteorological Society's Helmut Landsberg award for his pioneer work on urbanization) had a formula for the warming that is tied to population. Oke (1973) found that the urban heat-island (in °C) increases according to the formula –

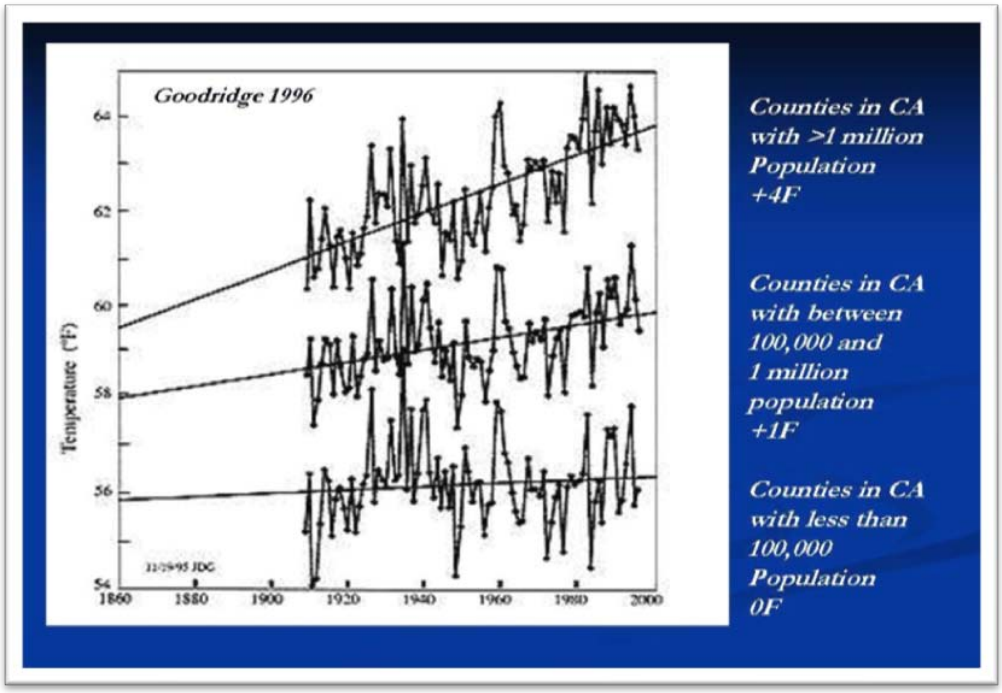
- Urban heat-island warming = 0.317 ln *P*, where *P* = population.

Thus a village with a population of 10 has a warm bias of 0.73°C. A village with 100 has a warm bias of 1.46°C and a town with a population of 1000 people has a warm bias of 2.2C°. A large city with a million people has a warm bias of 4.4°C.



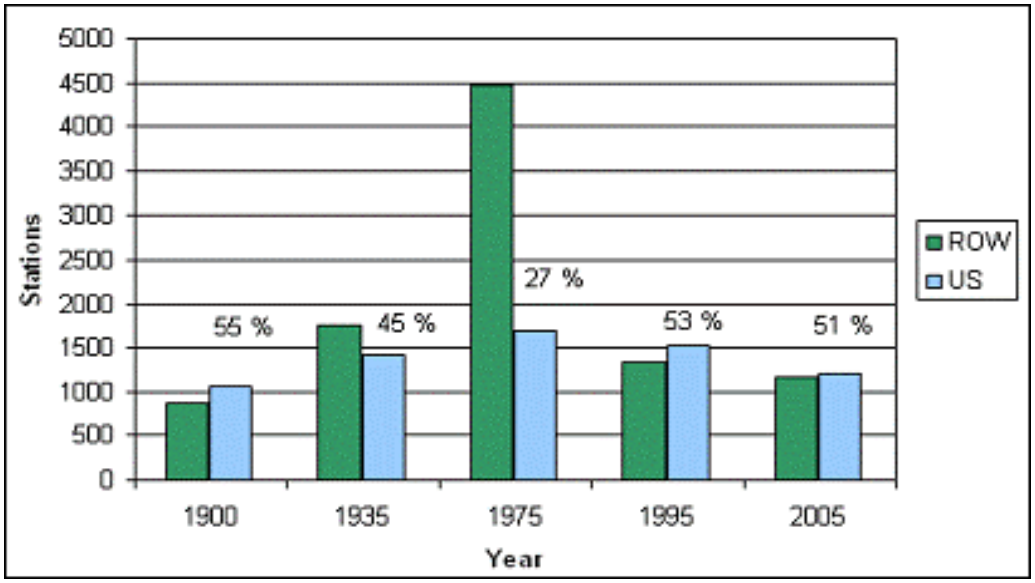
Urban heat islands as seen from infrared sensors on board satellites.

Goodrich (1996) showed the importance of urbanization to temperatures in his study of California counties in 1996. He found for counties with a million or more population the warming from 1910 to 1995 was 4F, for counties with 100,000 to 1 million it was 1F and for counties with less than 100,000 there was no change (0.1F).



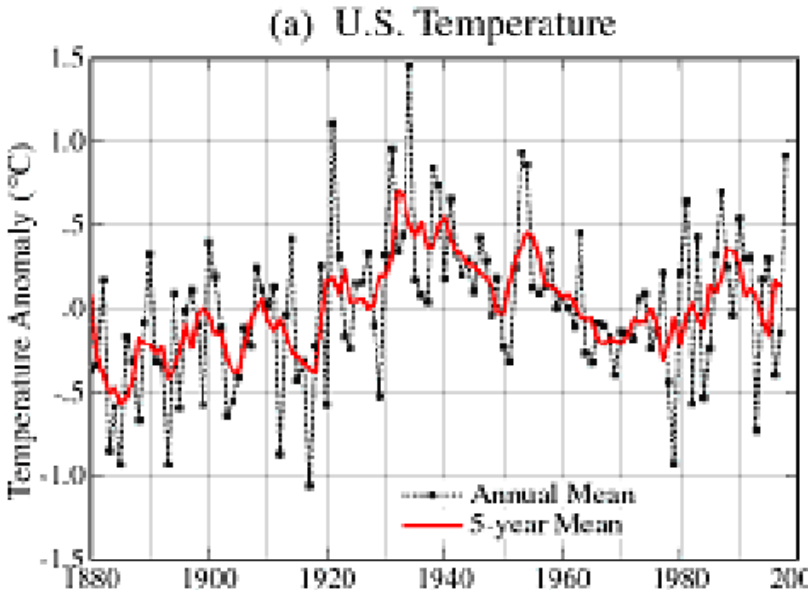
US CLIMATE DATA

Compared to the GHCN global database, the USHCN database is more stable.



Comparison of Number of GHCN Temperature Stations in the US versus rest of the world (ROW).

When first implemented in 1990 as Version 1, USHCN employed 1221 stations across the United States. In 1999, NASA's James Hansen published this graph of USHCN v.1 annual mean temperature:



Hansen correctly noted:

> "The US has warmed during the past century, but the warming hardly exceeds year-to-year variability. Indeed, in the US the warmest decade was the 1930s and the warmest year was 1934."

USHCN was generally accepted as the world's best database of temperatures. The stations were the most continuous and stable and had adjustments made for time of observation, urbanization, known station moves or land-use changes around sites, as well as instrumentation changes.

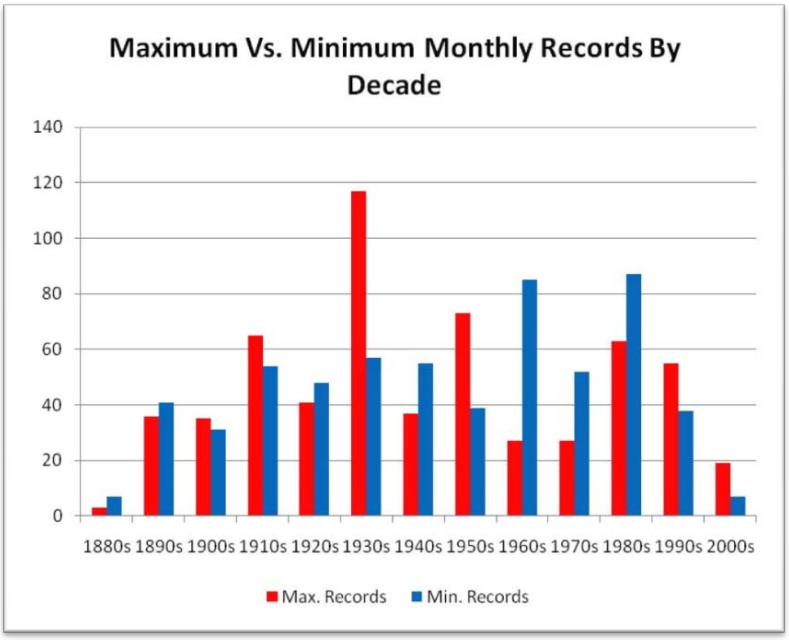
Note how well the original USHCN agreed with the state record high temperatures.

The 1930s were, by far, the hottest period for the timeframe. In absolute terms the 1930s had a much higher frequency of maximum temperature extremes than the 1990s or 2000s or the combination of the last two decades.

US State Heat Records Suggest Recent Decades are Not the Warmest

The 1930s were, by far, the hottest period for the timeframe. In absolute terms the 1930s had a much higher frequency of maximum temperature extremes than the 1990s or 2000s

or the combination of the last two decades. This was shown by Bruce Hall and Dr. Richard Keen here[33], also covering Canada.



NCDC's Tom Karl (1988) employed an urban adjustment scheme for the first USHCN database (released in 1990). He noted that the national climate network formerly consisted of predominantly rural or small towns with populations below 25,000 (as of 1980 census) and yet that an urban heat-island effect was clearly evident.

Tom Karl *et al*'s adjustments were smaller than Oke had found (0.22°C annually on a town of 10,000 and 1.81°C on a city of 1 million and 3.73°C for a city of 5 million).

Karl observed that in smaller towns and rural areas the net urban heat-island contamination was relatively small, but that significant anomalies showed up in rapidly growing population centers.

MAJOR CHANGES TO USHCN IN 2007

In 2007 the NCDC, in its version 2 of USHCN, inexplicably removed the Karl urban heat-island adjustment and substituted a change-point algorithm that looks for sudden shifts (discontinuities). This is best suited for finding site moves or local land use changes (like paving a road or building next to sensors or shelters), but not the slow ramp up of temperature characteristic of a growing town or city.

Joe D'Aleo had a conversation with NCDC's Tom Karl two years ago when the USHCN version 2 was announced. Joe told Tom he had endorsed his 1988 Journal of Climate paper

[33] http://icecap.us/index.php/go/new-and-cool/more_critique_of_ncar_cherry_picking_temperature_record_study/.

(Urbanization: Its Detection and Effect in the United States Climate Record), based on the work of Landsberg and Oke on which that paper had depended.

Joe asked him if USHCN v2 would no longer have an urbanization adjustment. After a few moments of silence he told Joe he had asked those who had worked on version 2 that same question and was reassured that the new algorithms would catch urban warming and other changes, including "previously undocumented inhomogeneities" (discontinuities that suggest some local site changes or moves that were never documented).

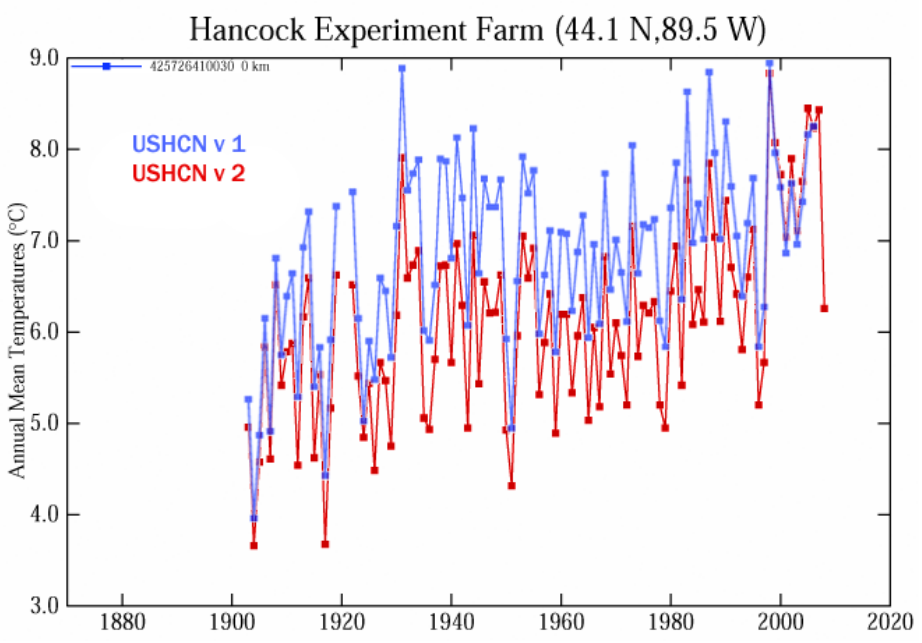
The difference between the old and new is shown here. Note the significant post-1995 warming and mid-20th century cooling owing to de-urbanization of the database.

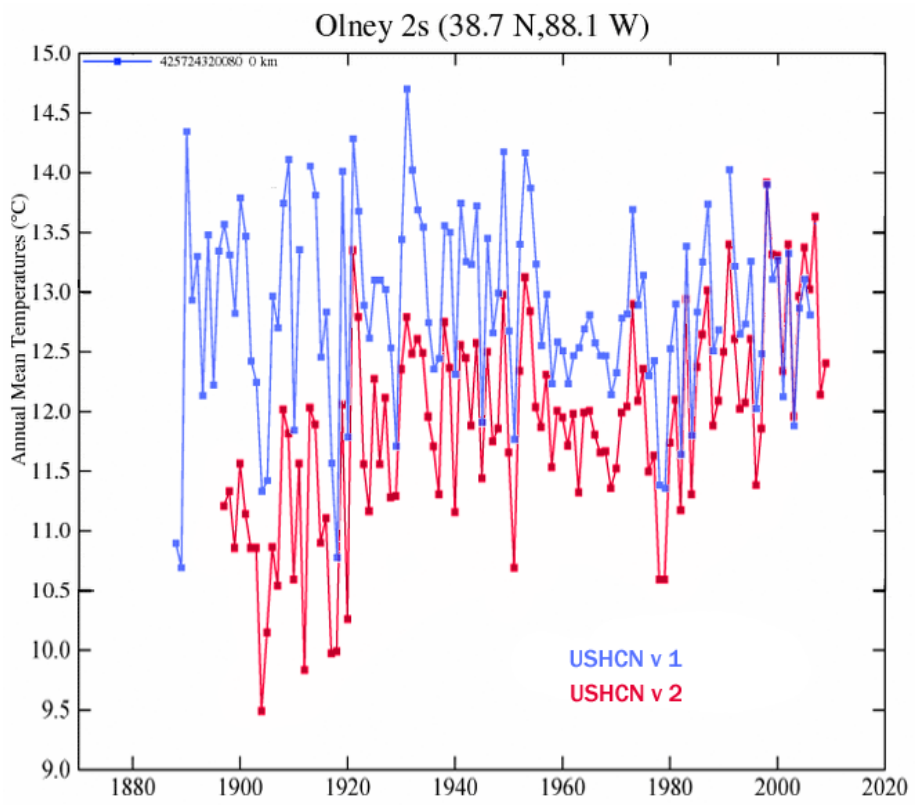
The change can be seen clearly in this animation[34] and in 'blink charts for Wisconsin here[35] and Illinois here[36].

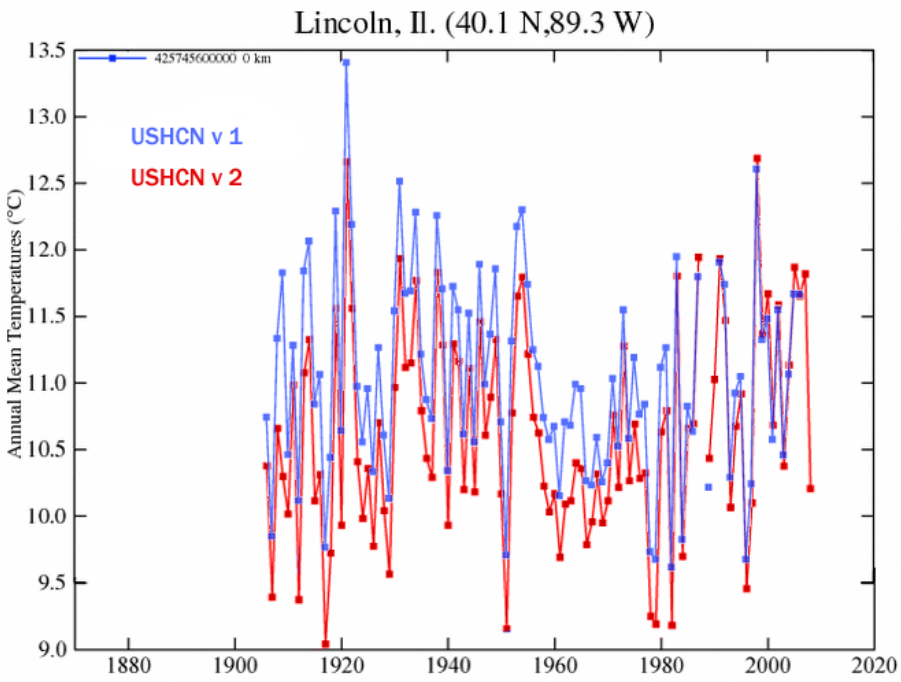
[34] http://climate-skeptic.typepad.com/.a/6a00e54eeb9dc18834010535ef5d49970b-pi.
[35] http://www.rockyhigh66.org/stuff/USHCN_revisions_wisconsin.htm.
[36] http://www.rockyhigh66.org/stuff/USHCN_revisions.htm.

Here are three example stations with USHCN version 1 and version 2 superimposed. The first is from Wisconsin, the next two Illinois (thanks to Mike McMillan).

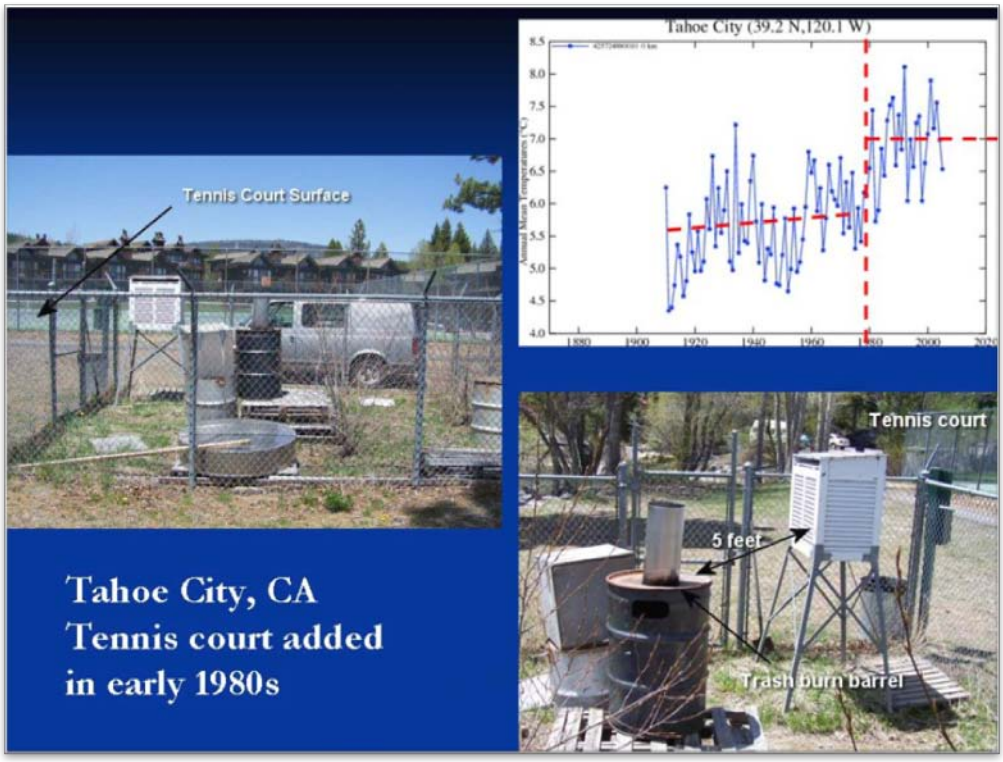
Notice the clear tendency to cool off the early record and leave the current levels near recently reported levels or increase them. The net result is either reduced cooling or enhanced warming not found in the raw data.





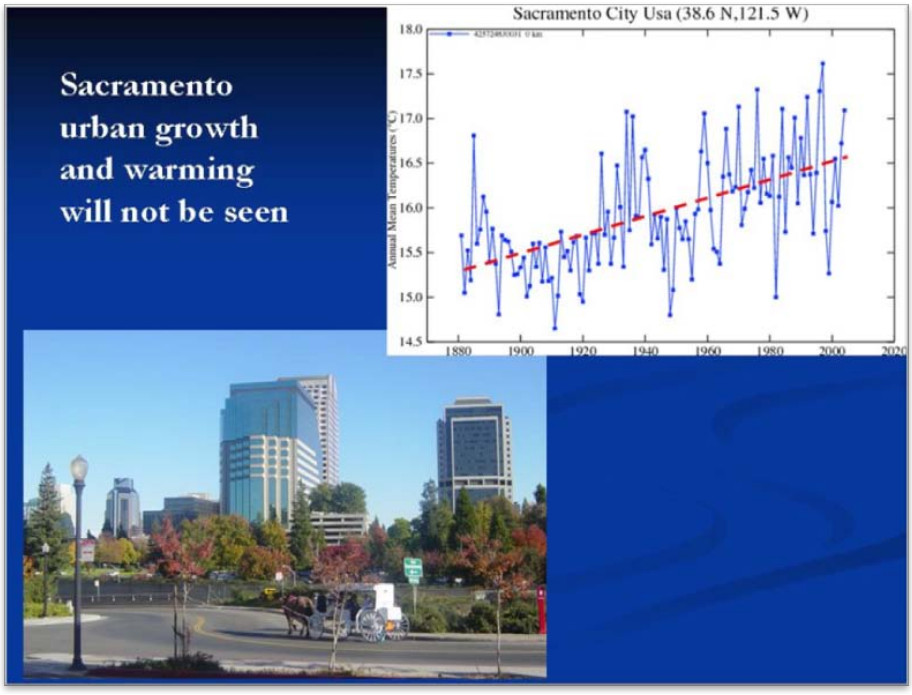


The new algorithms are supposed to correct for urbanization and changes in siting and instrumentation by recognizing sudden shifts in the temperatures.



(Photos by Anthony Watts, surfacestations.org.)

It should catch the kind of change shown above in Tahoe City, CA.



It is unlikely to catch the slow warming associated with the growth of cities and towns over many years, as in Sacramento, CA, above.

In a conversation during Anthony Watts invited presentation about the surfacestations projects to NCDC, on 4/24/2008, he was briefed on USHCN2's algorithms and how they operated by Matt Menne, lead author of the USHCN2 project. While Mr. Watts noted improvements in the algorithm can catch some previously undetected events like undocumented station moves, he also noted that the USHCN2 algorithm had no provision for long term filtering of signals that can be induced by gradual local urbanization, or by long term changes in the siting environment, such as weathering/coloring of shelters, or wind blocking due to growth of shrubbery/trees.

When Mr. Menne was asked by Mr. Watts if this lack of detection of such long term changes was in fact a weakness of the USHCN algorithm, he replied "Yes, that is correct". Essentially USHCN2 is a short period filter only, and cannot account for long term changes to the temperature record, such as UHI, making such signals indistinguishable from the climate change signal that is sought.

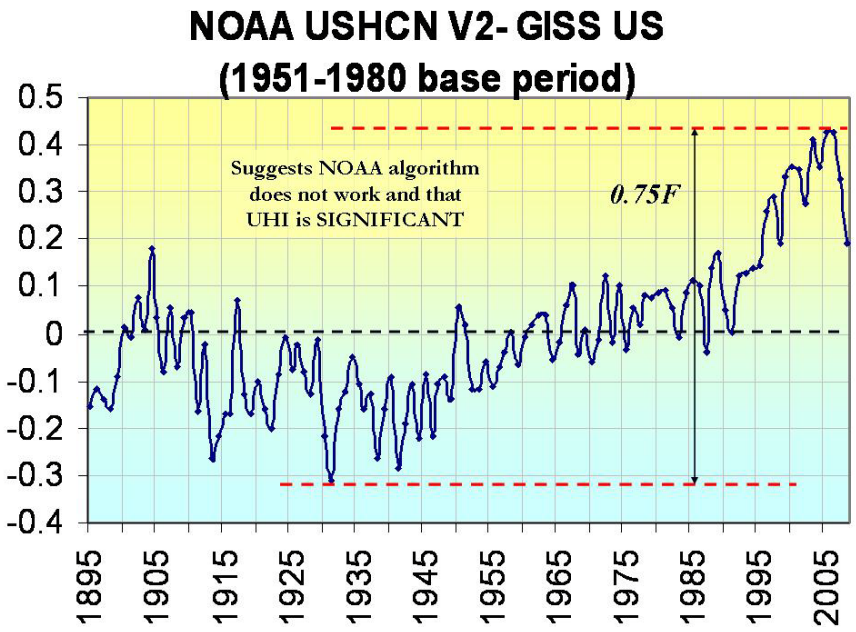
See some other examples of urban versus nearby rural here[37]. Doug Hoyt, who worked at NOAA, NCAR, Sacramento Peak Observatory, the World Radiation Center, Research and Data Systems, and Raytheon where he was a Senior Scientist did this analysis[38] of the urban heat island. Read beyond the references for interesting further thoughts.

[37] http://www.appinsys.com/GlobalWarming/GW_Part3_UrbanHeat.htm.
[38] http://www.warwickhughes.com/hoyt/uhi.htm.

NASA's GISS (US)

In the USA, southern Canada, and northern Mexico, GISS uses an urbanization adjustment based on the amount of night-time light measured by satellites. Unlit stations are classified as rural stations. This does produce some adjustment and a reasonable plot of temperatures, but, as GISS notes, this is less than 2% of the globe. As McIntyre notes here[39], this "NASA GISS adjustment to the US temperatures for UHI using nightlights information, coerces the low-frequency data to the higher-quality stations. The trend difference between NOAA and NASA GISS is approximately 0.7 deg F/century in the 1950-2008 period in question: obviously not a small proportion of the total reported increase."

Indeed, the difference between the GISS adjusted values and the NOAA values, no longer adjusted, shows NOAA were misguided in their removal of the urban adjustment. This removal produced a net cooling of 0.2 to 0.3 F in the 1930s and warming of 0.4F near 2005. Below is the NOAA data adjusted to the GISS base period of 1951-1980.



The net warming in the urban heat-island adjusted GISS US dataset from the peak around 1930 to the peak near 2000 was a meager 0.15 C°. It may be assumed the same would be true for the world if we could make a similar needed urban heat-island adjustment.

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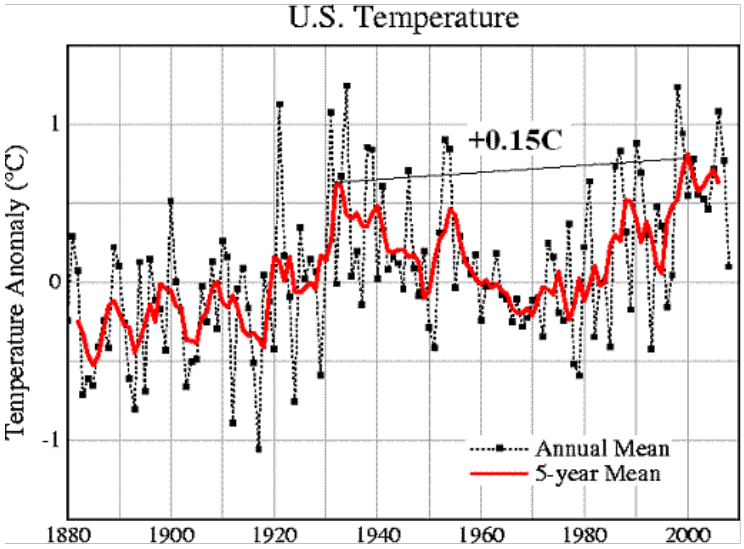
[39] http://climateaudit.org/2009/06/29/the-talking-points-memo/.



GISS Adjusted US Temperatures

Even before the version 2, Balling and Idso (2002)[40] found that the adjustments being made to the raw USHCN temperature data were "producing a statistically significant, but spurious, warming trend" that "approximates the widely-publicized 0.50°C increase in global temperatures over the past century." There was actually a linear trend of progressive cooling of older dates between 1930 and 1995.

"It would thus appear that in this particular case of "data-doctoring," the *cure* was much worse than the *disease*. And it likely still is! In fact, it would appear that the cure may actually ***be*** the disease."

HADLEY AND NOAA

No real urbanization adjustment is made for either NOAA's or CRU's global data. Jones *et al*. (1990: Hadley/CRU) concluded that urban heat-island bias in gridded data could be capped at 0.05 C°/century. Jones used data by Wang which Keenan[41] has shown was fabricated. Peterson et al (1998) agreed with the conclusions of Jones, Easterling *et al* (1997) that urban effects on 20th century globally and hemispherically-averaged land air temperature time-series do not exceed about 0.05°C from 1900-1990.

Peterson (2003) and Parker (2006) argue urban adjustment is not really necessary. Yet Oke (1973) showed a town of 1000 could produce a 2.2 C° (3.4 F° warming). The UK Met Office (UKMO) has said[42] future heat waves could be especially deadly in urban areas, where the temperatures could be 9 C° or more above today's, according to the Met Office's Vicky Pope. As usual, the warmers want to have it both ways. They argue that the urban heat island effect is insignificant, but also argue future heat-waves will be most severe in the urban areas.

[40] http://www.co2science.org/articles/V12/N50/C1.php.
[41] http://www.informath.org/WCWF07a.pdf.
[42] http://icecap.us/index.php/go/joes-blog/cities_to_sizzle_as_islands_of_heat/.

The most recent exposition of CRU methodology is Brohan *et al*. (2006), which included an allowance of 0.1 C°/century for urban heat-island effects in the uncertainty but did not describe any adjustment to the reported average temperature. To make an urbanization assessment for all the stations used in the HadCRUT dataset would require suitable meta-data (population, siting, location, instrumentation, etc.) for each station for the whole period since 1850. No such complete meta-data are available.

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The homepage for the NOAA temperature index here[43] cites Smith and Reynolds (2005) as authority. Smith and Reynolds in turn state that they use the same procedure as CRU: i.e. they make an allowance in the error-bars but do not correct the temperature index itself. The population of the world went from 1.5 to 6.5 billion in the 20th century, yet NOAA and CRU ignore population growth in the database with only a 0.05 to 0.1C uncertainty adjustment.

Steve McIntyre challenged Peterson (2003), who had said, "Contrary to generally accepted wisdom, no statistically significant impact of urbanization could be found in annual temperatures" here[44], by showing that the difference between urban and rural temperatures for Peterson's station set was 0.7 C° and between temperatures in large cities and rural areas 2 C°. He has done the same for Parker (2006) here[45].

Runnalls and Oke (2006) concluded that –

> "Gradual changes in the immediate environment over time, such as vegetation growth or encroachment by built features such as paths, roads, runways, fences, parking lots, and buildings into the vicinity of the instrument site, typically lead to trends in the series.
>
> "Distinct régime transitions can be caused by seemingly minor instrument relocations (such as from one side of the airport to another or even within the same instrument enclosure) or due to vegetation clearance. This contradicts the view that only substantial station moves involving significant changes in elevation and/or exposure are detectable in temperature data."

[43] http://www.ncdc.noaa.gov/oa/climate/research/anomalies/anomalies.html.
[44] http://climateaudit.org/2007/08/04/1859/.
[45] http://climateaudit.org/2007/06/14/parker-2006-an-urban-myth/.

Numerous other peer-reviewed papers and other studies have found that the lack of adequate urban heat-island and local land use change adjustments could account for up to half of all apparent warming in the terrestrial temperature record since 1900.

Siberia is one of the areas of greatest apparent warming in the record. Besides station dropout and a tenfold increase in missing monthly data, numerous problems exist with prior temperatures in the Soviet era. City and town temperatures determined allocations for funds and fuel from the Supreme Soviet, so it is believed that cold temperatures were exaggerated in the past. This exaggeration in turn led to an apparent warming when more honest measurements began to be made. Anthony Watts has found that in many Russian towns and cities heating pipes[46] are in the open. Any sensors near these pipes would be affected.

Numerous other peer-reviewed papers and other studies have found that the lack of adequate urban heat-island and local land use change adjustments could account for up to half of all apparent warming in the terrestrial temperature record since 1900.

The physical discomfort and danger to observers in extreme environments led to some estimations or fabrications being made in place of real observations, especially in the brutal Siberian winter. See this report[47]. This was said to be true also in Canada along the Dewline (The Distant Early Warning Line) where radars were set up to detect incoming Soviet bombers during the Cold War.

McKitrick and Michaels (2004) gathered weather station records from 93 countries and regressed the spatial pattern of trends on a matrix of local climatic variables and socioeconomic indicators such as income, education, and energy use. Some of the non-climatic variables yielded significant coefficients, indicating a significant contamination of the temperature record by non-climatic influences, including poor data quality.

The two authors repeated the analysis on the IPCC gridded data covering the same locations. They found that approximately the same coefficients emerged. Though the discrepancies were smaller, many individual indicators remained significant. On this basis they were able to rule out the hypothesis that there are no significant non-climatic biases in the data. Both de Laat and Maurellis and McKitrick and Michaels concluded that non-climatic influences add up to a substantial warming bias in measured mean global surface temperature trends.

[46] http://wattsupwiththat.com/2008/11/15/giss-noaa-ghcn-and-the-odd-russian-temperature-anomaly-its-all-pipes.

[47] http://wattsupwiththat.com/2008/07/17/fabricating-temperatures-on-the-dew-line/.

Ren et al (2007), in the abstract of a paper on the urban heat-island effect in China, published in *Geophysical Research Letters*, noted that "annual and seasonal urbanization-induced warming for the two periods at Beijing and Wuhan stations is also generally significant, with the annual urban warming accounting for about 65-80% of the overall warming in 1961-2000 and about 40-61% of the overall warming in 1981-2000."

This result, along with the previous researches, indicates a need to pay more attention to the urbanization-induced bias that appears to exist in the current surface air temperature records.

Numerous recent studies show the effects of urban anthropogenic warming on local and regional temperatures in many diverse, even remote, locations. Block *et al*., (2004) showed effects across central Europe. Zhou *et al*. (2004) and He *et al*. (2005) across China, Velazquez-Lozada *et al*. (2006) across San Juan, Puerto Rico, and Hinkel *et al*., (2003) even in the village of Barrow, Alaska. In all cases, the warming was greatest at night and in higher latitudes, chiefly in winter.

Kalnay and Cai (2003) found regional differences in US data but overall very little change and if anything a slight decrease in daily maximum temperatures for two separate 20-year periods (1980-1999 and 1960-1979), and a slight increase in night-time readings. They found these changes consistent with both urbanization and land-use changes from irrigation and agriculture.

Christy et al. (2006) showed that temperature trends in California's Central Valley had significant nocturnal warming and daytime cooling over the period of record. The conclusion is that, as a result of increases in irrigated land, daytime temperatures are suppressed owing to evaporative cooling and nighttime temperatures are warmed in part owing to increased heat capacity from water in soils and vegetation. Mahmood *et al.* (2006b) also found similar results for irrigated and non-irrigated areas of the Northern Great Plains.

"Fully correcting the surface temperature data for non-climatic effects reduce the estimated 1980-2002 global average temperature trend over land by about half."

Two Dutch meteorologists, Jos de Laat and Ahilleas Maurellis, showed in 2006 that climate models predict there should be no correlation between the spatial pattern of warming in climate data and the spatial pattern of industrial development. But they found that this correlation does exist and is statistically significant. They also concluded it adds a large upward bias to the measured global warming trend.

Ross McKitrick and Patrick Michaels in December 2007 showed a strong correlation between urbanization indicators and the "urban adjusted"

temperatures, indicating that the adjustments are inadequate. Their conclusion is: "Fully correcting the surface temperature data for non-climatic effects reduce the estimated 1980-2002 global average temperature trend over land by about half."

As Pielke (2007) also notes –

> "Changnon and Kunkel (2006) examined discontinuities in the weather records for Urbana, Illinois, a site with exceptional metadata and concurrent records when important changes occurred. They identified a cooling of 0.17°C caused by a non-standard height shelter of 3 m from 1898 to 1948. After that there was a gradual warming of 0.9°C as the University of Illinois campus grew around the site from 1900 to 1983. This was followed by an immediate 0.8°C cooling when the site moved 2.2 km to a more rural setting in 1984. A 0.3°C cooling took place with a shift in 1988 to Maximum-Minimum Temperature systems, which now represent over 60% of all USHCN stations. The experience at the Urbana site reflects the kind of subtle changes described by Runnalls and Oke (2006) and underscores the challenge of making adjustments to a gradually changing site."

A 2008 paper[48] by Hadley's Jones *et al*, has shown a considerable contamination in China, amounting to 1 degree C per century. This is an order of magnitude greater than the amount previously assumed (0.05-0.1 C/century uncertainty).

In a 2009 article[49], Brian Stone of Georgia Tech wrote –

> "Across the US as a whole, approximately 50 percent of the warming that has occurred since 1950 is due to land use changes (usually in the form of clearing forest for crops or cities) rather than to the emission of greenhouse gases. Most large US cities, including Atlanta, are warming at more than twice the rate of the planet as a whole. This is a rate that is mostly attributable to land use change."

GISS Global Urban Heat-island Adjustments

Is NASA better? Steve McIntyre has taken an in-depth look at the data adjustments made to NASA's GISS global dataset. The findings are summarized very well in *Correct the Correction,* by Ken Gregory of Friends of Science –

> "NASA's Goddard Institute of Space Studies publishes a global temperature index. The temperature record is contaminated by the effects of urban development and land use changes. NASA applies an 'urbanization adjustment' to adjust the temperature histories to eliminate these effects. The resulting GISS temperature index is supposed to represent what the temperatures would have been in the absence of urbanization and land use changes. Most scientists assume that these adjustments are done correctly.

"An audit by researcher Steve McIntyre reveals that NASA has made urban adjustments of temperature data in its GISS temperature record in the wrong direction."

[48] http://www.warwickhughes.com/blog/?p=204.
[49] http://www.gatech.edu/newsroom/release.html?nid=47354.

> "An audit by researcher Steve McIntyre reveals that NASA has made urban adjustments of temperature data in its GISS temperature record in the wrong direction. The urban adjustment is supposed to remove the effects of urbanization. Instead the NASA negative adjustments increase the urbanization effects. The result is that the surface temperature trend utilized by the International Panel on Climate Change (IPCC) is exaggerated."

Outside of the USA, southern Canada and northern Mexico, GISS uses population data to define rural stations –

> "We use the definition of Peterson et al 1997 for these categories: that is, rural areas have a recent population of less than 10,000, small towns between 10,000 and 50,000 and urban areas more than 50,000. These populations refer to approximately 1980."

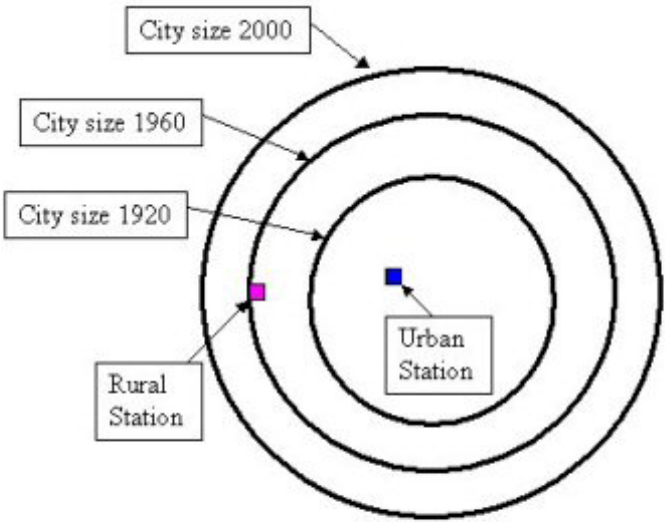
The GISS sites are defined to be "rural" if the town has a population under 10,000. Unfortunately, the GISS population data are out of date. Stations at cities with populations greatly exceeding 10,000 are incorrectly classified as rural. For example, in Peru there are 13 stations classified as rural. Of these, one station is located at a city with a population of 400,000. Five are at cities with populations from 50,000-135,000.

The GISS sites are defined to be "rural" if the town has a population under 10,000. Unfortunately, the GISS population data are out of date. Stations at cities with populations greatly exceeding 10,000 are incorrectly classified as rural.

Steve McIntyre says –

> "If the supposedly 'rural' comparanda are actually 'urban' or 'small towns' within the Hansen definitions, the GISS 'adjustment' ends up being a … meaningless adjustment of one set of urban values by another set of urban values. No wonder these adjustments seem so random."

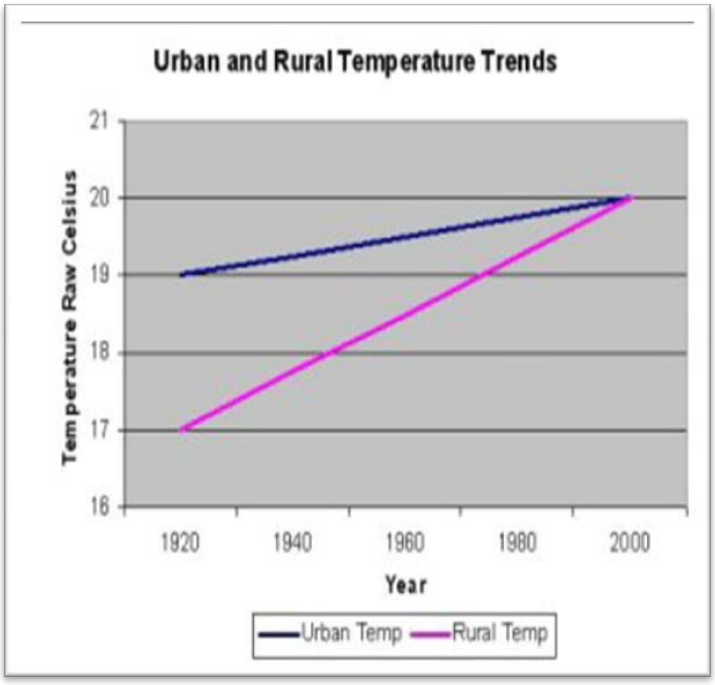
A population increase of 500 in a town of 2000 people would have a much larger effect on temperature measurements than the same increase in a city of 500,000 people. A city with a growing population generally increases its area. A temperature station inside the city would be little affected by the expansion of the suburbs. However, a temperature station located just outside a city would be greatly affected by the city expanding around the station –



A hypothetical urban station is shown in a city. A rural station is outside the city in 1920.

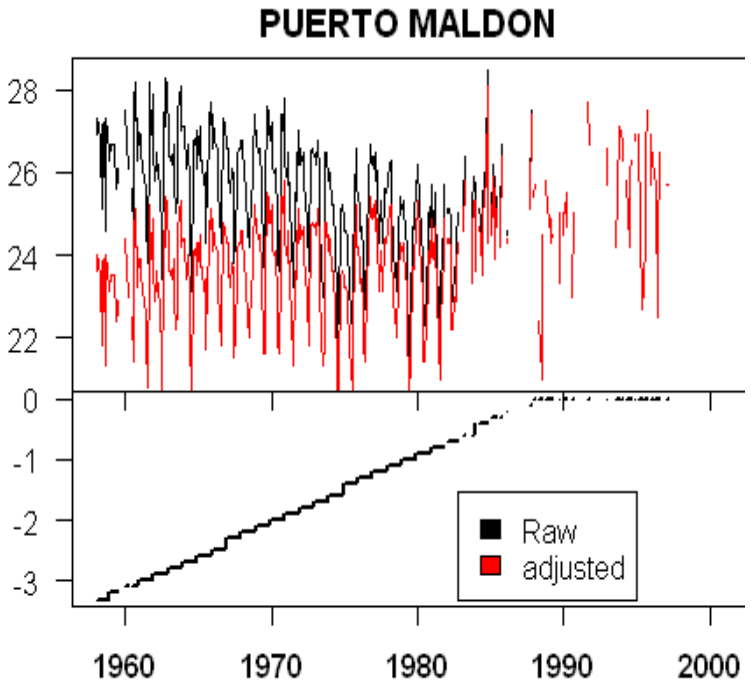
By 1960, the city has grown out to reach the rural station. The city's growth has little effect on the urban station but a much larger affect on the rural station.

By 2000 the rural station is completely surrounded by the city, so it has the same temperature as the urban station –



Now, as indicated in the graph, the unadjusted rural temperature trend is much greater than the urban station trend. According to the urban adjustment procedure, the urban station trend is increased to match the rural station trend by reducing the past temperatures.

Here is an example of an urban negative adjustment from Peru:



Note that the raw data show no warming trend, but after applying the GISS urban adjustment the adjusted data show a significant warming trend. The adjustments are applied to reduce the past temperatures by up to 3 degrees Celsius. This is a very large adjustment when compared to the total warming of the twentieth century of 0.6 Celsius estimated by the IPCC.

A proper urban correction algorithm would reduce the warming trends of both stations to make an adjusted temperature record represent what would have happened if nobody had lived near the stations.

In many examples we found increased warming trends were accomplished by "cooling" older time periods. This is what NCAR's Tom Wigley refers to as the "warm blip" in the 1940s.

In many examples we found increased warming trends were accomplished by "cooling" older time periods.

The many studies in this area convincingly show that urban "corrections" fail to correct for the effects of urbanization, but do not indicate why the corrections fail. The audit of GISS urban adjustments by Steve McIntyre answers this question.

FINAL ADJUSTMENTS – HOMOGENIZATION

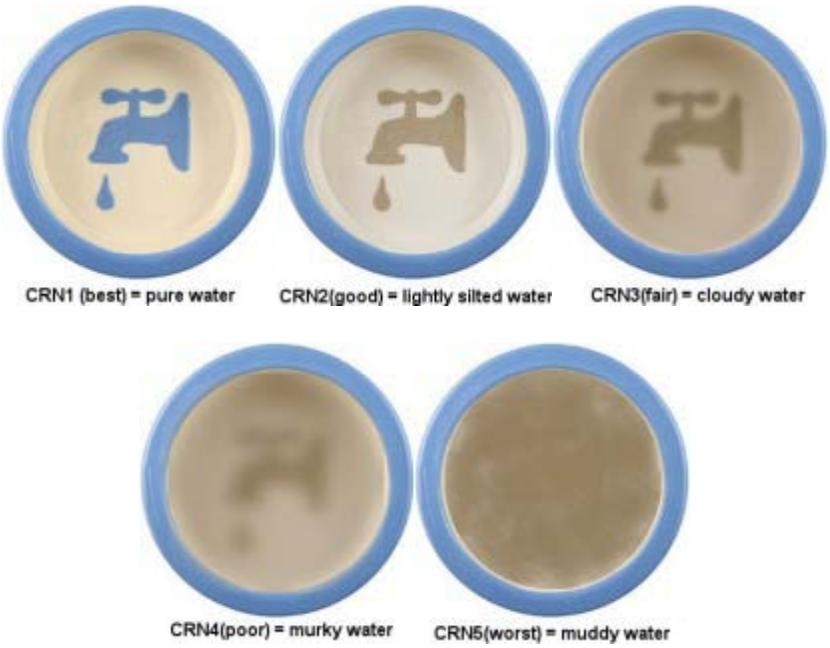
Dr., William Briggs in a 5 part series on the NOAA/NASA process of homogenization on his blog here[50] noted the following: *"At a loosely determined geographical spot over time, the data instrumentation might have changed, the locations of instruments could be different, there could be more than one source of data, or there could be other changes. The main point is that there are lots of pieces of data that some desire to stitch together to make one whole.*

Why?

I mean that seriously. Why stitch the data together when it is perfectly useful if it is kept separate? By stitching, you introduce error, and if you aren't careful to carry that error forward, the end result will be that you are far too certain of yourself. And that condition - unwarranted certainty - is where we find ourselves today."

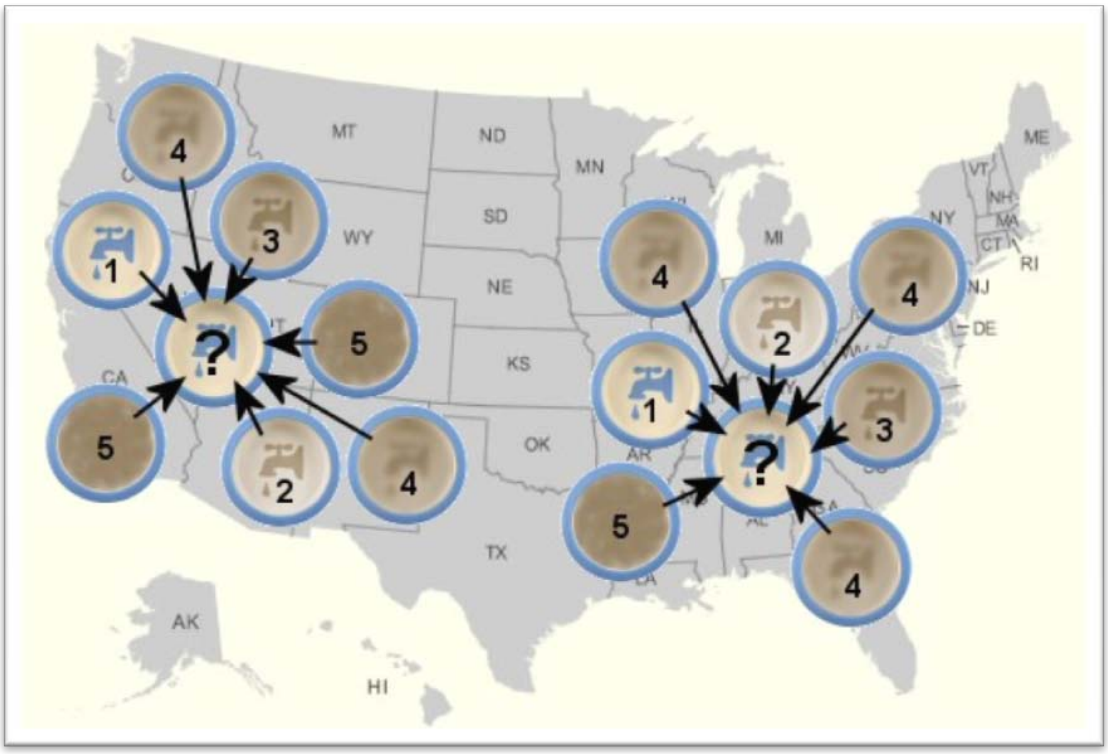
It has been said by NCDC in Menne et al *"On the reliability of the U.S. surface temperature record*" (in press) and in the June 2009[51] "Talking Points: related to "Is the U.S. Surface Temperature Record Reliable?" that station siting errors do not matter. However, the way NCDC conducted the analysis gives a false impression because of the homogenization process used.

Here's a way to visualize the homogenization process. Think of it like measuring water pollution. Here's a simple visual table of CRN station quality ratings and what they might look like as water pollution turbidity levels, rated as 1 to 5 from best to worst turbidity:



[50] http://wmbriggs.com/blog/?p=1459.
[51] www.ncdc.noaa.gov/oa/about/response-v2.pdf.

In homogenization the data is weighted against the nearby neighbors within a radius. And so a station might start out as a "1" data wise, might end up getting polluted with the data of nearby stations and end up as a new value, say weighted at "2.5". Even single stations can affect many other stations in the GISS and NOAA data homogenization methods carried out on US surface temperature data here[52] and here[53].

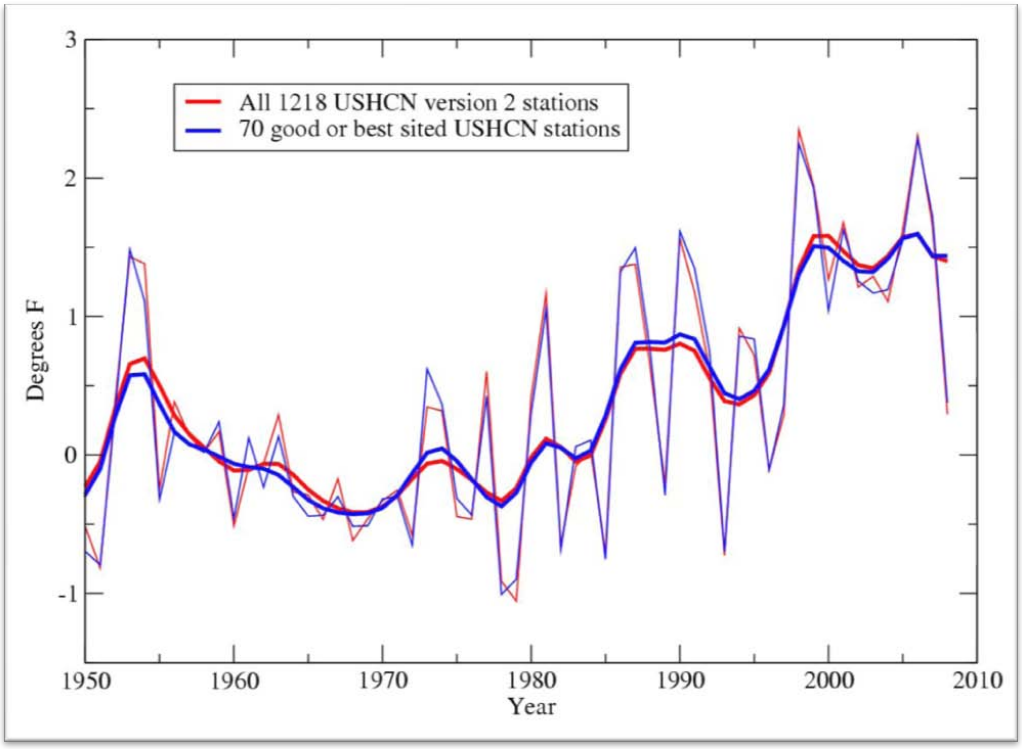


In the map above, applying a homogenization smoothing, weighting stations by distance nearby the stations with question marks, what would you imagine the values (of turbidity) of them would be? And, how close would these two values be for the east coast station in question and the west coast station in question? Each would be closer to a smoothed center average value based on the neighboring stations.

Essentially, NCDC is comparing *homogenized data* to *homogenized data*, and thus there would *not* likely be any large difference between "good" and "bad" stations in that data. All the differences have been smoothed out by homogenization (pollution) from neighboring stations!

The best way to compare the effect of siting between groups of stations is to use the "raw" data, before it has passed through the multitude of adjustments that NCDC performs. However NCDC is apparently using homogenized data. So instead of comparing apples and oranges (poor sited -vs- well sited stations) they essentially just compare apples (Granny Smith -vs- Golden delicious) of which there is little visual difference beyond a slight color change.

[52] http://wattsupwiththat.com/2009/07/20/and-now-the-most-influential-station-in-the-giss-record-is/.
[53] http://wattsupwiththat.com/2008/09/23/adjusting-pristine-data/.



From NCDC's "talking points" rebuttal - click for larger image.

They cite 60 years of data in the graph they present, ignoring the warmer 1930's. They also use an early and incomplete surfacestations.org dataset, that was never intended for analysis, in their rush to rebut the issues raised. However, our survey most certainly cannot account for changes to the station locations or station siting quality any further back than about 30 years. By NCDC's own admission, (see Quality Control of pre-1948 Cooperative Observer Network Data[54]) they have little or no metadata posted on station siting much further back than about 1948 on their MMS metadatabase. Clearly, siting quality is dynamic over time.

The other issue about siting that NCDC does not address is that it is a significant contributor to extreme temperature records. By NOAA's own admission in PCU6 - Unit No. 2 Factors Affecting the Accuracy and Continuity of Climate Observations[55] such siting issues as the rooftop weather station in Baltimore contributed many erroneous high temperature records, so many in fact that the station had to be closed.

NOAA wrote about the Baltimore station:

A combination of the rooftop and downtown urban siting explain the regular occurrence of extremely warm temperatures. Compared to nearby ground-level instruments and nearby airports and surrounding COOPs, it is clear that a strong warm bias exists, partially because of the rooftop location.

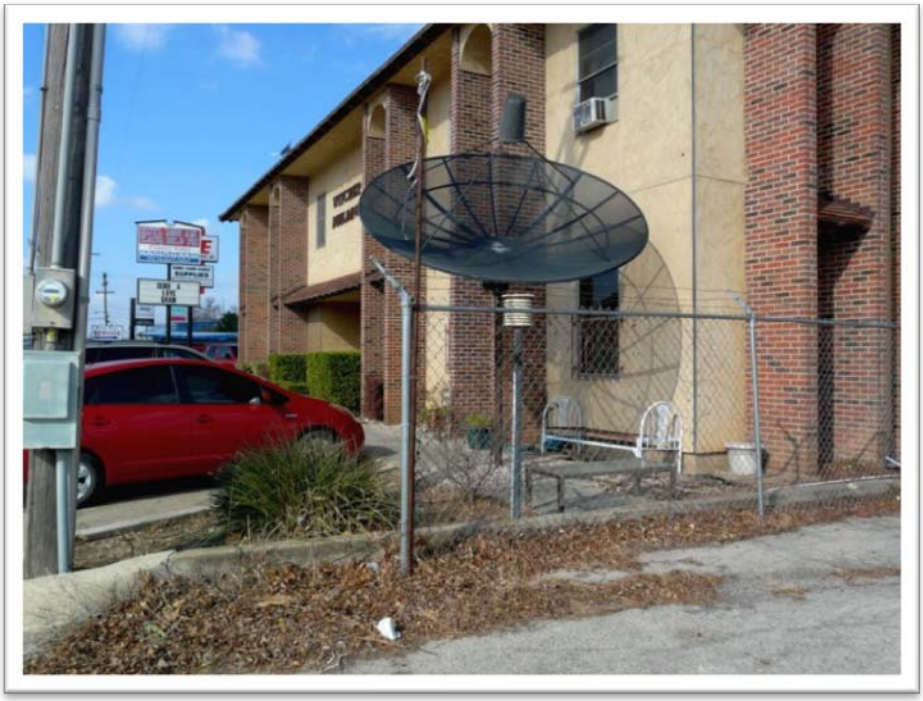
[54] http://ams.confex.com/ams/pdfpapers/68379.pdf.
[55] http://www.weather.gov/om/csd/pds/PCU6/IC6_2/tutorial1/PCU6-Unit2.pdf.

Maximum and minimum temperatures are elevated, especially in the summer. The number of 80 plus minimum temperatures during the one-year of data overlap was 13 on the roof and zero at three surrounding LCD airports, the close by ground-based inner Baltimore harbor site, and all 10 COOPs in the same NCDC climate zone. Eighty-degree minimum are luckily, an extremely rare occurrence in the mid-Atlantic region at standard ground-based stations, urban or otherwise.

Clearly, siting does matter, and siting errors have contributed to the temperature records of the United States, and likely the world GHCN network. Catching such issues isn't always as easy as NOAA demonstrated in Baltimore.

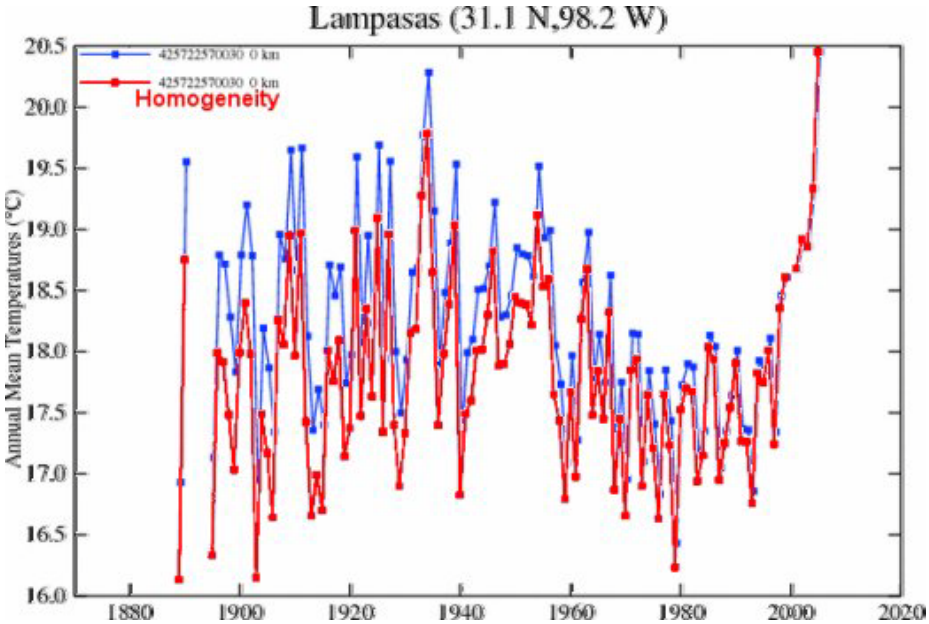
Baltimore USHCN station circa 1990's photo, courtesy NOAA.

There is even some evidence that the change point algorithm does not catch some site changes it should catch and that homogenization doesn't help. Take, for example, Lampasas, Texas, as identified by Anthony Watts.



Photograph by Julie K. Stacy, courtesy of surfacestations.org.

The site at Lampasas, TX, moved close to a building and a street from a more appropriate grassy site after 2001. Note even with the GISS "homogeneity" adjustment (red) applied to the NOAA adjusted data, this artificial warming remains although the old data (blue) is cooled to accentuate warming even further.



The net result is to make the recent warm cycle maximum more important relative to the earlier maximum in the 1930s, and note the sudden warm blip after the station move remains.

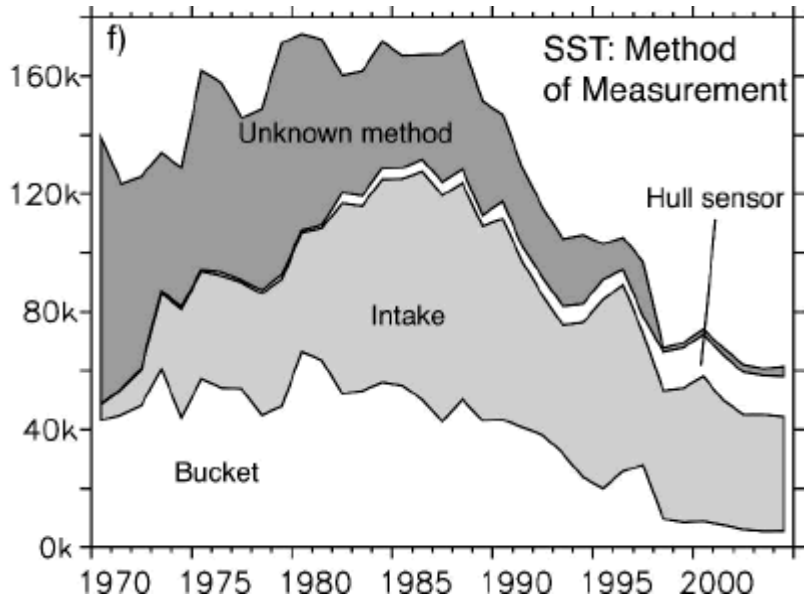
This final data set is then used to populate a global grid, interpolating up to 1200 km (745 miles) to a grid boxes that had become now vacant by the elimination of stations.

Often the data centers look to stations at lower latitudes, and/or lower elevations and that were often more urban or affected by land use changes (such as at airports) to determine the latest monthly values. Then anomalies are computed by differencing from the base period averages.

The data is then used for estimating the global average temperature and anomaly and for initializing or validating climate models. Interestingly the very same often coolest stations that were, in last two decades, deleted from the world climate network were retained for computing the average temperature in the base periods for each grid box. This also would indicate a deliberate attempt to create a warm bias because in calculating the average temperatures in this way it would ensure that the global average temperature for each month and year would now show a positive temperature anomaly.

PROBLEMS WITH SEA SURFACE TEMPERATURE MEASUREMENTS

The world is 71% ocean. The Hadley Centre only trusts data from British merchant ships, mainly plying northern hemisphere routes. Hadley has virtually no data from the southern hemisphere's oceans, which cover four-fifths of the hemisphere's surface. NOAA and NASA use ship data reconstructions. The gradual change from taking water in canvas buckets to taking it from engine intakes introduces uncertainties in temperature measurement. Different sampling levels will make results slightly different. How to adjust for this introduced difference and get a reliable dataset has yet to be resolved adequately, especially since the transition occurred over many decades. The chart, taken from Kent (2007), shows how methods of ocean-temperature sampling have changed over the past 40 years –



We have reanalysis data based on reconstructions from ships, from buoys (which also have problems with changing methodology) and, in recent decades, from satellites. The oceans offer some opportunity for mischief, as the emails released by the Climategate whistleblower showed clearly.

Satellite input was removed (Smith et. al., 2008) by NOAA in July 2009 after complaints of a cold bias in the southern hemisphere. The immediate result was a sharp increase in ocean and ocean/land global temperatures. The result was that NOAA claimed that July and August 2009 had the warmest water temperatures on record, with a jump of about 0.24C. This added 0.15 C to global mean temperatures.

In addition, as now detailed in the SPPI report by Dr. David Evans here[56]:

> There has been a change in direction by the climate alarmists, as shown by their new "Synthesis Report"[57] (June 2009). They now emphasize ocean temperatures and ocean heat content, and pay scant attention to air temperature. Their new argument is that most of the heat in the climate system (water, air, ice, and snow) is stored in the oceans, so the ocean temperature is "a better indicator of change in the climate" than the air temperature. This argument is correct (as supported by DiPuccio 2009[58] and originally suggested by Pielke Sr. in 2003 and again in 2007 on his blog, A Litmus Test for Global Warming). The problem is that ocean temperatures have only been measured adequately since mid 2003.
>
> Measuring ocean temperature globally is harder than it sounds. The Argo network[59] finally overcomes many of the prior problems, but only became operational in mid-2003.
>
> Before Argo, starting in the early 1960s, ocean temperatures were measured with bathythermographs (XBTs). They are expendable probes fired into the water by a gun, that transmit data back along a thin wire. They were nearly all launched from ships along the main commercial shipping lanes, so geographical coverage of the world's oceans was poor—for example the huge southern oceans were not monitored. XBTs do not go as deep as Argo floats, and their data is much less accurate (Met Office[60], Argo[61]).

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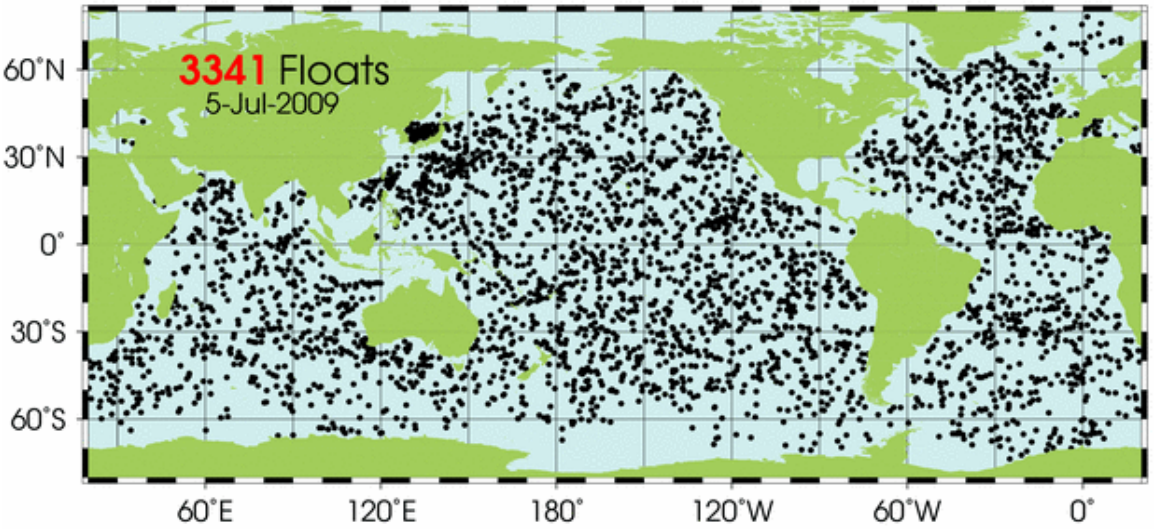
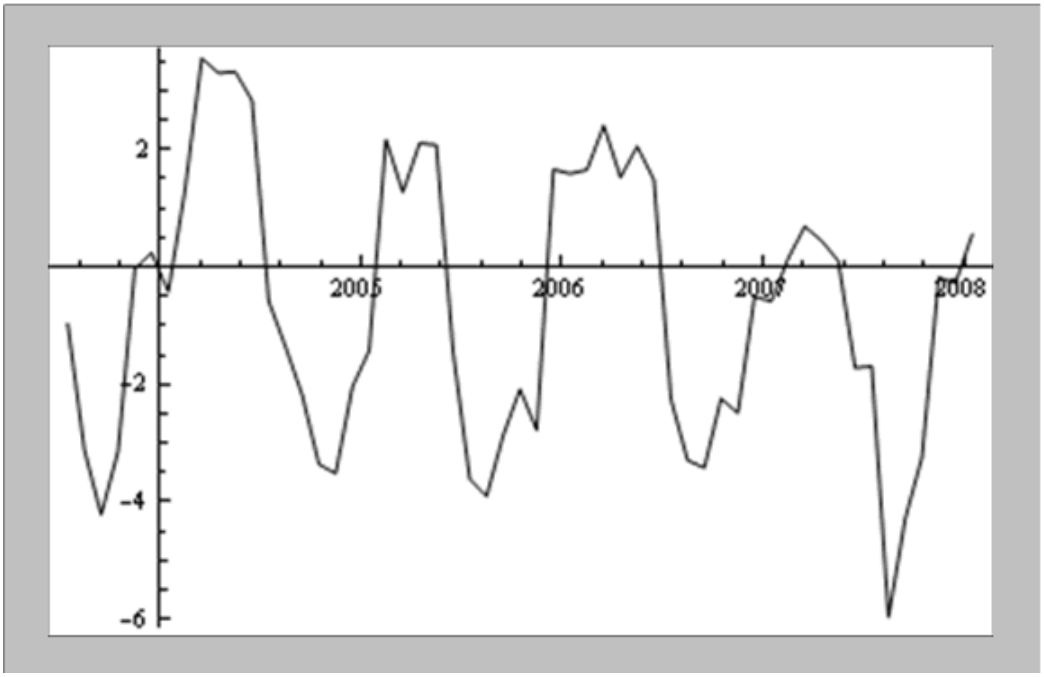
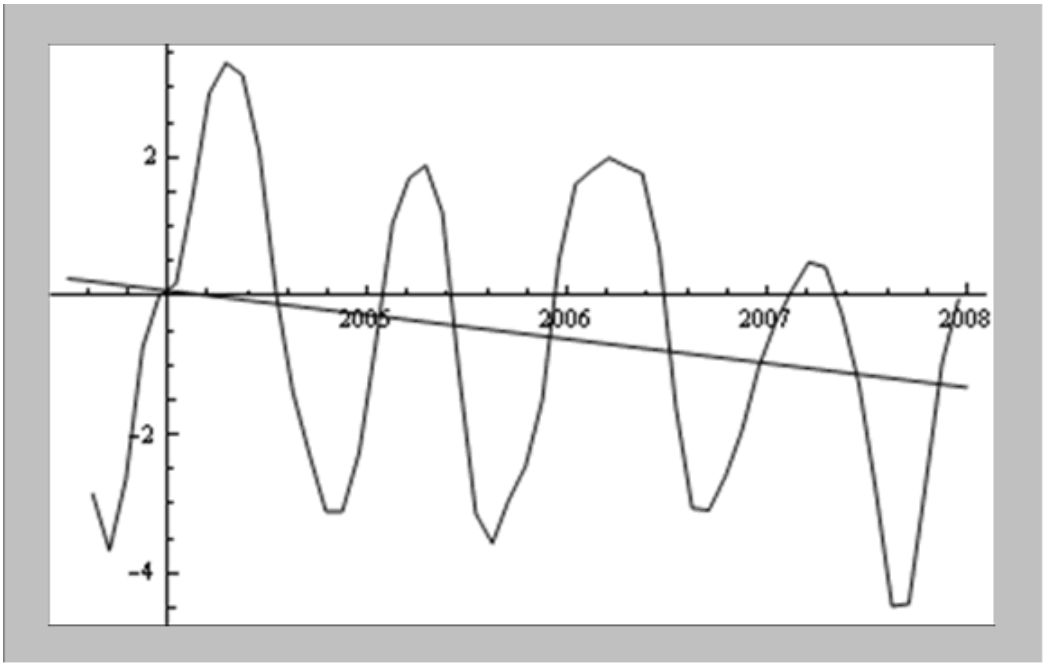
[56] http://scienceandpublicpolicy.org/images/stories/papers/originals/ocean_temps.pdf.
[57] http://climatecongress.ku.dk/pdf/synthesisreport/.
[58] http://pielkeclimatesci.wordpress.com/2009/05/05/have-changes-in-ocean-heat-falsified-the-global-warming-hypothesis-a-guest-weblog-by-william-dipuccio/.
[59] http://www.argo.ucsd.edu/About_Argo.html.
[60] http://www.metoffice.gov.uk/weather/marine/observations/gathering_data/argo.html.
[61] http://wwlw.argo.ucsd.edu/Novel_argo.html.



The Argo data shows that the oceans have been in a slight cooling trend since at least late-2004, and possibly as far back as mid-2003 when the Argo network started.



The ocean heat content from mid 2003 to early 2008, as measured by the Argo network, for 0 – 700 meters. The unit of the vertical axis is 1022 Joules (about 0.01°C). This shows the recalibrated data, ***after*** *the data from certain instruments with a cool bias were removed (initial Argo results showing strong cooling).*



The Argo data smoothed, with a line of best fit. The line is dropping at -0.35 x 1022 Joules per year (about 0.035°C per decade) Loehle (2009).

Josh Willis of NASA's Jet Propulsion Laboratory, in charge of the Argo data, said in March 2008 on NPR: "There has been a very slight cooling, but not anything really significant".

The ocean data that the alarmists are relying on to establish their warming trends is all pre-Argo; it all comes from the old, less accurate XBTs. Now that we are measuring ocean temperatures properly, the warming trend has disappeared. And by coincidence, it disappeared just when we started measuring it properly! There is a large ocean temperature rise reported in the two years before Argo became available—might there have been a calibration problem between the old data and the Argo data? Could the old ocean temperature data have been subject to "corrections", like the GISS air temperature data?

The Argo data originally showed a strong cooling trend. Josh Willis was surprised at the results: "every body was telling me I was wrong", because it didn't agree with the climate models or satellite observations of net radiation flux. Willis decided to recalibrate the Argo data by omitting readings from some floats that seemed to be giving readings that were too cold. The Argo results shown above are for the new, current data, ***after*** those recalibrations were made.

There is a problem with data in the politicized world of climate science: alarmists have all the authority positions in climate science and own (manage) all the datasets. Datasets that contradict the alarmist theory have a habit of being recalibrated or otherwise adjusted for technical reasons, and the changes to the datasets always make them more supportive of the alarmist theory."

Also, there is NO use of the Argo buoy data in the global monthly assessments.

SUMMARY

Just as the Medieval Warm Period was an obstacle to those trying to suggest that today's temperature is exceptional, and the UN and its supporters tried to abolish it with the "hockey-stick" graph, the warmer temperatures in the 1930s and 1940s were another inconvenient fact that needed to be "fixed".

Just as the Medieval Warm Period was an obstacle to those trying to suggest that today's temperature is exceptional, and the UN and its supporters tried to abolish it with the "hockey-stick" graph, the warmer temperatures in the 1930s and 1940s were another inconvenient fact that needed to be "fixed".

In each of the databases, the land temperatures from that period were simply adjusted downward, making it look as though the rate of warming in the 20th century was higher than it was, and making it look as though today's temperatures were unprecedented in at least 150 years.

Wigley[62] even went so far as to suggest that sea surface temperatures for the period should likewise be "corrected" downward by 0.15C, making the 20th-century warming trend look greater but still plausible. This is obvious data doctoring.

In the Climategate emails, Wigley also noted[63]:

> "Land warming since 1980 has been twice the ocean warming — and skeptics might claim that this proves that urban warming is real and important."

NOAA, then, is squarely in the frame. First, the unexplained major station dropout with a bias towards warmth in remaining stations and a process that increases the need to estimate data for regions where data was accessed before but not currently despite it being available and visible to all even on the internet. Next, the removal of the urbanization adjustment and lack of oversight and quality control in the siting of new instrumentation in the United States data base degrading what once was the world's best data set, USHCNv1. Then, ignoring a large body of peer review research demonstrating the importance of urbanization and land use changes to not include any urban adjustment for the global data set, GHCN.

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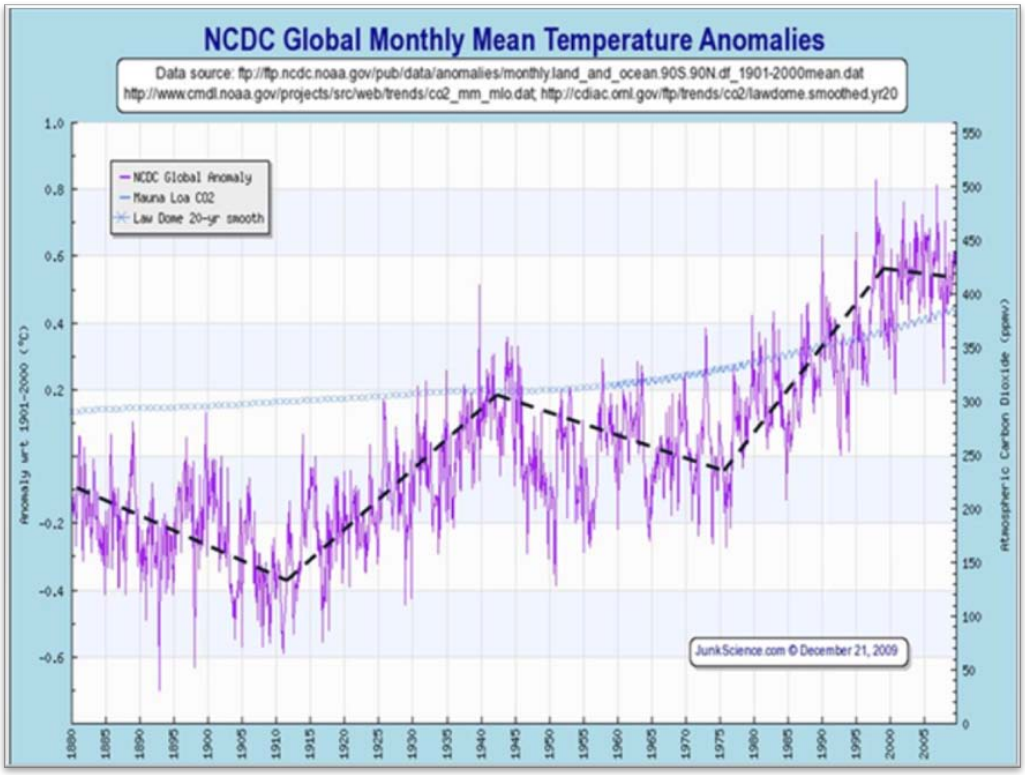
62 http://www.eastangliaemails.com/emails.php?eid=1016&filename=1254108338.txt.

63 http://www.eastangliaemails.com/emails.php?eid=1067&filename=1257546975.txt.

As shown, these and other changes that have been made, alter the historical record and mask cyclical changes that could be readily explained by natural factors like multidecadal ocean and solar changes (here[64]).



Is NASA in the clear? No. It works with the same GHCN/USHCN base data, (plus the SCAR data from Antarctica). To its credit, as we have shown it's US data base includes an urban adjustment that is reasonable, but as Steve McIntyre showed[65] for GHCN it uses population data and adjusts temperature records for cities in a warming direction as often as they do in a cooling direction.

NASA also constantly tampers with the data.

And their homogenization process and other non-documented final adjustments result in an increase in apparent warming, often by cooling the early record as can be seen in several case studies that follow.

NASA also constantly tampers with the data. John Goetz[66] showed that 20% of the historical record was modified 16 times in the 2½ years ending in 2007. 1998 and 1934 ping pong regularly between first and second warmest year as the fiddling with old data continues.

[64] http://icecap.us/images/uploads/ATMOSPHERIC_CIRCULATION.doc.
[65] http://icecap.us/images/uploads/US_AND_GLOBAL_TEMP_ISSUES.pdf.
[66] http://wattsupwiththat.com/2008/04/08/rewriting-history-time-and-time-again/.

NOAA USHCN was observed to gradually change after 1999 before version 2 was introduced. Anecdotal evidence also suggests GHCN V2 may have varied (including the Central Park Case Study). A new version of GHCN (V3) is said to be coming in 2010.

Climategate has sparked a flurry of examinations of the global datasets not only at CRU, NASA, and NOAA, but in various countries throughout the world. Though the Hadley Centre implied their data was in agreement with other datasets and was thus trustworthy, the truth is that other data centers and the individual countries involved are complicit in the data manipulation.

SECOND WARMEST YEAR (NASA), WARMEST DECADE EVER (NOAA) – NONSENSE!

Should you believe NOAA/NASA/HADLEY rankings for month and year? Definitively NO! Climate change is real, there are cooling and warming periods that can be shown to correlate nicely with solar and ocean cycles. You can trust in the data that shows there has been warming from 1979 to 1998, just as there was warming around 1920 to 1940. But there has been cooling from 1940 to the late 1970s and since 2001. It is the long term trend on which this cyclical pattern is superimposed that is exaggerated.

As shown, record highs in North America show the cyclical pattern but suggest the 1930s to 1940 peak was higher than the recent peak around 1998. Recent ranking was very likely exaggerated by the numerous data issues discussed. Given these data issues and the inconvenient truths in the Climategate emails, the claim that the 2000s was the warmest decade in a millennium or two is ludicrous.

These factors all lead to significant uncertainty and a tendency for overestimation of century-scale temperature trends. An obvious conclusion from all findings above and the case studies that follow is that the global data bases are seriously flawed and can no longer be trusted to assess climate trends. And, consequently, such surface data should not be used for decision making.

We enthusiastically support Roger Pielke Sr. who, after exchanges with Phil Jones over data sets, called for[67] *"an inclusive assessment of the surface temperature record of CRU, GISS and NCDC. We need to focus on the science issues. This necessarily should involve all research investigators who are working on this topic, with formal assessments chaired and paneled by mutually agreed to climate scientists who do not have a vested interest in the outcome of the evaluations."* We further suggest it should be extended to include UAH and RSS .

In addition, the reliance on the global data by both the UNIPCC and the US GCRP/CCSP requires a full investigation and audit.

[67] http://wattsupwiththat.com/2010/01/14/pielke-senior-correspondence-with-phil-jones-on-klotzbach-et-al/.

CASE STUDIES IN DATA MANIPULATION

A series of case studies illustrates the scale and frequency of data manipulation. In every instance, the effect of the tampering is to make it appear as though temperature has risen faster in the instrumental record than in truth it has. This is but a sampling. By the time you read this, there probably will be many more.

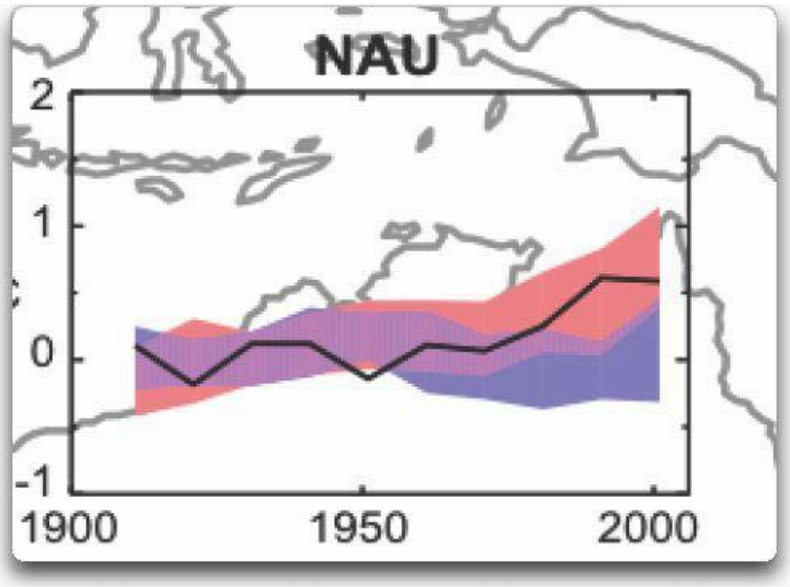
> ***In every instance, the effect of the tampering is to make it appear as though temperature has risen faster in the instrumental record than in truth it has.***

CASE 1: THE SMOKING GUN AT DARWIN ZERO

by Willis Eschenbach for Watts Up With That (posted here[68])

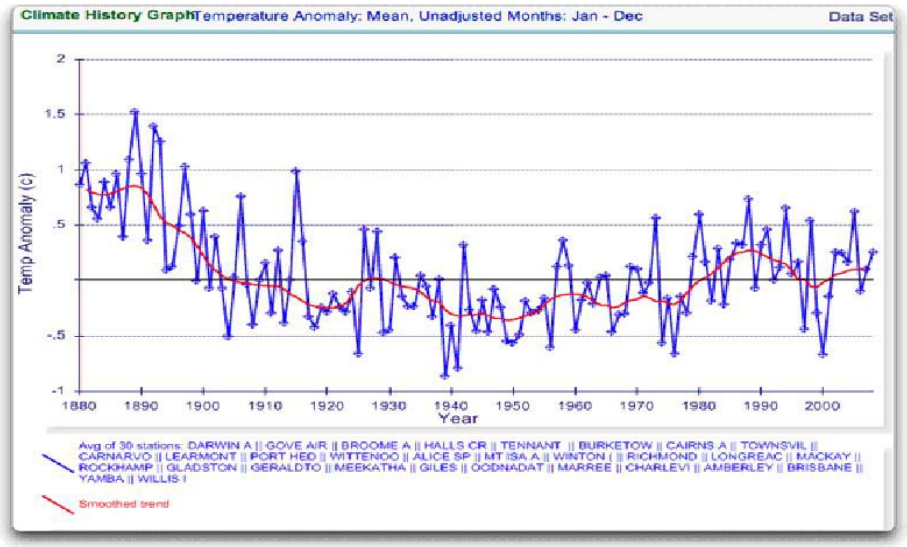
So I'm still on my multi-year quest to understand the climate data. You never know where this data chase will lead. This time, it has ended me up in Australia. NASA [GHCN] only presents 3 stations covering the period 1897-1992. What kind of data is the IPCC Australia diagram based on? If any trend it is a slight cooling. However, if a shorter period (1949-2005) is used, the temperature has increased substantially. The Australians have many stations and have published more detailed maps of changes and trends.

The folks at CRU told Wibjorn that he was just plain wrong. Here's what they said is right, the record that Wibjorn was talking about, Fig. 9.12 in the UN IPCC Fourth Assessment Report, showing Northern Australia (vertical axis is temperature anomaly in Celsius).

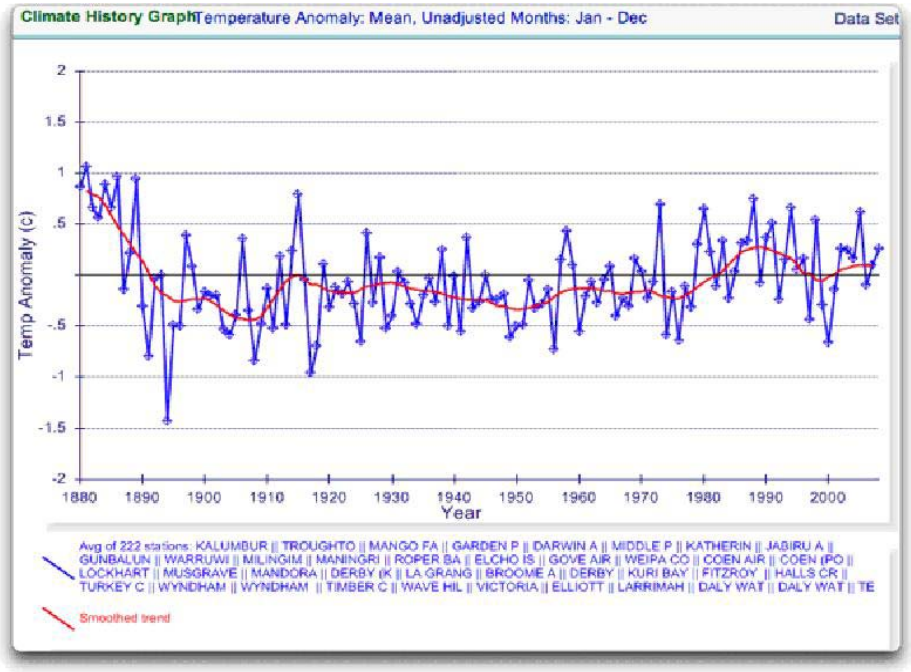


[68] http://wattsupwiththat.com/2009/12/08/the-smoking-gun-at-darwin-zero/.

Here are all 30 stations in the region as defined by the IPCC that contains temperature records that extend up to the year 2000 no matter when they started –



Still no similarity with IPCC. So I looked at every station in the area. That's 222 stations. Here's that result (below, enlarged here[69]) –



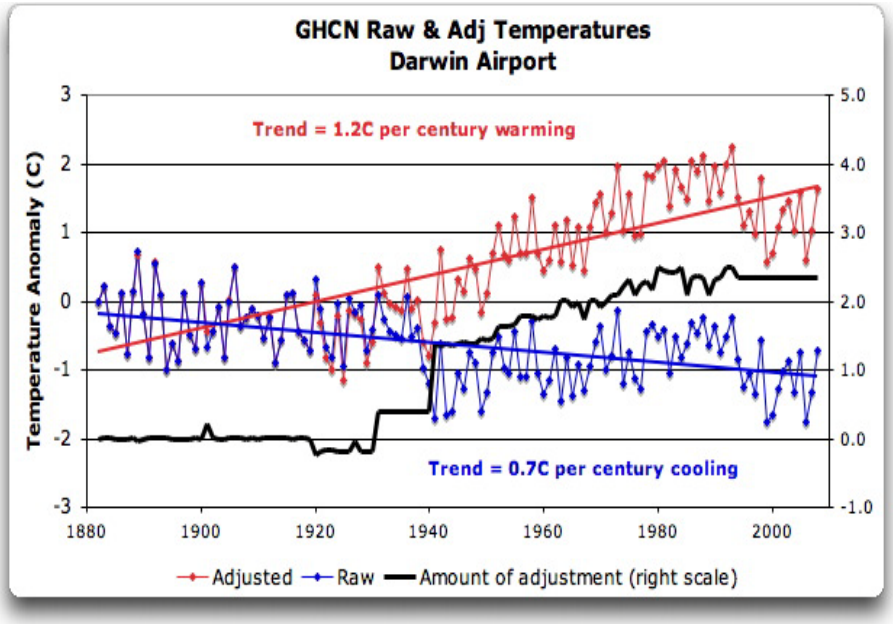
These graphs all use the raw GHCN data, and they show virtually no trend in temperatures in Northern Australia in 125 years.

These graphs all use the raw GHCN data, and they show virtually no trend in temperatures in Northern Australia in 125 years. However, the IPCC uses the "adjusted" data. GHCN adjusts the data to remove what it calls "inhomogeneities". So, on a whim I thought I'd take a look at the first station on the list, Darwin Airport, so I could see what an inhomogeneity might look like when it was at home.

[69] http://icecap.us/images/uploads/darwin_zero4.JPG.

Then I went to look at what happens when the GHCN "adjusts" the data to remove the "inhomogeneities". Of the five raw datasets, the GHCN discards two, probably because they are short and duplicate existing longer records. The three remaining records are first "homogenized" and then averaged to give the "GHCN Adjusted" temperature record for Darwin.

To my great surprise, here's what I found. To explain the full effect, I am showing this with both datasets starting at the same point (rather than ending at the same point as they are often shown).



Before the "adjustment" by NOAA, temperatures in Darwin were falling at 0.7 Celsius per century, but after the homogenization they were rising at 1.2 Celsius per century. The gross upward adjustment was 2 Celsius per century.

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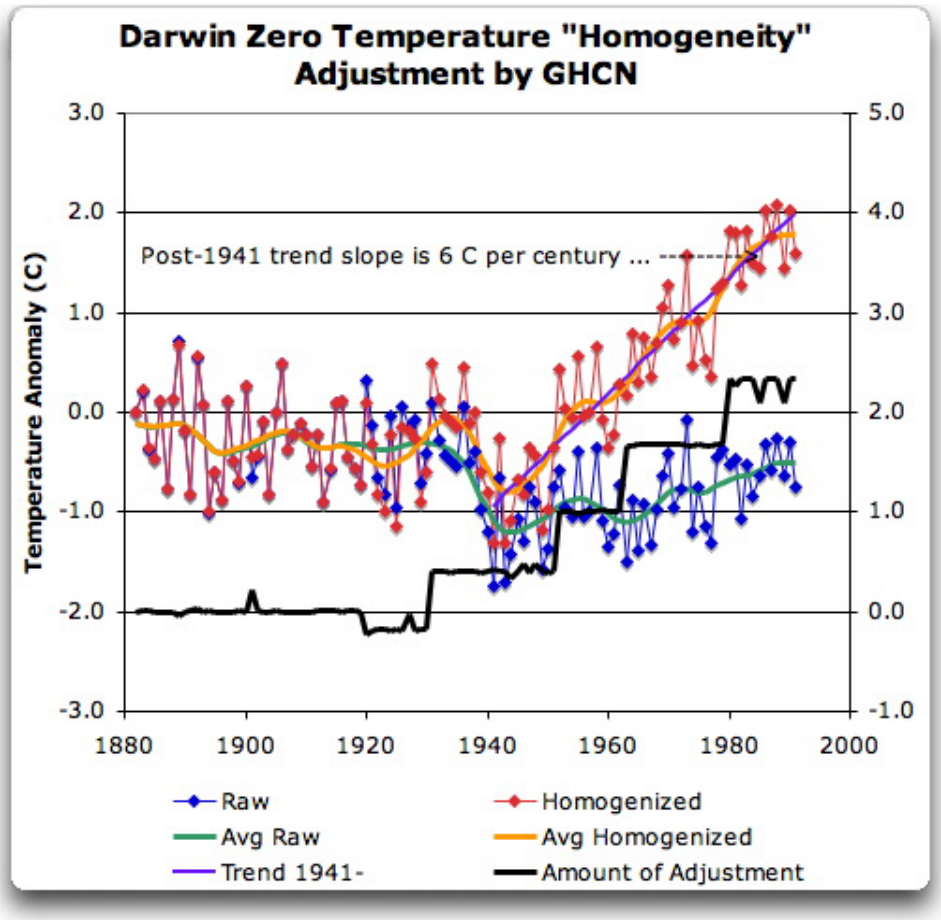
Intrigued by the curious shape of the average of the homogenized Darwin records, I then went to see how NOAA had homogenized each of the individual station records, starting with the earliest record. Here is Station Zero at Darwin, showing the raw and the homogenized versions –



It is difficult to justify adjustment on so very large a scale. We have five different records covering Darwin from 1941 on. They all agree almost exactly. Why adjust them at all? NOAA added a huge, artificial, imaginary trend to the most recent half of the raw data. Now it looks like the IPCC diagram. Note how the magnitude of the adjustment climbs in discrete steps like a ziggurat. What's up with that? See here[70].

CASE 2: NEW ZEALAND WARMS TO WARMING

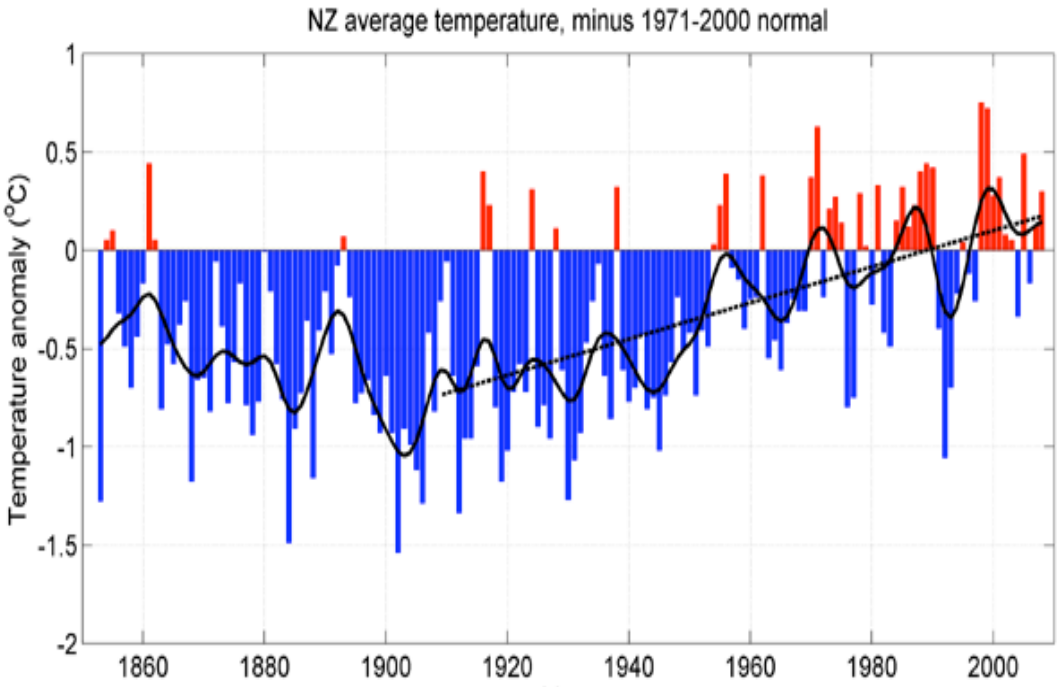
A study by the New Zealand Climate Science Coalition

There have been strident claims that New Zealand is warming. The UN's climate panel is not alone in alleging that, along with the rest of the world, New Zealand has been heating up for over 100 years.

But now, a simple check of publicly-available information proves these claims wrong. In fact, New Zealand's temperature has been remarkably stable for a century and a half. So what's going on?

[70] http://wattsupwiththat.com/2009/12/08/the-smoking-gun-at-darwin-zero/.

New Zealand's National Institute of Water & Atmospheric Research (NIWA) is responsible for New Zealand's National Climate Database. This database, available online, holds all of New Zealand's climate data, including temperature readings, since the 1850s. Anybody can go and get the data for free. That's what we did, and we made our own graph. Before we see that, let's look at the official temperature record. This is NIWA's graph of temperatures covering the last 156 years, from NIWA's website –



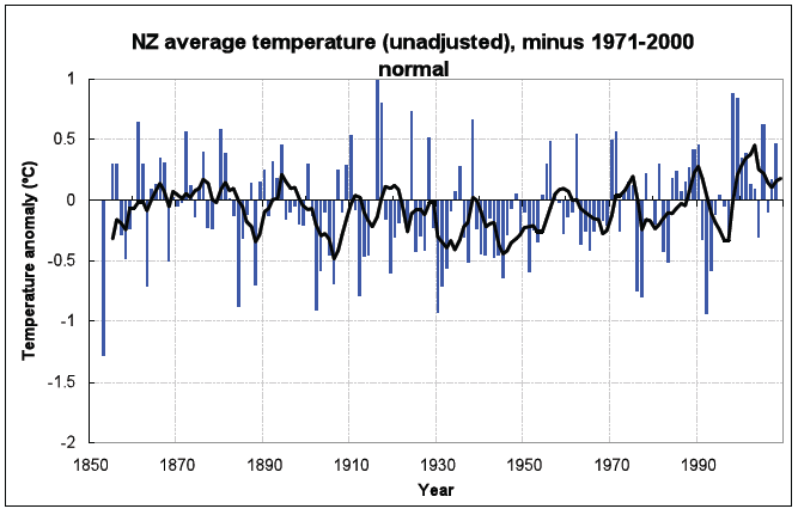
The graph shows mean annual temperature over New Zealand, from 1853 to 2008 inclusive, based on between two (from 1853) and seven (from 1908) long-term station records. The blue and red bars show annual differences from the 1971-2000 average, the solid black line is a smoothed time series, and the dotted straight line is the linear trend over 1909 to 2008 (0.92 C°/century).

This graph is the centerpiece of NIWA's temperature claims. It contributes to global temperature statistics and the IPCC reports. It is partly why our government is insisting on introducing an Emissions Trading Scheme (ETS) and participating in the climate conference in Copenhagen. But it's an illusion.

Dr Jim Salinger (who no longer works for NIWA) started this graph in the 1980s when he was at CRU (Climate Research Unit at the University of East Anglia, UK) and it has been updated with the most recent data. It's published on NIWA's website[71] and in their climate-related publications.

[71] http://www.niwa.co.nz/ourscience/climate/information-and-resources/clivar/pastclimate.

To get the original New Zealand temperature readings, you register on NIWA's web site, download what you want and make your own graph. We did that, but the result looked nothing like the official graph. Instead, we were surprised to get this:



Straight away you can see there's no slope - either up or down. The temperatures are remarkably constant way back to the 1850s. Of course, the temperature still varies from year to year, but the trend stays level - statistically insignificant at 0.06 C° per century since 1850. Putting these two graphs side by side, you can see huge differences. What is going on?

Why does NIWA's graph show strong warming, when graphing the raw data looks completely different? NIWA's graph shows warming, but the actual temperature readings show none whatsoever! Have the readings in the official NIWA graph been adjusted?

It is relatively easy to find out. We compared raw data for each station (from NIWA's web site) with the adjusted official data, which we obtained from one of Dr Salinger's colleagues. Requests for this information from Dr Salinger himself over the years, by different scientists, have long gone unanswered, but now we might discover the truth.

What did we find? First, the station histories are unremarkable. There are no reasons for any large corrections. But we were astonished to find that strong adjustments have indeed been made. About half the adjustments actually created a warming trend where none existed; the other half greatly exaggerated existing warming. All of the adjustments increased or even created a warming trend, with only one (Dunedin) going the other way and slightly reducing the original trend.

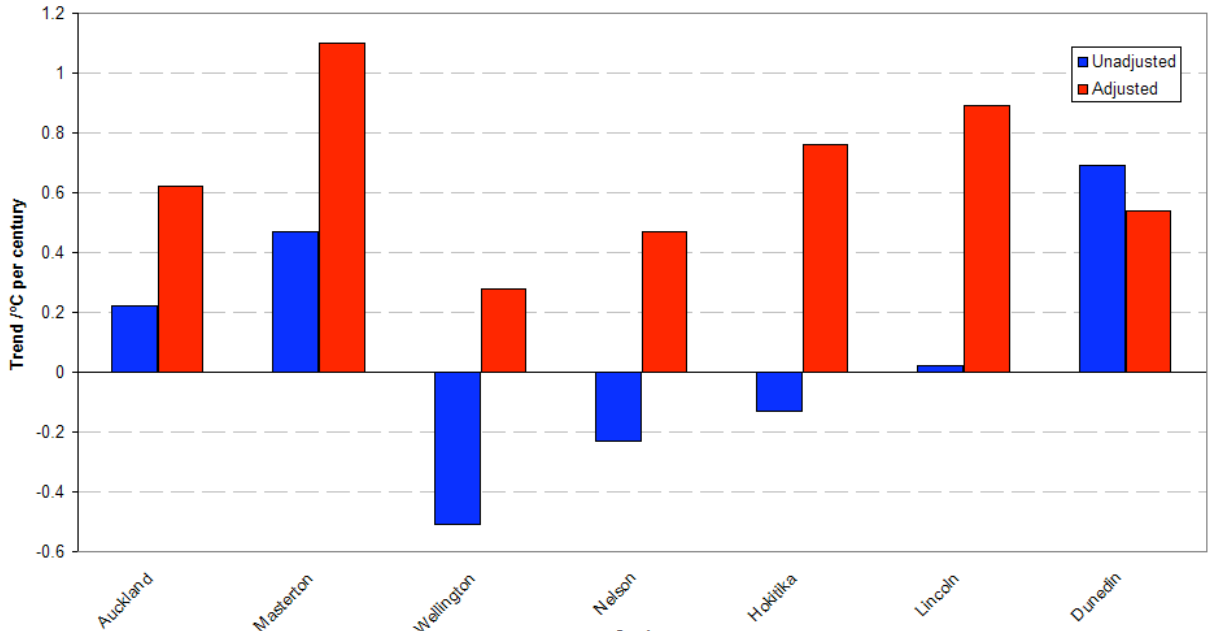
We were astonished to find that strong adjustments have indeed been made. About half the adjustments actually created a warming trend where none existed; the other half greatly exaggerated existing warming.

	Trend: °C per century		
Station	Unadjusted	Adjusted	Difference
Auckland	+0.22	+0.62	+0.40
Masterton	+0.47	+1.10	+0.63
Wellington	-0.51	+0.28	+0.79
Nelson	-0.23	+0.47	+0.70
Hokitika	-0.13	+0.76	+0.89
Lincoln	+0.02	+0.89	+0.87
Dunedin	+0.69	+0.54	-0.15

The shocking truth is that the oldest readings have been cranked way down and later readings artificially lifted to give a false impression of warming, as documented below. There is nothing in the station histories to warrant these adjustments. To date Dr Salinger and NIWA have not revealed why they did this.

The shocking truth is that the oldest readings have been cranked way down and later readings artificially lifted to give a false impression of warming.

The next graph shows **unadjusted** and **adjusted** temperature trends in New Zealand –



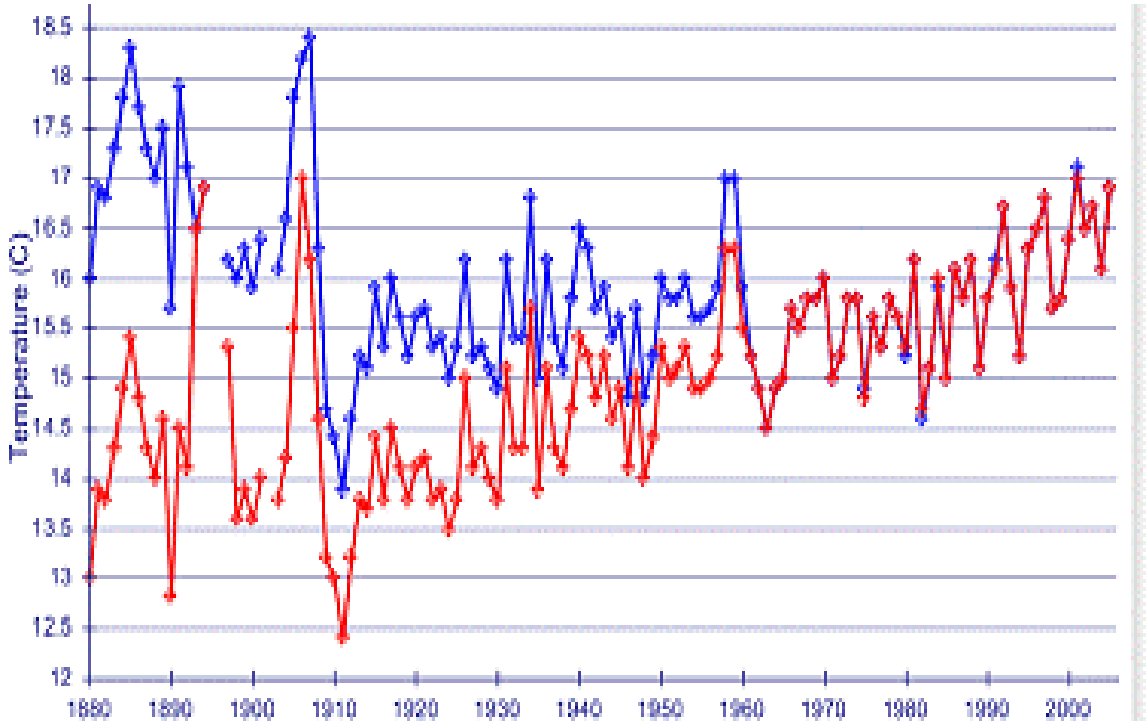
See much more of this detailed analysis here[72]. NIWA responds to the charges here[73].

CASE 3: OTHER EXAMPLES OF TEMPERATURE ADJUSTMENT

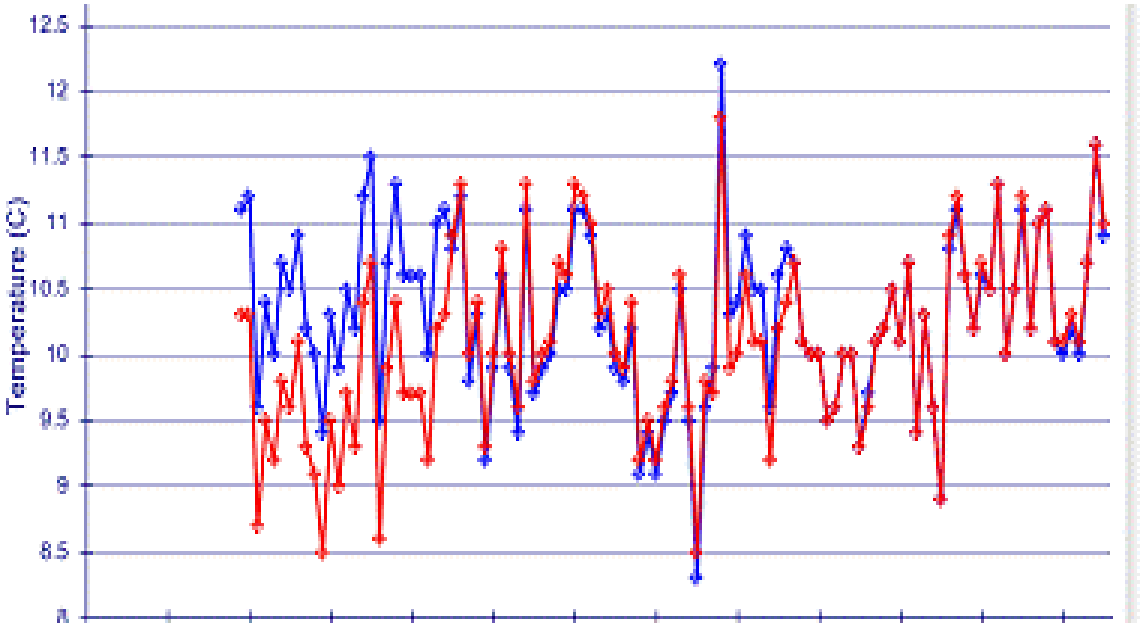
by Alan Cheetham, Global Warming Science

Temperature adjustments[74] are often made to US stations that are hard to explain but invariably increase the apparent warming. The following figure shows the closest rural station to San Francisco (Davis) and closest rural station to Seattle (Snoqualmie). In both cases a warming trend is artificially introduced to rural stations by adjusting earlier periods to make them appear cooler (blue for unadjusted, red for adjusted values) –

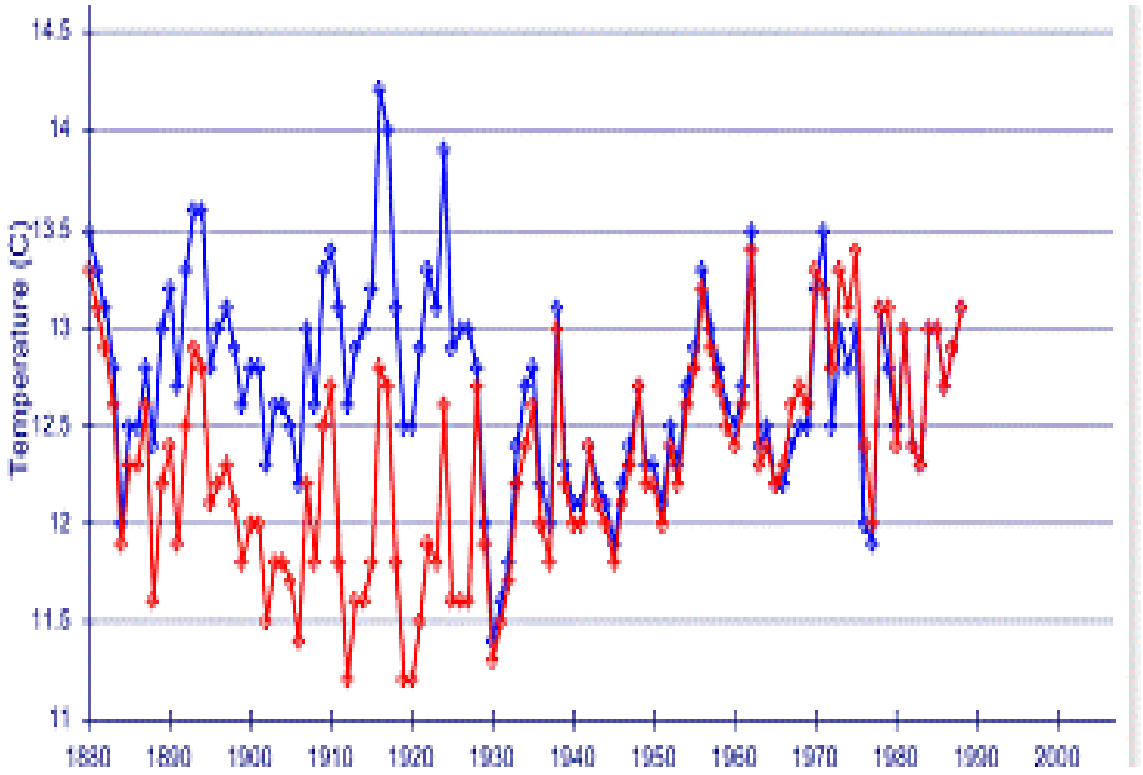
> ***In both cases a warming trend is artificially introduced to rural stations by adjusting earlier periods to make them appear cooler.***

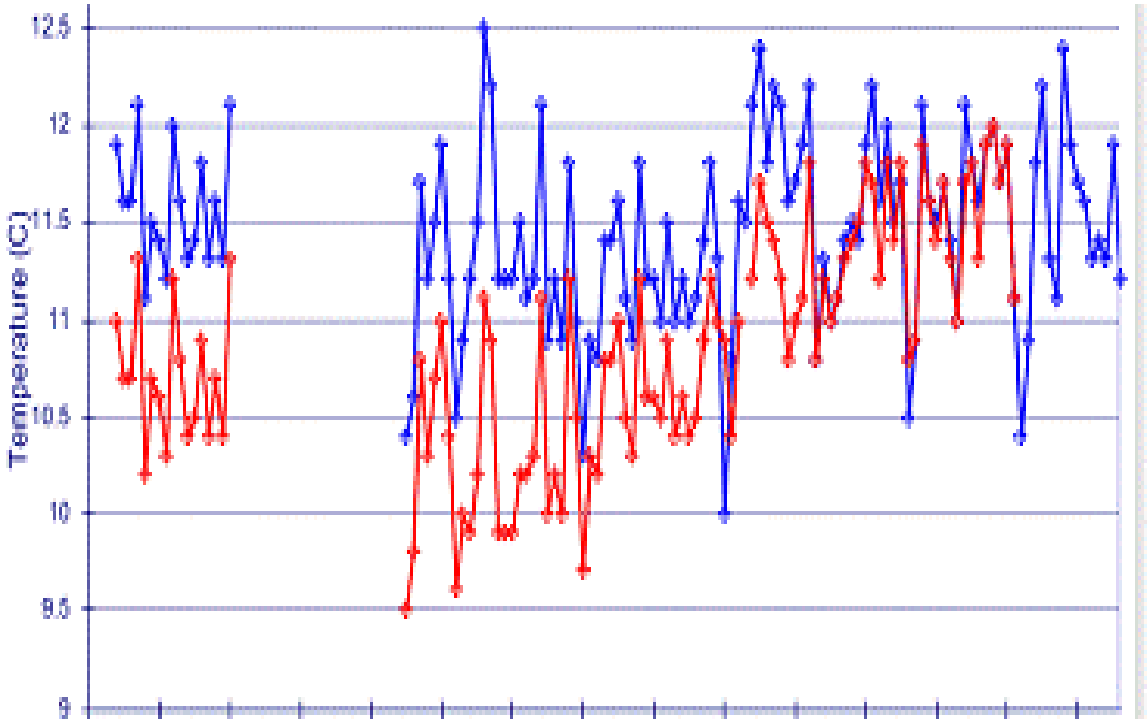


[72] http://icecap.us/images/uploads/global_warming_nz_pdf.pdf.
[73] http://www.niwa.co.nz/our-science/climate/news/all/niwa-confirms-temperature-rise.
[74] http://www.appinsys.com/GlobalWarming/GW_Part2_GlobalTempMeasure.htm.

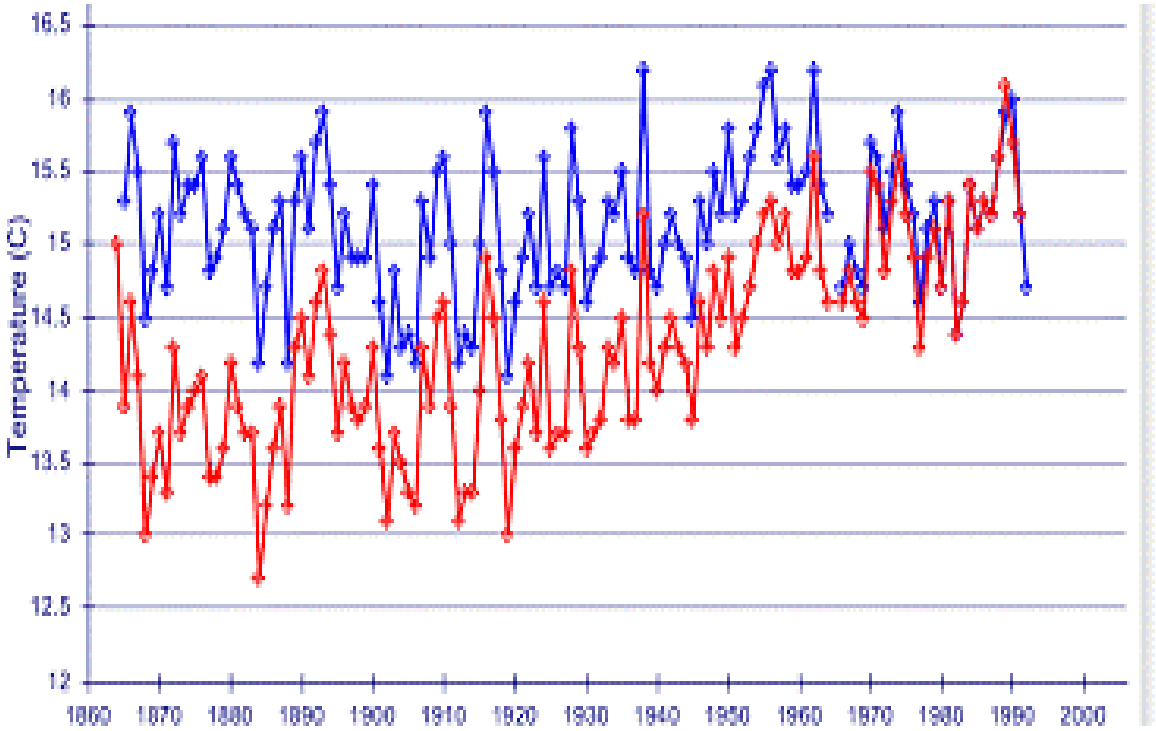


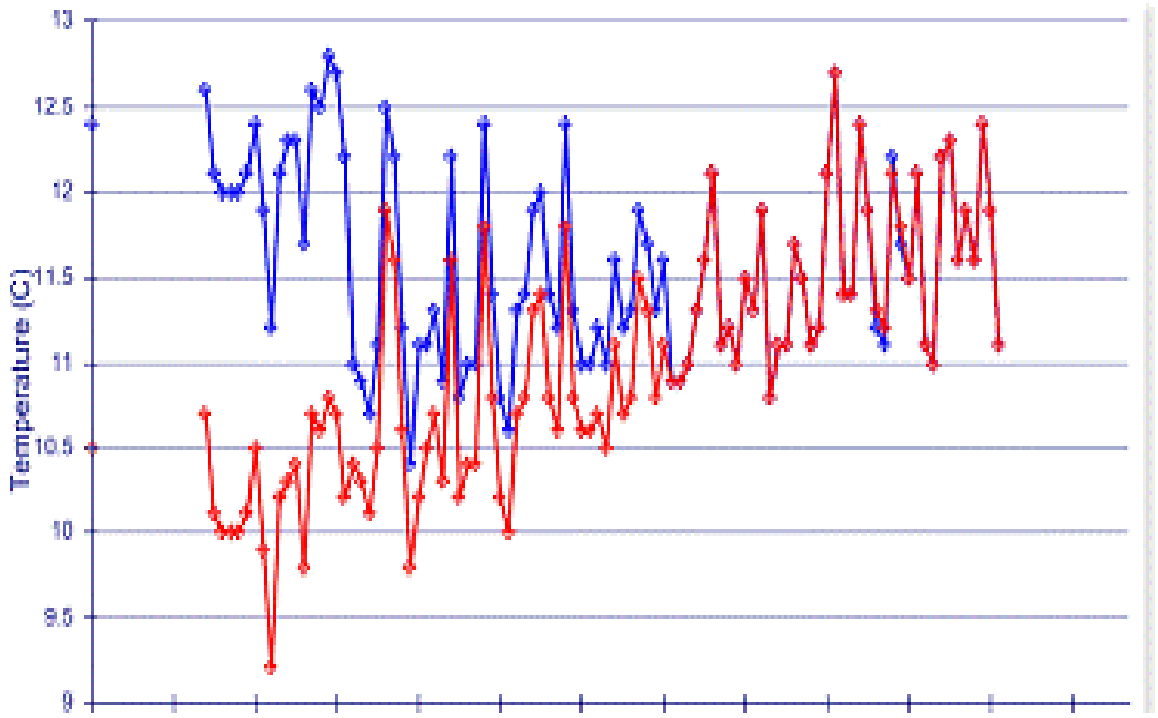
Similar adjustments can be seen here in both New Zealand and Australia. Here is a comparison of **unadjusted** and **adjusted** temperature data for Wellington (top) and Christchurch (bottom) –



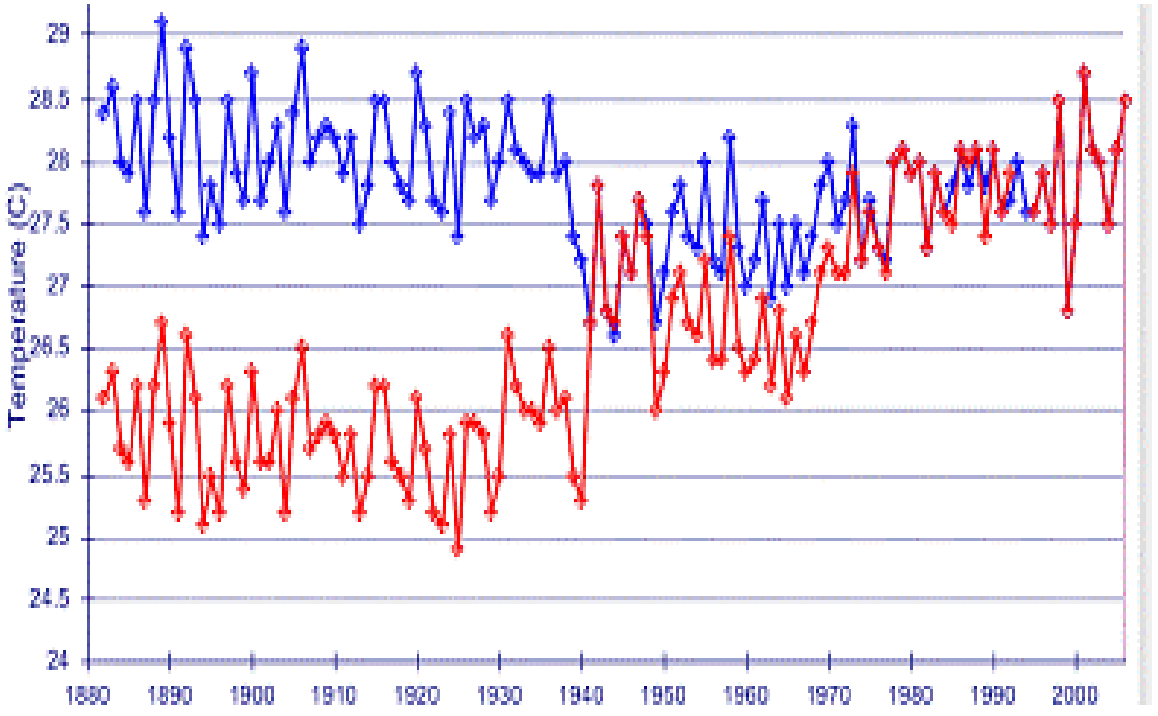


Here is a comparison of **unadjusted** and **adjusted** temperature data for Auckland (top) and Hokitika (bottom). Even the Hokitika station, listed as rural, ends up with a very significant warming trend –





The following graph is typical of the standard adjustments made to the temperature data. This is for Darwin, Australia, **unadjusted** and **adjusted**. Warming is created in the data through the adjustments, again by making earlier periods cooler –



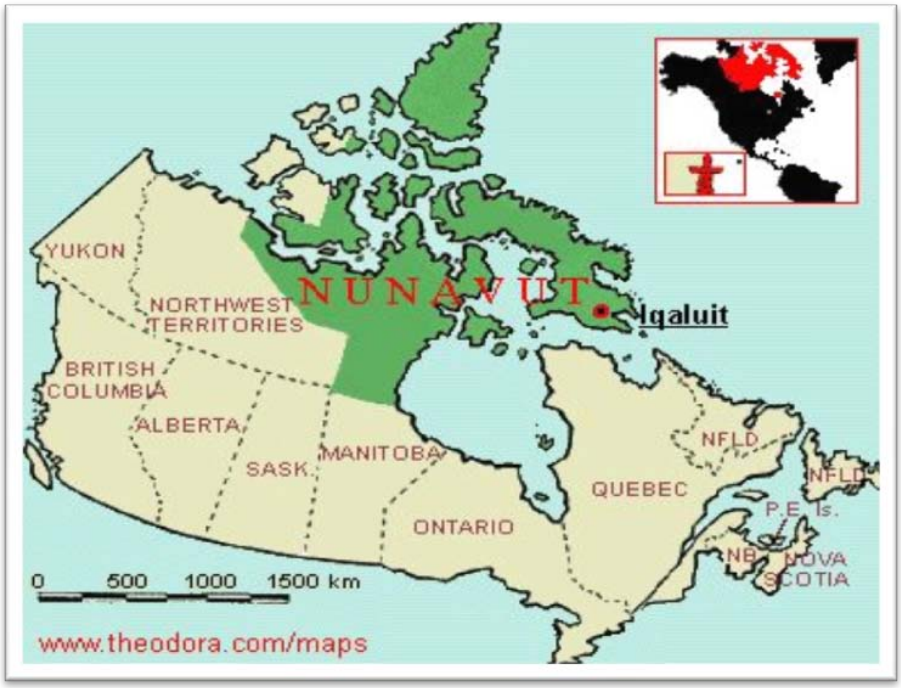
CASE 4: CANADA'S WEATHER NETWORK

by Dr. Tim Ball

Canada is the second-largest country in the world, with an area of 9,976,140 km^2. It encloses Hudson Bay, the largest inland ocean sea, with a surface area of 480,000 km^2, for a combined area of 10,456,140 km^2. There were 1088 WMO-rated stations – a density of one for every 9,610 km^2. However, density is extremely variable and the lack of density is troublesome in critical areas, the worst of which is Nunavut –

Land and Water Area, Quantity, and Density of WMO Stations

Province	Land (km^2)	Water (km^2)	Total (km^2)	WMO	Density (km^2)
Alberta	642,317	19,531	661,848	**18**	36,769
British Columbia	925,186	19,549	944,735	**107**	8,829
Manitoba	553,556	94,241	647,797	**42**	15,423
New Brunswick	71,450	1,458	72,908	**18**	4,050
Newfoundland	373,872	31,340	405,212	**18**	22,511
Northwest Terri.	1,183,085	163,021	1,346,106	**6**	56,087
Nova Scotia	53,338	1,946	55,284	**24**	2,303
Nunavut	1,936,113	157,077	2,093,190	**6**	348,865
Ontario	917,741	158,654	1,076,395	**96**	11,212
Prince Edward Is.	5,660	0	5,660	**8**	707
Quebec	1,365,128	176,928	1,542,056	**66**	23,364
Saskatchewan	591,670	59,366	651,036	**52**	12,519
Yukon	474,391	8,052	482,443	**5**	96,488



Now add the inadequate coverage for Yukon Territory, Northwest Territory, Newfoundland, and Labrador.

It is quickly apparent that coverage for most of northern Canada is totally inadequate.

The problem goes even further because there are no stations for the Arctic Basin, as the Arctic Impact Assessment Report identified, ironically using CRU data.

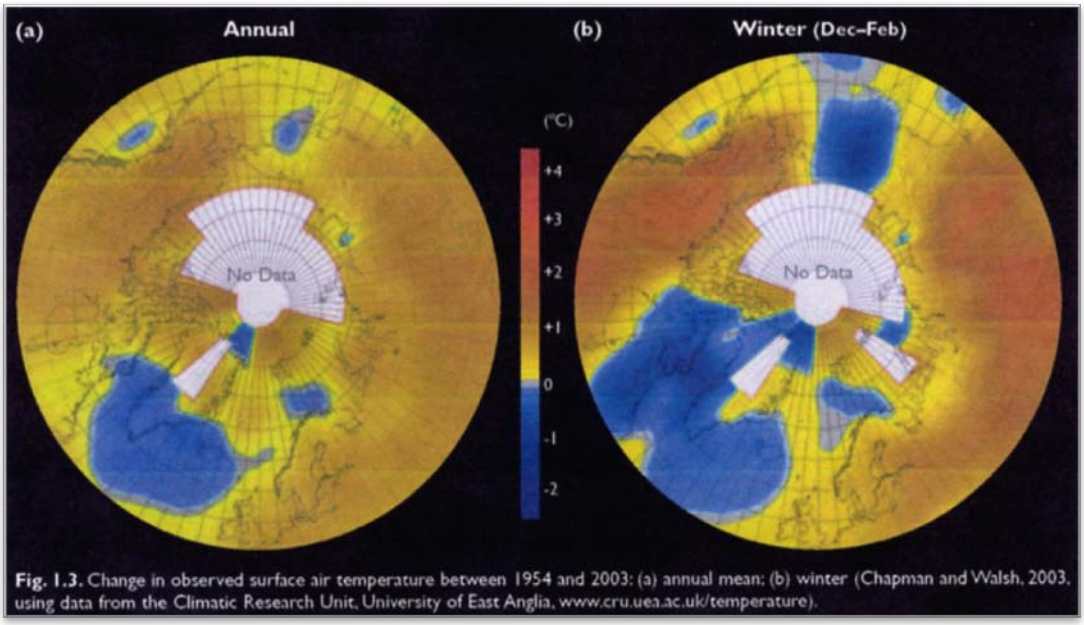


Fig. 1.3. Change in observed surface air temperature between 1954 and 2003: (a) annual mean; (b) winter (Chapman and Walsh, 2003, using data from the Climatic Research Unit, University of East Anglia, www.cru.uea.ac.uk/temperature).

This map shows the northern Canadian region with cold temperatures and Eurasia with warmer temperatures.

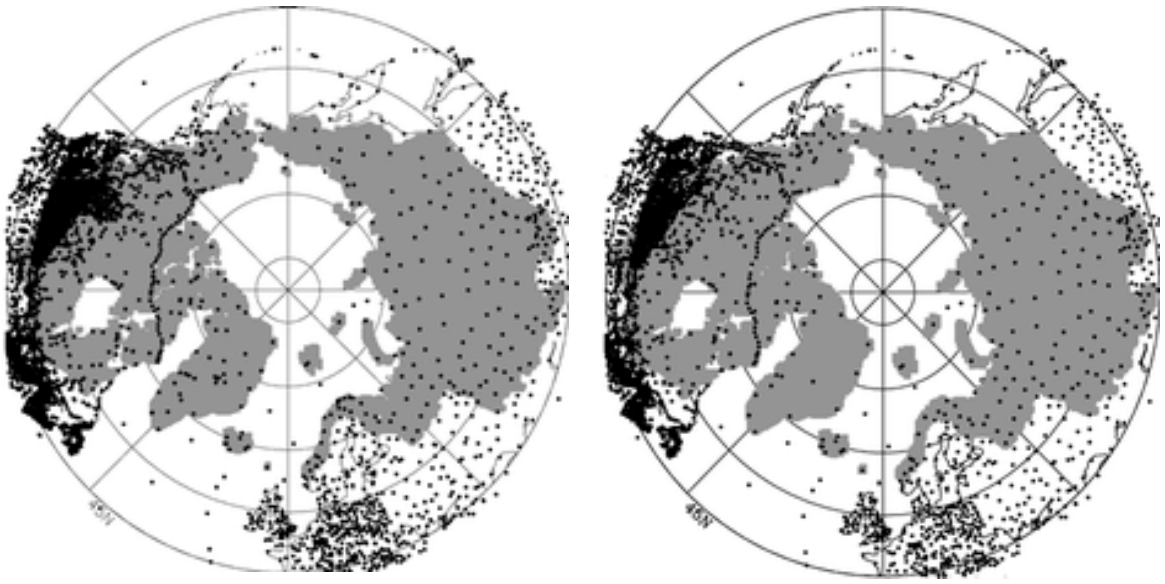
However, we now know the Eurasian pattern is distorted by the very selective stations used by NOAA and CRU.

The densities given for the Canadian provinces, which generally lie south of 60° N, are averages, but a quick look at the map of the total stations show a concentration in the southern half of each province.

For example, there are only three stations north of 55° N in Quebec. This is important because the boundary between the general surplus energy of the tropics and the deficit of the polar regions, traditionally known as the Polar Front, moves north and south within Canada in response to the general migration of the Sun.

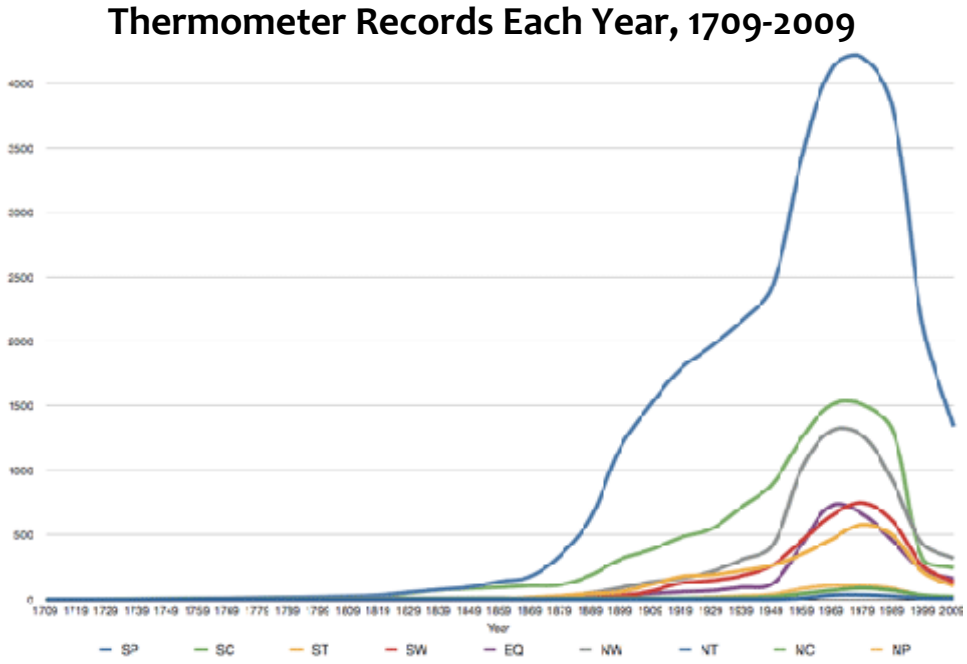
Its mean summer position is approximately 65° N, so the year-round area of deficit has virtually no weather stations.

The next diagram, with caption, comes from Rawlins and Wilmott (2003).



Locations of the monthly air-temperature station records for all Arctic stations (left) and for those Arctic stations with data from 1961–1990 (right). The light grey shading delineates the Pan-Arctic drainage basin. The map projection is Lambert's Azimuthal Equal Area (original caption). Source is here[75].

E.M. Smith has done a detailed analysis[76] of this limitation summarized in this diagram –

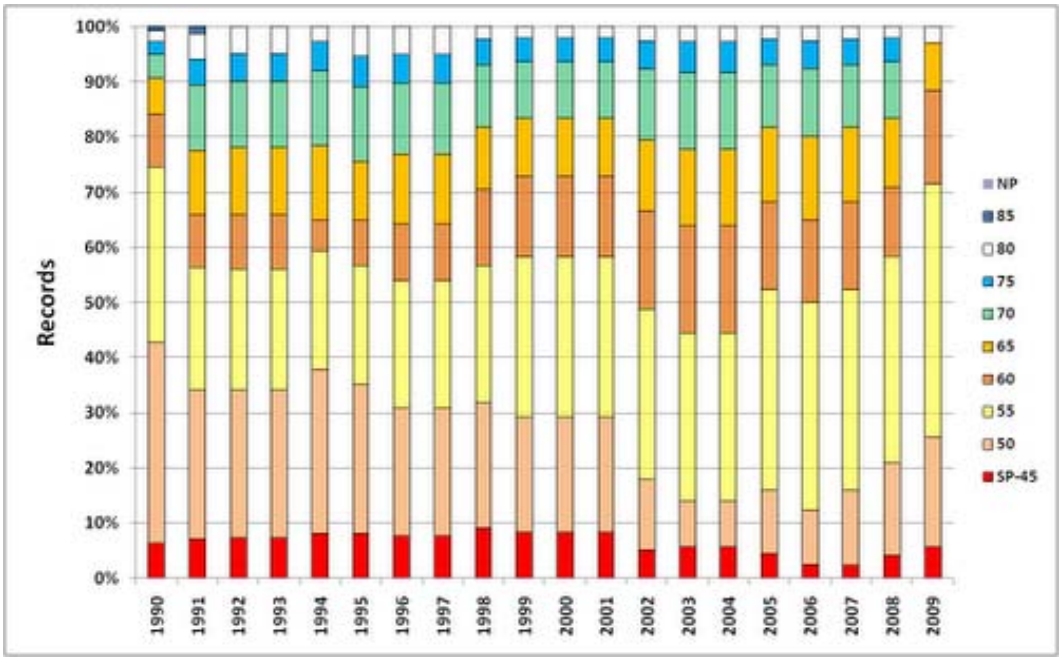


Smith's caption says: "*That next to the top green line is the Northern Cold band. The area we are talking about here. From 50N to 70N latitude. We see the thermometer count rise from the 1700s until a sudden Great Dying as the Thermometer Langoliers take their toll.*"

[75] http://www.bioone.org/doi/abs/10.1657/1523-0430(2003)035%5b0530:WATCOT%5d2.0.CO;2?cookieSet=1&journalCode=aare.

[76] http://chiefio.wordpress.com/2009/10/27/ghcn-up-north-blame-canada-comrade/.

Smith also shows a graph showing changing coverage north of 55° N from 1990-2009:



Smith's comments are: "Here we see that three northern bands have been gutted entirely. There are now NO thermometers (as of 2009) in the 65-70, 70-75, and 80-85 bands. 1992 saw the 80-85 band die. 2009, the others. Due to the general slaughter of thermometers, that 75-80 band is ONE thermometer.

That's right: one thermometer for everything north of Latitude 65°. Who needs Northwest Territories, Yukon Territories, or Baffin Island anyway?

Two factors led to the decline in stations from 950 in 1945 to 210 today: first, the decision that satellites would reduce the need for surface stations; secondly, the shift from a weather service as mandated by law to a climate change agency. The Auditor General reported $6.8 billion spent on climate change between 1998 and 2005. The lack of stations was an immediate problem aggravated by the replacement in many cases with Automatic Weather Observing Stations (AWOS). When NavCanada was formed in 1997 to take over airports, they became responsible for the weather stations. They refused to accept the AWOS stations as unreliable, which triggered a parliamentary investigation by Senator Pat Carney.

The 210 are the stations considered for producing global average annual temperature. The number of weather stations in Canada has reduced significantly since 1945 but coverage was always inadequate. There are very few stations with records over 60 years in length. Most of them are in southern regions, that is south of 55° N, and are located near large cities. The urban heat island effect is especially pronounced in Canadian cities because of the cold temperatures. Studies in Winnipeg, Montreal, Hamilton and Vancouver all show considerable differences between urban and surrounding rural areas, especially in winter. The lack of records for the sub-polar and polar regions is especially problematic because most agencies agree this is where global temperatures changes are detected first.

If we add the inadequacy of the records for Eurasia, it is reasonable to say that we are ignorant of weather and climate north of 55° N in the Northern Hemisphere.

The number of stations in Canada is inadequate at any time to determine the actual temperature or how it has changed. It is certainly inadequate to serve as the basis for the grids that form the basis of computer models. If we add the inadequacy of the records for Eurasia, it is reasonable to say that we are ignorant of weather and climate north of 55° N in the Northern Hemisphere. A more complete analysis is here[77].

CASE 5: NO WARMING TREND IN THE 351-YEAR CENTRAL ENGLAND TEMPERATURE RECORD

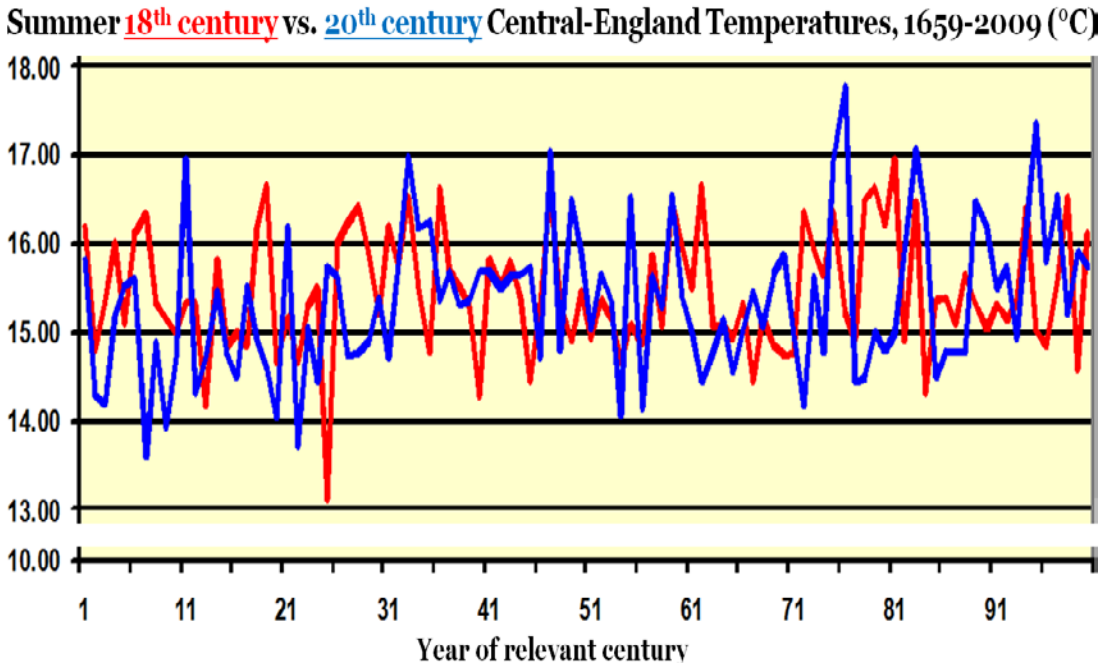
by the Carbon Sense Coalition (here[78])

The Central England Temperature record, starting in 1659 and maintained by the UK Met Office, is the longest unbroken instrumental temperature record in the world.

Temperature data are averaged for a number of weather stations representative of central England.

A Scottish chemist, Dr. Wilson Flood, has collected and analyzed the 351-year Central England temperature record.

Here is the comparison of the 18th Century with the 20th Century:



[77] http://icecap.us/images/uploads/Canada.pdf.
[78] http://carbon-sense.com/2009/10/01/british-record/.

Wilson Flood comments:

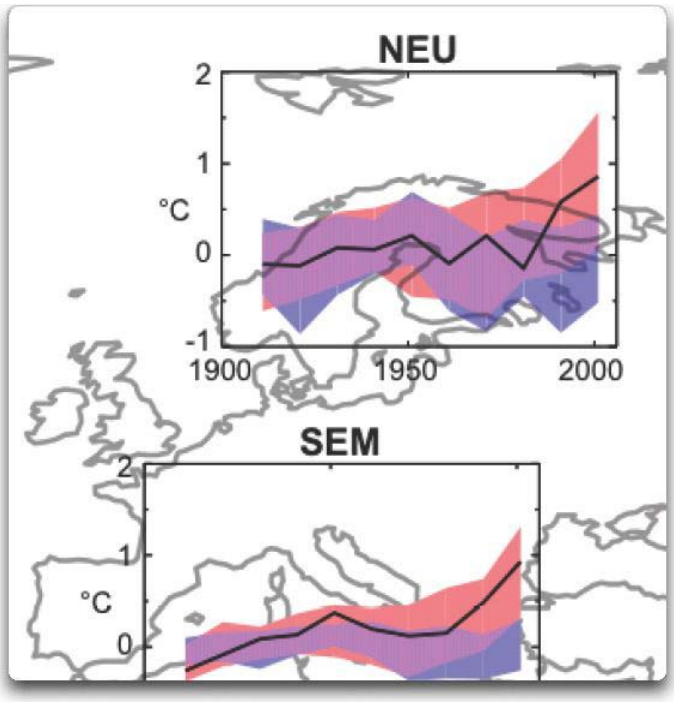
> "Summers in the second half of the 20th century were warmer than those in the first half and it could be argued that this was a global warming signal. However, the average CET summer temperature in the 18th century was 15.46 degC while that for the 20th century was 15.35 degC. Far from being warmer due to assumed global warming, comparison of actual temperature data shows that UK summers in the 20th century were cooler than those of two centuries previously."

"Far from being warmer due to assumed global warming, comparison of actual temperature data shows that UK summers in the 20th century were cooler than those of two centuries previously."

CASE 6: KARLEN ON NON-REPLICABILITY OF IPCC CRU-BASED NORDIC DATA

by Willis Eschenbach on wattsupwiththat.com

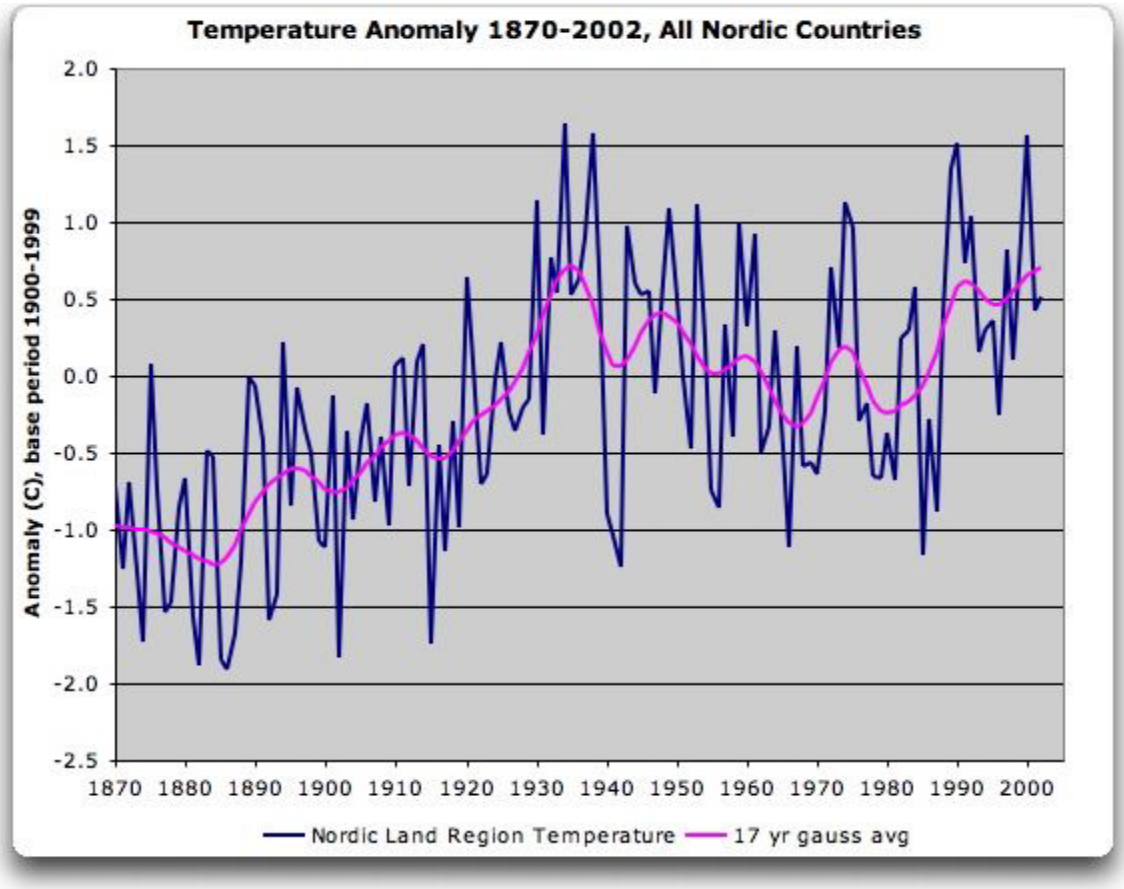
Professor Karlen attempts to reconstruct the Nordic temperature. In his analysis, I find an increase from the early 1900s to ~1935, a downtrend to the mid 1970s and another increase to about the same temperature level as in the late 1930s (below, enlarged here[79]).



A distinct warming to a temperature about 0.5 deg C above the 1940 level is reported in the IPCC diagrams (above). I have been searching for this recent increase, which is very

[79] http://icecap.us/images/uploads/wrgb4.jpg.

important for the discussion about a possible human influence on climate, but I have failed to find any subsequent warming compared with the late 1930s (below, enlarged here[80]).

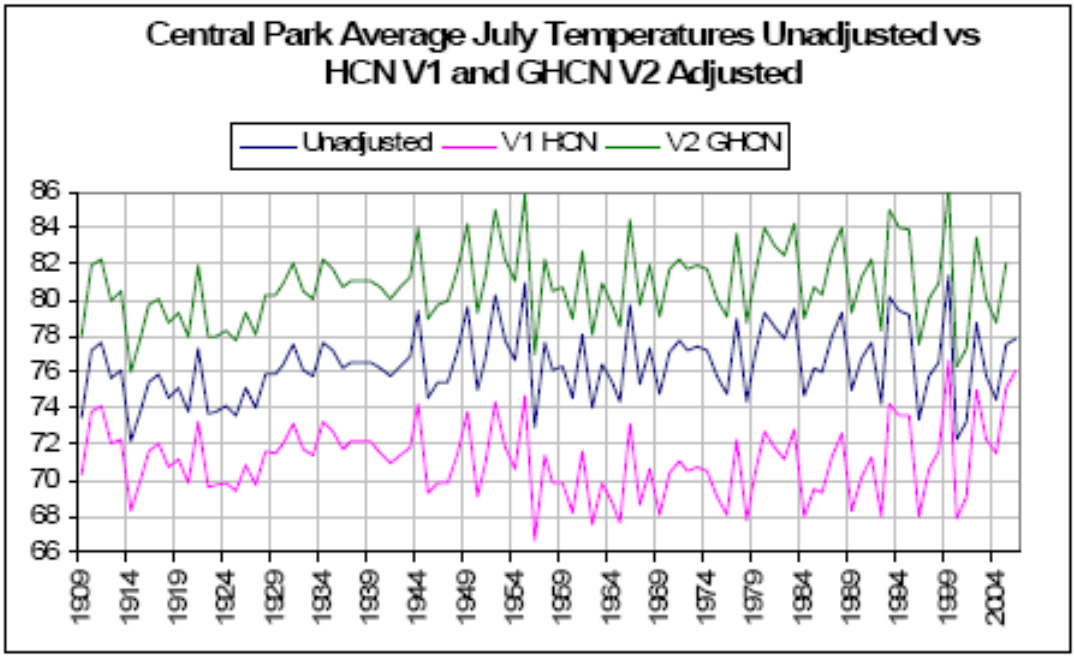


See much more here[81].

CASE 7: CENTRAL PARK – HISTORY A MYSTERY

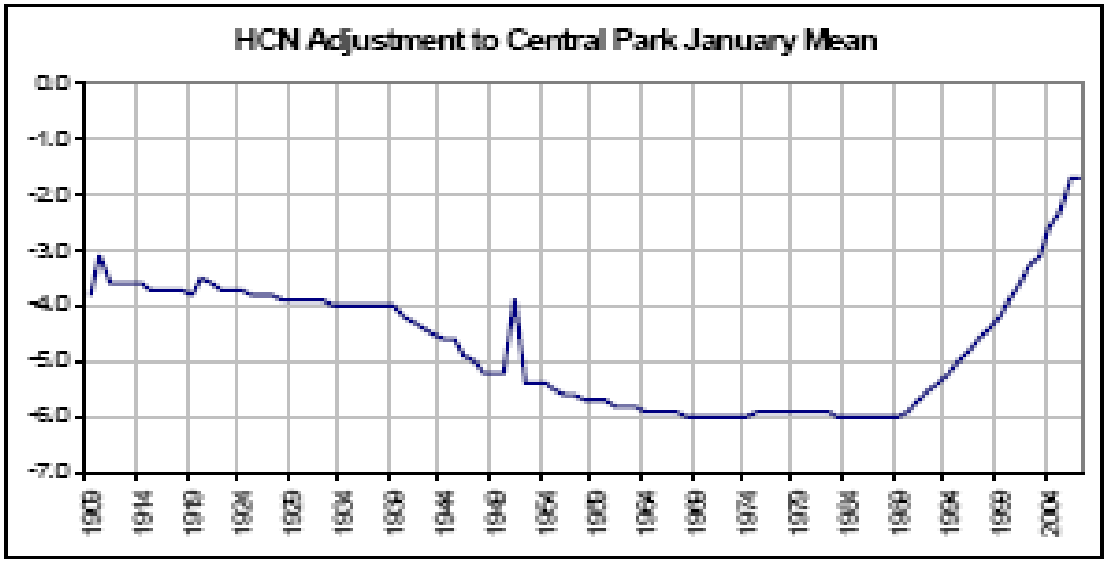
In this analysis[82], see how Central Park data was manipulated in inconsistent ways. The original US Historical Climate Network (USHCN: blue) data showed a cooling when adjusted for urban heat island effect (pink). The global version of Central Park (GHCN again: green) inexplicably warmed Central Park by 4 F° –

[80] http://icecap.us/images/uploads/wrgb3.jpg.
[81] http://wattsupwiththat.com/2009/11/29/when-results-go-bad/.
[82] http://icecap.us/images/uploads/Central_Park_Temperatures_Two.pdf.

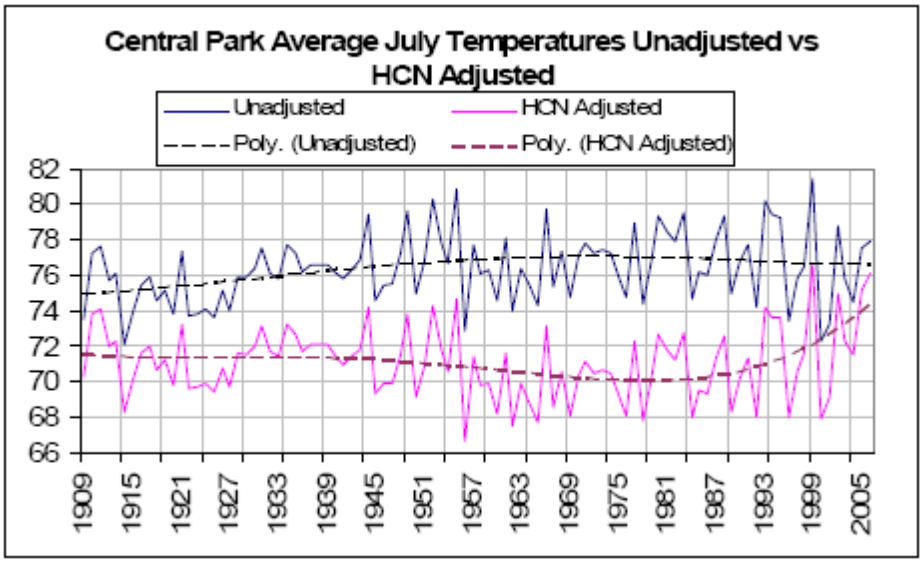


Raw observed Central Park mean July temperatures (blue), HCN v.1 (pink), and GHCN v.2 (green), 1909-2009.

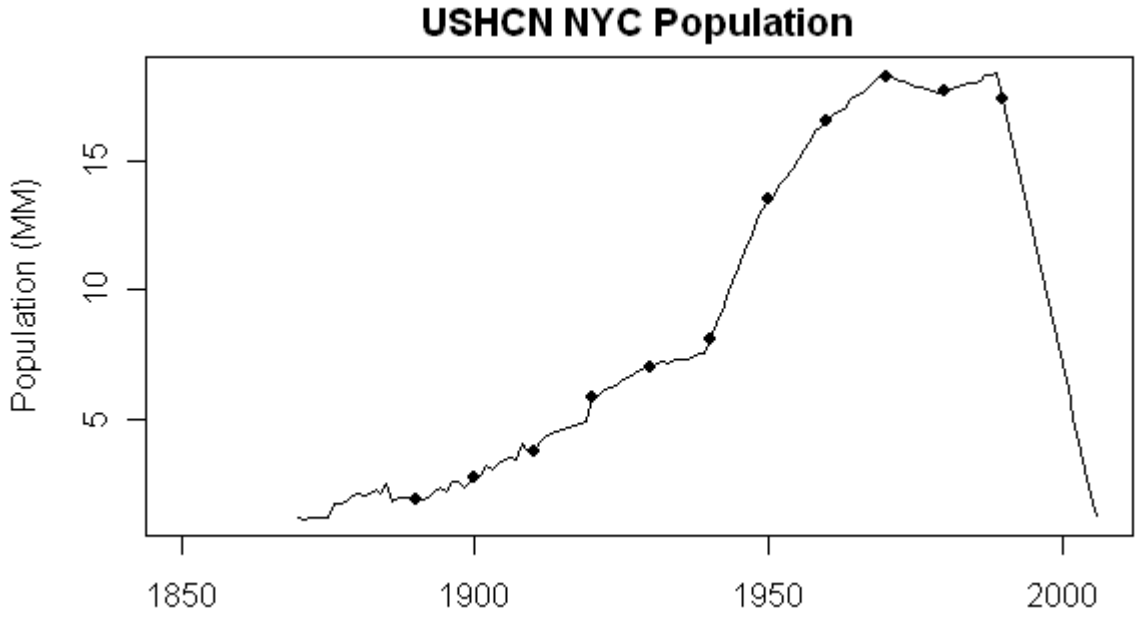
The difference between the two US-adjusted and global-adjusted databases, both produced by NCDC, reached an unbelievable 11F for the month of July, and 7F annually. Gradually, and without notice, NOAA began slowly backing off the urban heat island adjustment in the USHCN data in 1999 and eliminated it entirely in 2007 –



The USHCN version 1 had an urban adjustment (Karl 1988) when it was introduced in 1990. The cooling was as 7F for July and 6F for January. Notice however as some state climatologists noticed, the annual adjustments began to diminish in 1999 and in version 2 of USHCN disappeared altogether.

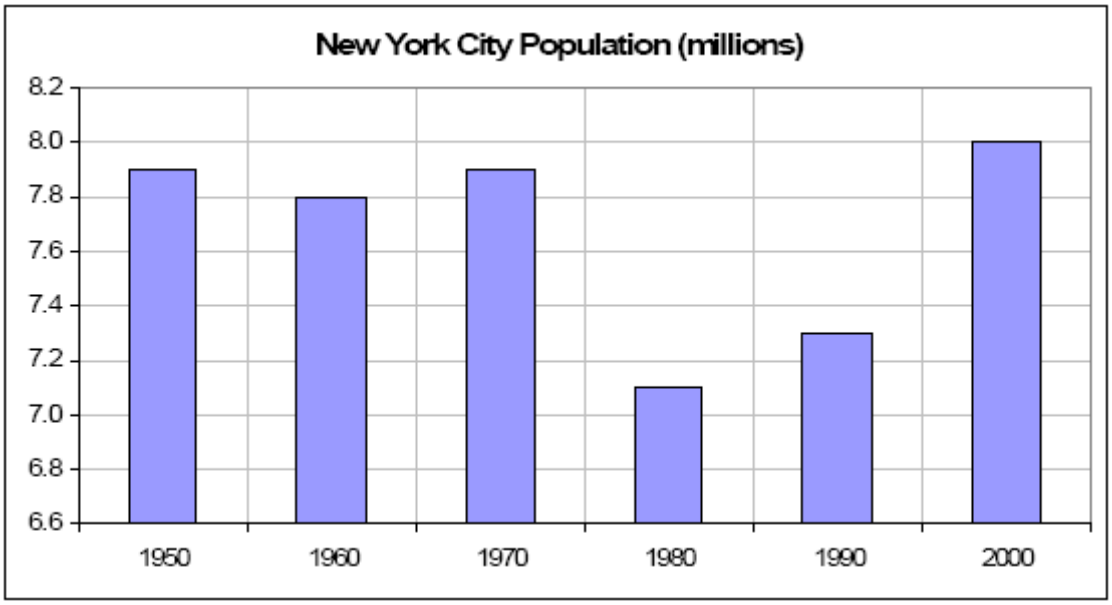


This led Steve McIntyre here[83] to quip "If one reverse engineers this adjustment to calculate the New York City population used in the USHCN urban adjustment, the results are, in Per's words, 'gobsmacking' (utterly astounding, even by climate science standards." This was because, it could only be explained by a massive depopulation of New York City.



Shown clearly not the case.

[83] http://climateaudit.org/2007/07/05/central-park-will-the-real-slim-shady-please-stand-up/.



The story doesn't end there. The same NCDC maintains a global data base of station data used for climate change assessment called GHCN Version 2 of GHCN contains some of the same adjustments except for the Karl urban adjustment. Central Park is one of the GHCN sites. Note in the top graph above, it mysteriously warms not cools New York's Central Park by 4F.

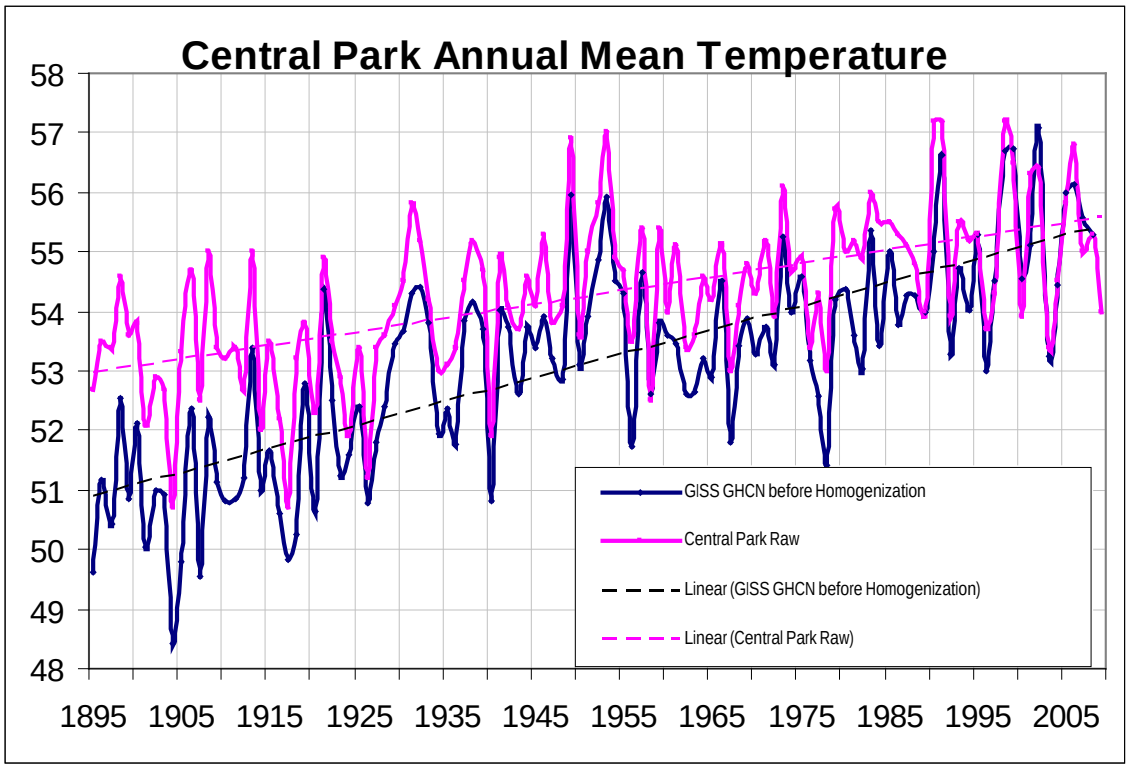
GISS USES GHCN AS UNADJUSTED DATA BEFORE HOMOGENIZATION

GISS recently eliminated GHCN with USHCN adjustments as one of the data access options here[84]. *"We no longer include data adjusted by GHCN" as an option,* implying they start with GHCN 'unadjusted' before they work their own homogenization and other magical wonders.

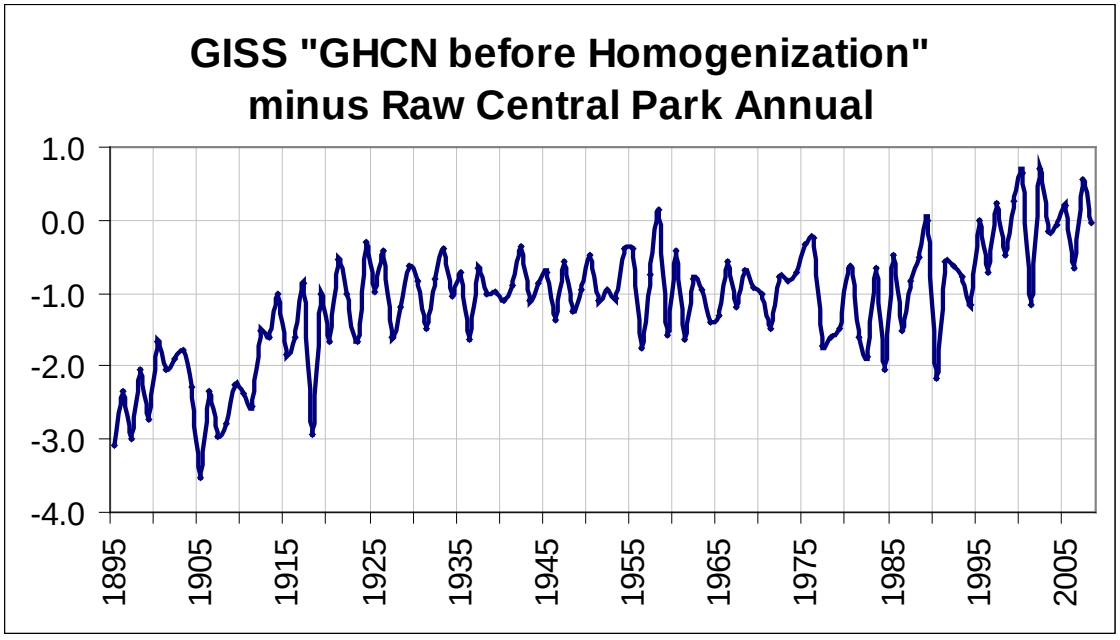
I downloaded what GISS describes as Central Park data before homogenization and "after combining sources at the same location" from GISS and did a comparison with the raw annual mean data downloaded from the NWS New York City Office web site here[85].

We found that the two data sets were not the same. For some unknown reason, Central Park was colder in the unadjusted data sets in the early record as much as 3F than the raw observation records. The difference gradually diminished so, currently the changes are small (2008 was the same). Some recent years the 'unadjusted' adjustments were inexplicably positive.

[84] http://data.giss.nasa.gov/gistemp/station_data/.
[85] http://www.erh.noaa.gov/okx/climate/records/monthannualtemp.html.



The difference is shown below.

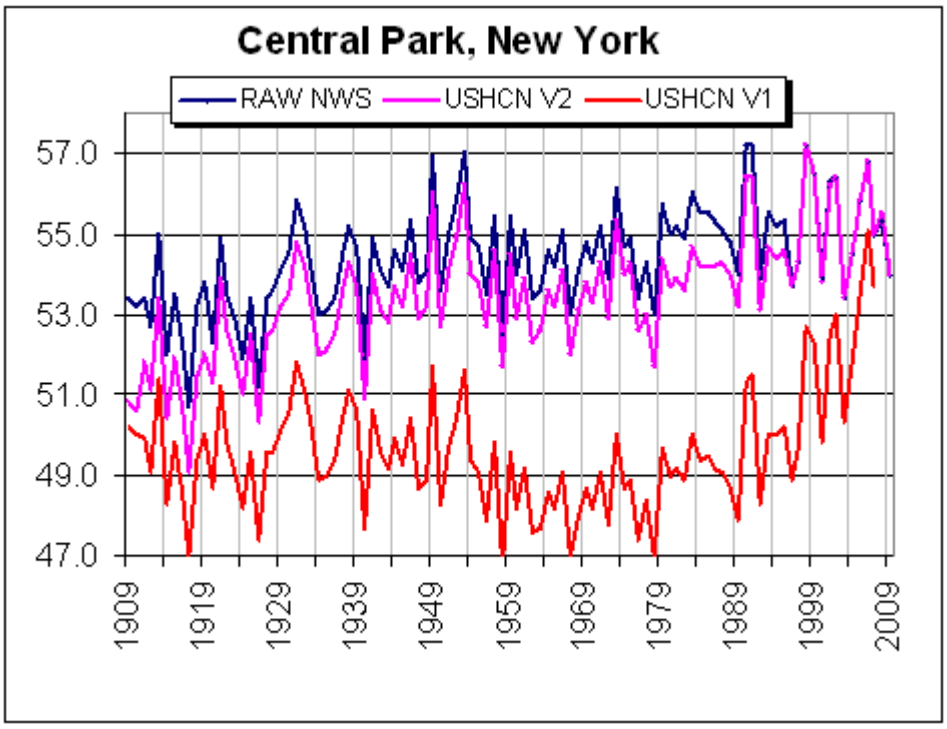


Thus in the implied unadjusted data, the warming (due to urbanization) is somehow increased from 2.5 to 4.5F.

E.M. Smith downloaded the latest iteration of GHCN Central Park directly from NOAA and found it had found its way back closer to the raw data. So the data at GISS is some other source, perhaps an earlier version of the GHCN with USHCN adjustments. He notes there are many iterations of the data sets available from CRU, NOAA and NASA. The differences between them is much greater than the changes over time calling into question our ability to accurately assess climate trends. See his discussion here[86].

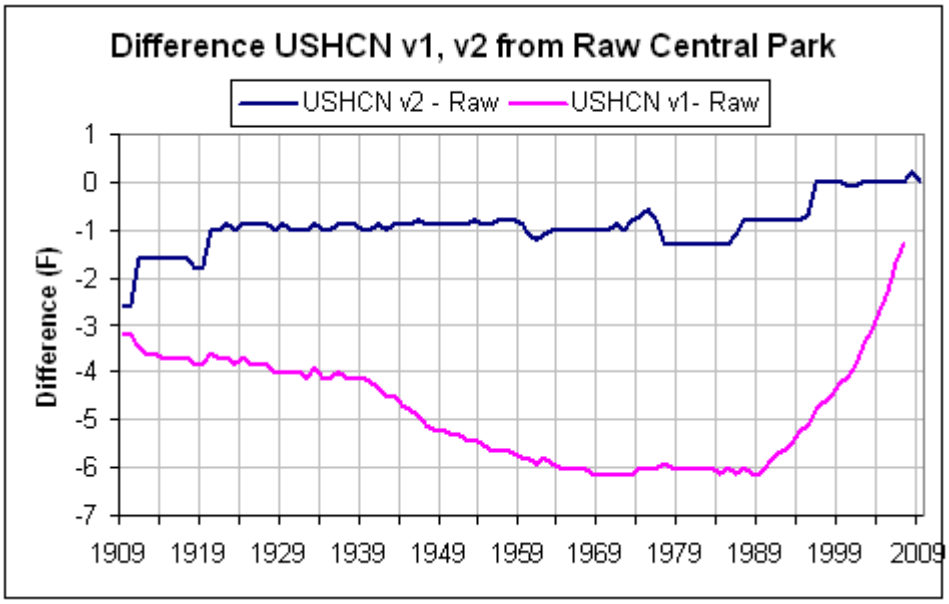
There are many iterations of the data sets available from CRU, NOAA and NASA. The differences between them is much greater than the changes over time calling into question our ability to accurately assess climate trends.

We followed this up with a comparison of the raw with the USHCN version 1 and the newly available USHCNv2. Here is the plot of USHCN versions 1 and 2 together with raw original observations for Central Park.



And the differences between the raw and USCHN v1 and v2 .

[86] http://chiefio.wordpress.com/2010/01/13/ghcn-does-unadjusted-mean-cooked/.



The most obvious feature that jumps out from the chart is the cooling (UHI) that peaked at just over 6 degrees in the 1980s, then inexplicably diminished after 1999 slowly and disappeared in 2007 when version 2 was issued. For version 2, a reduction of 2.6F from the raw for the first two years (1909-1910) gradually diminishes to zero in recent years.

Obviously adjustments here as in the many other locations are enhancing warming.

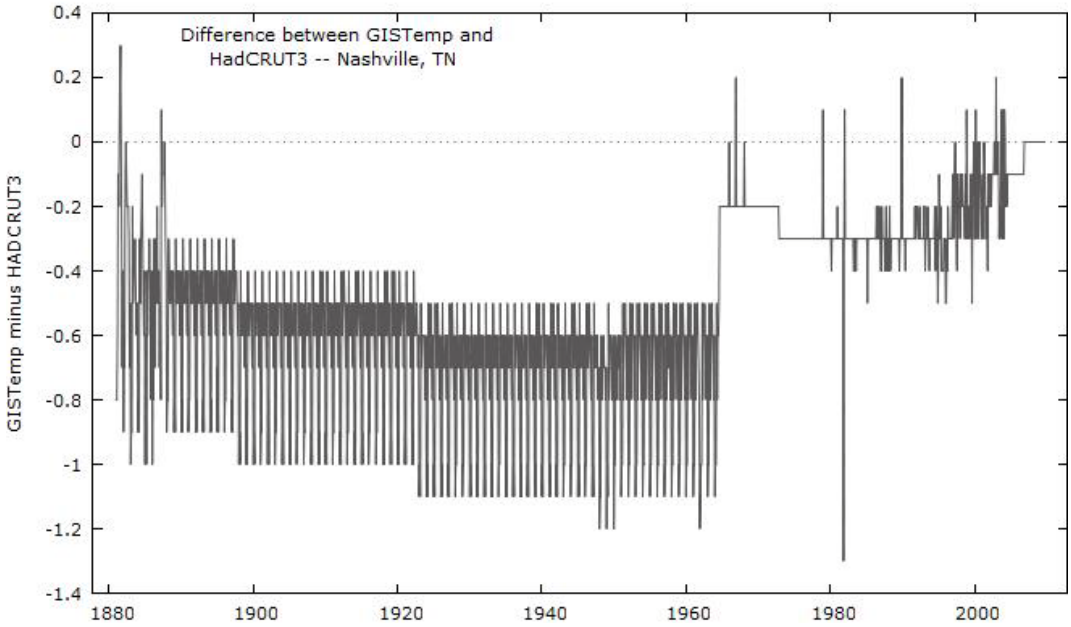
CASE 8: WOULD YOU LIKE YOUR DATA HOMOGENIZED, OR PASTEURIZED?

by Basil Copeland on wattsupwiththat.com

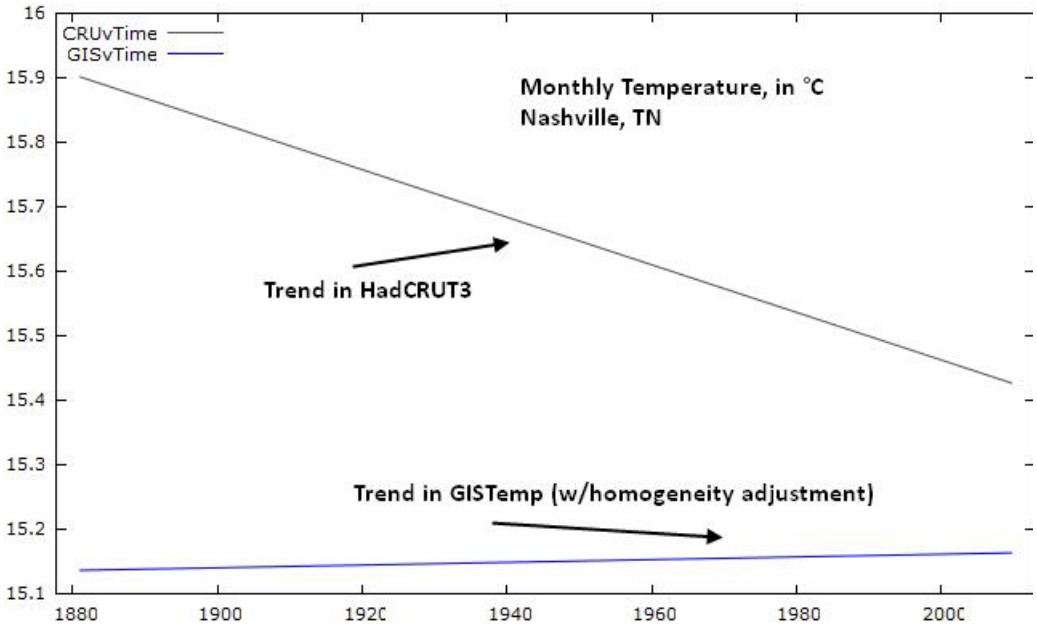
The hits just keep on coming. About the same time that Willis Eschenbach revealed "The Smoking Gun at Darwin Zero," the UK's Met Office released a "subset" of the HadCRUT3 dataset used to monitor global temperatures. I grabbed a copy of "the subset[87]" and then began looking for a location near me in central Arkansas that had a long and generally complete station record that I could compare to a "homogenized" set of data for the same station from the GISTemp dataset[88].

I quickly, and more or less randomly, decided to take a closer look at the data for Nashville, TN. In the HadCRUT3 subset, this is "72730" in the folder "72." A direct link to the homogenized GISTemp data used is here. After transforming the row data to column data (see the end of the post for a "bleg" about this), the first thing I did was plot the differences between the two series.

[87] http://www.metoffice.gov.uk/climatechange/science/monitoring/subsets.html.
[88] http://data.giss.nasa.gov/gistemp/station_data/.



The GISTemp homogeneity adjustment looks a little hockey-stickish, and induces an upward trend by reducing older historical temperatures more than recent historical temperatures. This has the effect of turning what is a negative trend in the HadCRUT3 data into a positive trend in the GISTemp version –



So what would appear to be a general cooling trend over the past ~130 years at this location when using the unadjusted HadCRUT3 data becomes a warming trend when the homogeneity "adjustment" is supplied.

"There is nothing to see here, move along." I do not buy that. Whether or not the homogeneity adjustment is warranted, it has an effect that calls into question just how much the earth has in fact warmed over the past 120-150 years (the period covered, roughly,

by GISTemp and HadCRUT3). There has to be a better, more "robust" way of measuring temperature trends, that is not so sensitive that it turns negative trends into positive trends (which we've seen it do twice now, first with Darwin Zero, and now here with Nashville). I believe there is.

> ***Whether or not the homogeneity adjustment is warranted, it has an effect that calls into question just how much the earth has in fact warmed over the past 120-150 years.***

In a recent series of posts, here[89], here,[90] and with Anthony here[91], I've been promoting a method of analyzing temperature data that reveals the full range of natural climate variability. Metaphorically, this strikes me as trying to make a case for "pasteurizing" the data, rather than "homogenizing" it. In homogenization, the object is to "mix things up" so that it is "the same throughout." When milk is homogenized[92], this prevents the cream from rising to the top, thus preventing us from seeing the "natural variability" that is in milk. But with temperature data, I want very much to see the natural variability in the data. And I cannot see that with linear trends fitted through homogenized data. It may be a hokey analogy, but I want my data pasteurized – as clean as it can be – but not homogenized so that I cannot see the true and full range of natural climate variability. See full post here[93].

See this post on GISS Raw Station Data Before and After Homogenization[94] for an eye-opening view into blatant data manipulation and truncation.

CASE 9: CLIMATE DATA ANALYSIS OF EXISTING WEATHER STATIONS IN THE CENTRAL ALASKA NETWORK (CAKN) (PDF)[95]

Prepared for National Park Service, Central Alaska Inventory and Monitoring Network by Richard A. Keen, Ph.D.

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89 http://wattsupwiththat.com/2009/08/12/is-global-temperature-a-random-walk/.

90 http://wattsupwiththat.com/2009/11/30/what-do-we-really-know-about-climate-change/.

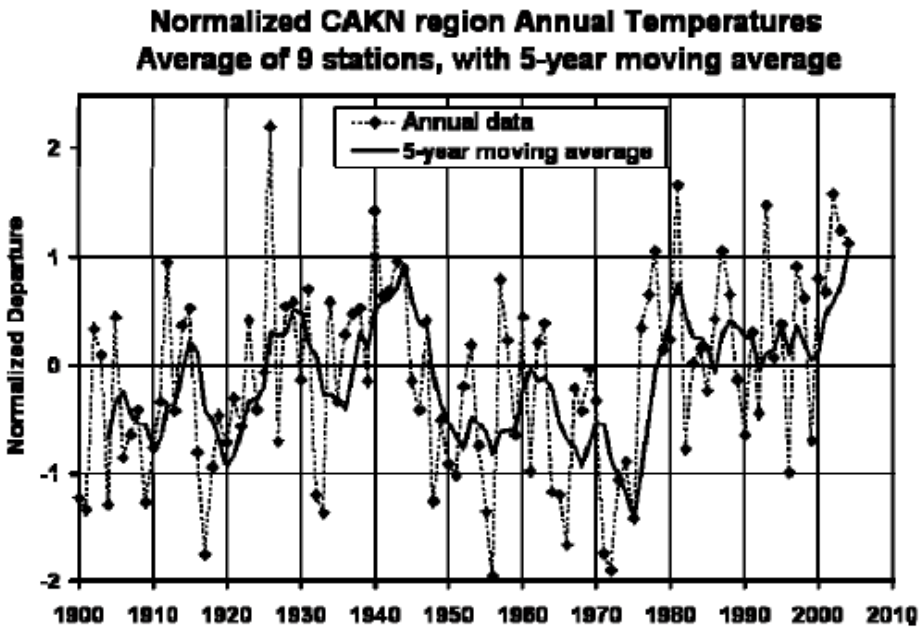
91 http://wattsupwiththat.com/2009/05/23/evidence-of-a-lunisolar-influence-on-decadal-and-bidecadal-oscillations-in-globally-averaged-temperature-trends/.

92 http://en.wikipedia.org/wiki/Homogenization_%28chemistry%29.

93 http://wattsupwiththat.com/2009/12/11/would-you-like-your-temperature-data-homogenized-or-pasteurized/#more-14026.

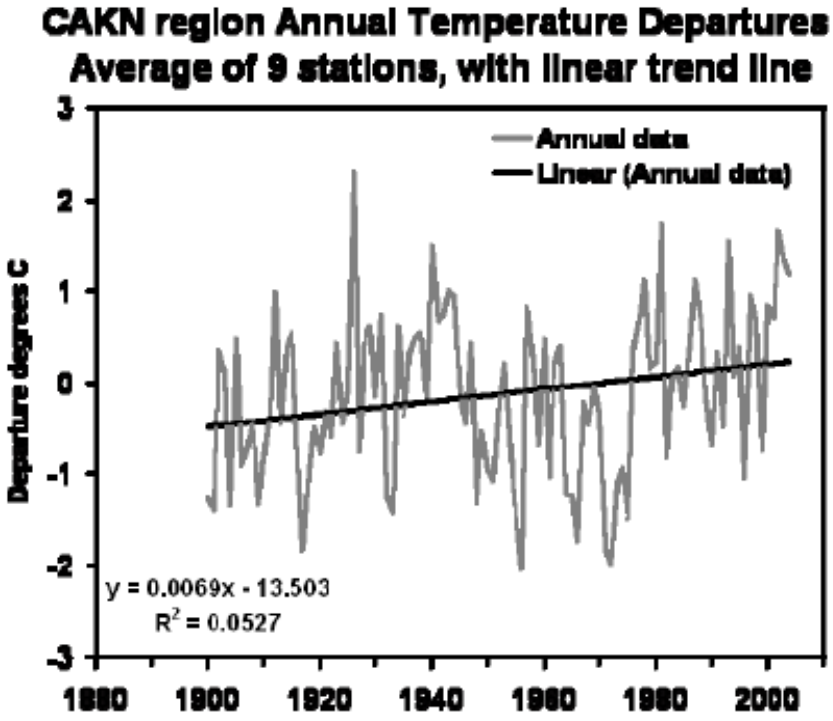
94 http://wattsupwiththat.com/2009/12/11/giss-raw-station-data-before-and-after/.

95 http://science.nature.nps.gov/im/units/cakn/Documents/2008reports/CAKN_Climate_Data_%20Analysis_%20Keen_2008.pdf.

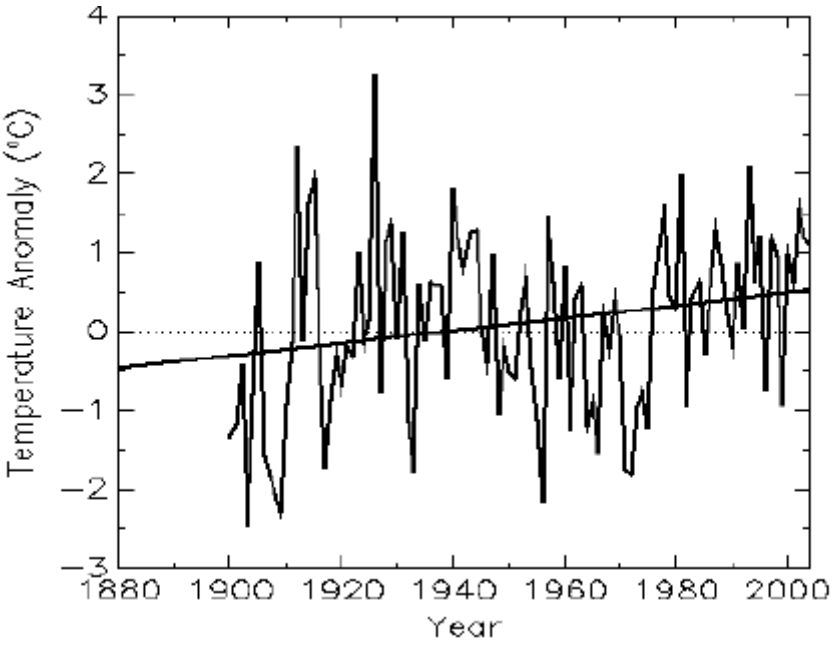


The next three figures show the annual normalized departures converted to degrees C, for comparison with annual temperatures for the grid area 60 to 65 North, 140 to 155 West, from the global temperature data sets of the Global Historical Climate Network (GHCN) and Jones et al.

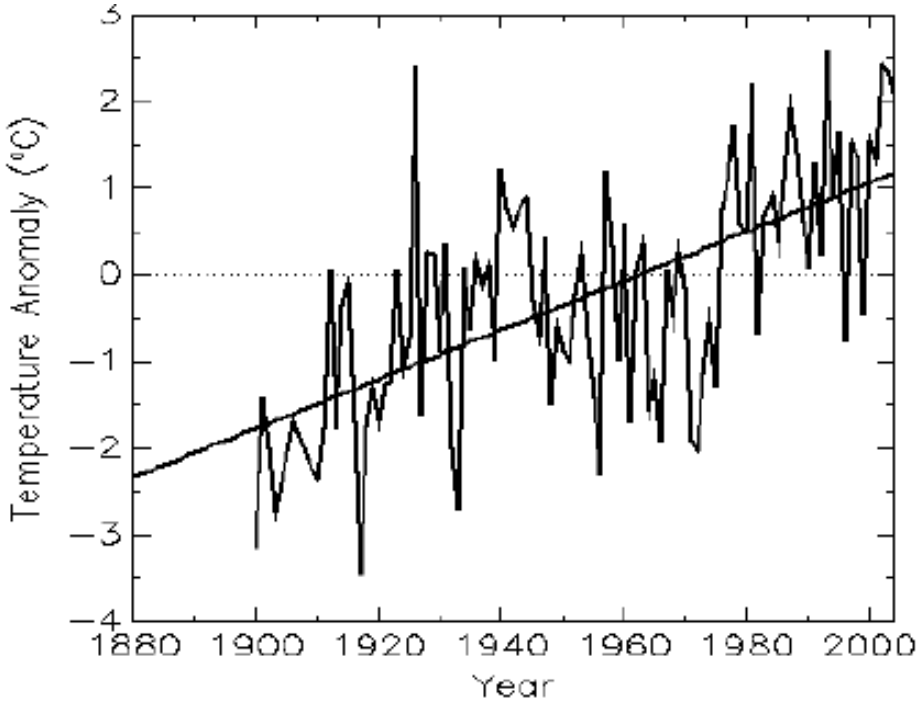
105 year record of regional Annual Average Temperature, degrees C.



105 year record of regional Annual Average Temperature, degrees C, from Jones et al.



105 year record of regional Annual Average Temperature, degrees C, from GHCN.



The annual temperatures in this study are very similar to those of Jones et al., the largest difference being due to the normalizations procedure used in this study. The GHCN time series differs most dramatically, most likely because of a different selection and/or

weighting of stations and because of a series of adjustments made to the GHCN data. The trends computed from the three time series are:

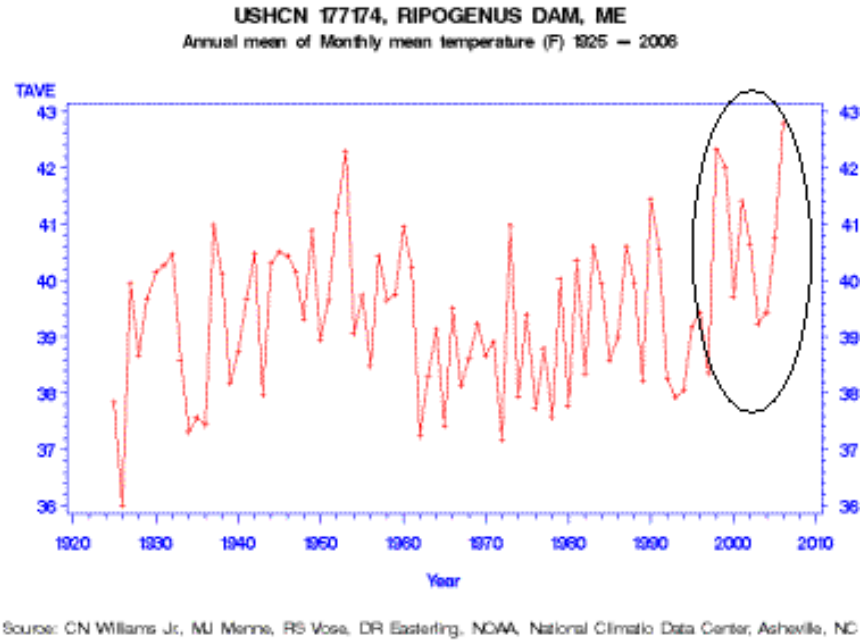
This Study 0.69 C/century
Jones et al. 0.79 C/century
GHCN 2.83 C/century.

CASE 10: WHEN STATIONS CLOSE BUT DATA APPEARS

For (these) stations that are missing periods or some stations that are now closed, surrounding stations data are used. One example is Ripogenus Dam in Maine.

Surveys of the United States Historic Climate Network (USHCN) temperature stations in Maine for Anthony Watts surface station evaluation project determined that every one of the stations in Maine was subject to microclimate or urbanization biases. One station especially surprised the surveyors, Ripogenus Dam, a station that was officially closed in 1995.

Despite being closed in 1995, USHCN data for this station is publicly available until 2006!



Part of the USHCN data is created by a computer program called "filnet" (essentially homogenization) which estimates missing values. According to the NOAA, filnet works by using a weighted average of values from neighboring stations. In this example data was created for a closed station from surrounding stations, which in this case as we noted were all subject to microclimate and urban bias. Those existing stations are no longer adjusted for the urban heat island effect so neither is the temperature for the "closed" station. Note the rise in temperatures after this best sited, truly rural station in Maine was closed.

CASE 11: SKEWED SCIENCE

by Phil Green, Financial Post

A French scientist's temperature data show results different from the official climate science. Why was he stonewalled? The Climategate emails detail efforts to deny access to global temperature data.

The global average temperature is calculated by climatologists at the Climatic Research Unit at the University of East Anglia. The temperature graph the CRU produces from its monthly averages is the main indicator of global temperature change used by the Intergovernmental Panel on Climate Change, and it shows a steady increase in global lower-atmosphere temperature over the 20th century. Similar graphs for regions of the world, such as Europe and North America, show the same trend. This is consistent with increasing industrialization, growing use of fossil fuels, and rising atmospheric concentrations of carbon dioxide.

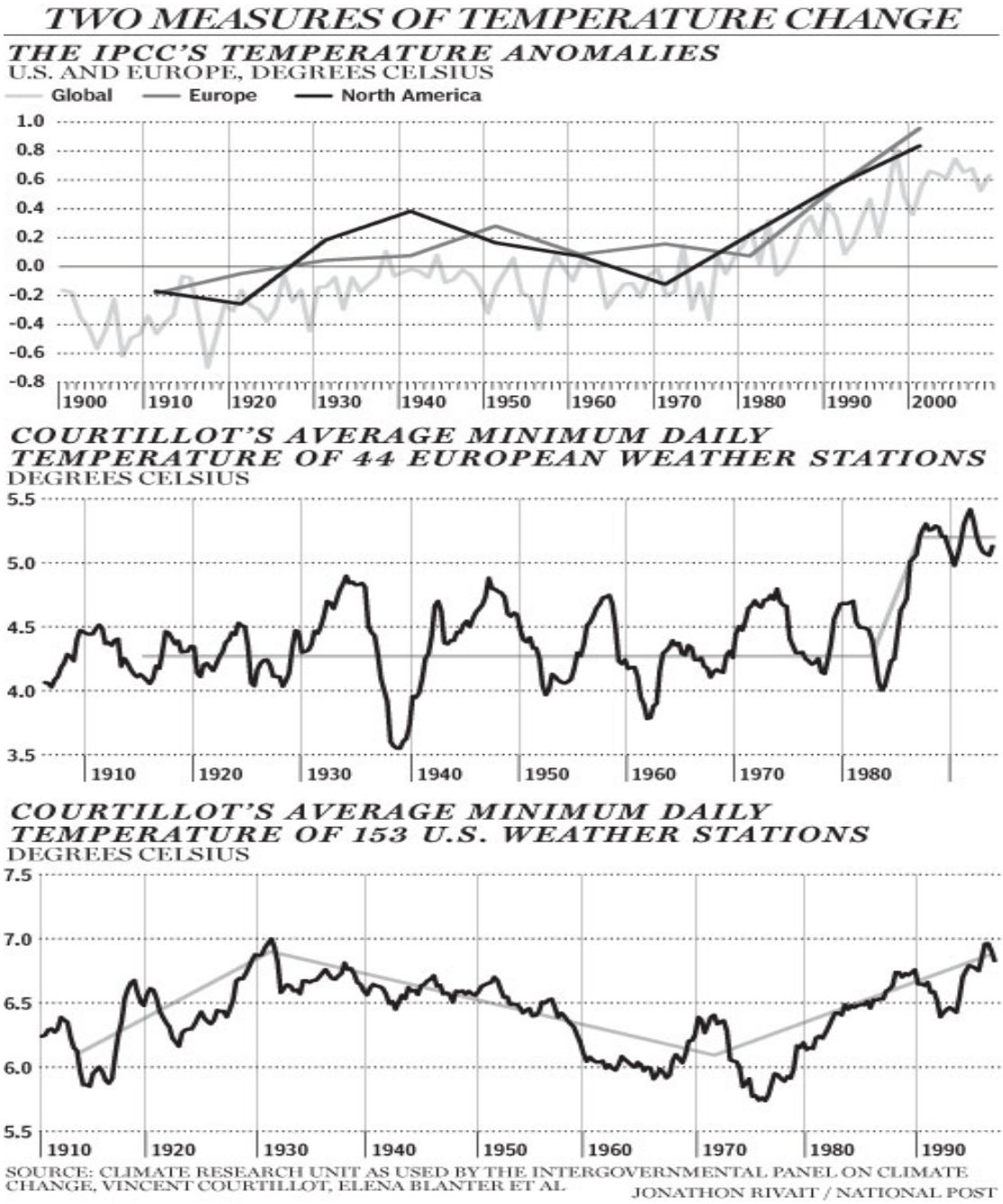
The Climategate emails detail efforts to deny access to global temperature data.

It took the CRU workers decades to assemble millions of temperature measurements from around the globe. The earliest measurements they gathered came from the mid-19th century, when mariners threw buckets over the side of their square-riggers and hauled them up to measure water temperature. Meteorologists increasingly started recording temperatures regularly on land around the same time. Today they collect measurements electronically from national meteorological services and ocean-going ships.

Millions of measurements, global coverage, consistently rising temperatures, case closed. The Earth is warming. Except for one problem. CRU's average temperature data doesn't jibe with that of Vincent Courtillot, a French geo-magneticist, director of the Institut de Physique du Globe in Paris, and a former scientific advisor to the French Cabinet. Last year he and three colleagues plotted an average temperature chart for Europe that shows a surprisingly different trend. Aside from a

Courtillot asked Phil Jones, the scientist who runs the CRU database, for his raw data, telling him (according to one of the 'Climategate' emails that surfaced following the recent hacking of CRU's computer systems), "There may be some quite important information in the daily values which is likely lost on monthly averaging." Jones refused Courtillot's request for data.

very cold spell in 1940, temperatures were flat for most of the 20th century, showing no warming while fossil fuel use grew. Then in 1987 they shot up by about 1 C and have not shown any warming since. This pattern cannot be explained by rising carbon dioxide concentrations, unless some critical threshold was reached in 1987; nor can it be explained by climate models.



Courtillot and Jean-Louis Le Mouel, a French geo-magneticist, and three Russian colleagues first came into climate research as outsiders four years ago. The Earth's magnetic field responds to changes in solar output, so geomagnetic measurements are good indicators of solar activity. They thought it would be interesting to compare solar activity with climatic temperature measurements.

Their first step was to assemble a database of temperature measurements and plot temperature charts. To do that, they needed raw temperature measurements that had not been averaged or adjusted in any way. Courtillot asked Phil Jones, the scientist who runs the CRU database, for his raw data, telling him (according to one of the 'Climategate' emails that surfaced following the recent hacking of CRU's computer systems), "There may be some quite important information in the daily values which is likely lost on monthly averaging." Jones refused Courtillot's request for data, saying that CRU had "signed agreements with national meteorological services saying they would not pass the raw data onto third parties." (Interestingly, in another of the CRU emails, Jones said something very different: "I took a decision not to release our [meteorological] station data, mainly because of McIntyre," referring to Canadian Steve McIntyre, who helped uncover the flaws in the hockey stick graph.)

Courtillot and his colleagues were forced to turn to other sources of temperature measurements. They found 44 European weather stations that had long series of daily minimum temperatures that covered most of the 20th century, with few or no gaps. They removed annual seasonal trends for each series with a three-year running average of daily minimum temperatures. Finally they averaged all the European series for each day of the 20th century.

CRU, in contrast, calculates average temperatures by month – rather than daily – over individual grid boxes on the Earth's surface that are 5 degrees of latitude by 5 degrees of longitude, from 1850 to the present. First it makes hundreds of adjustments to the raw data, which sometimes require educated guesses, to try to correct for such things as changes in the type and location of thermometers. It also combines air temperatures and water temperatures from the sea. It uses fancy statistical techniques to fill in gaps of missing data in grid boxes with few or no temperature measurements. CRU then adjusts the averages to show changes in temperature since 1961-1990.

The decision to consider the 1961-1990 period as 'normal' was CRUs. Had CRU chosen a different period under consideration, the IPCC graph would have shown less warming ... Parker advised Jones not to select a different period, saying "anomalies will seem less positive than before if we change to newer normals, so the impression of global warming will be muted."

CRU calls the 1961-1990 the "normal" period and the average temperature of this period it calls the "normal." It subtracts the normal from each monthly average and calls these the monthly "anomalies." A positive

anomaly means a temperature was warmer than CRU's normal period. Finally CRU averages the grid box anomalies over regions such as Europe or over the entire surface of the globe for each month to get the European or global monthly average anomaly. You see the result in the IPCC graph nearby, which shows rising temperatures.

The decision to consider the 1961-1990 period as 'normal' was CRUs. Had CRU chosen a different period under consideration, the IPCC graph would have shown less warming, as discussed in one of the Climategate emails, from David Parker of the UK meteorological office. In it, Parker advised Jones not to select a different period, saying "anomalies will seem less positive than before if we change to newer normals, so the impression of global warming will be muted." That's hardly a compelling scientific justification!

In addition to calculating temperature averages for Europe, Courtillot and his colleagues calculated temperature averages for the United States. Once again, their method yielded more refined averages that were not a close match with the coarser CRU temperature averages. The warmest period was in 1930, slightly above the temperatures at the end of the 20th century. This was followed by 30 years of cooling, then another 30 years of warming.

Courtillot's calculations show the importance of making climate data freely available to all scientists to calculate global average temperature according to the best science. Phil Jones, in response to the email hacking, said that CRU's global temperature series show the same results as "completely independent groups of scientists." Yet CRU would not share its data with independent scientists such as Courtillot and McIntyre, and Courtillot's series are clearly different. Read more here[96].

As Ronald Coase, the Nobel Laureate, when the Nobel was a meaningful prize well deserved, suggested "The data has indeed been tortured and it has confessed."

CASE 12: NASA: "HIDE THIS AFTER JIM CHECKS IT"

by Steve McIntyre, on ClimateAudit.org

This post by Steve McIntyre on his Climate Audit blog was given in response to NASA GISS's James Hansen comments to the early press release on the data issues on the KUSI website. It speaks to the 'quality control' efforts of the GISS team. It appears they indeed do practice quality control but not quality assurance, which is what a data center really should provide.

> "NASA has not been involved in any manipulation of climate data used in the annual GISS global temperature analysis. The analysis utilizes three independent data sources provided by other agencies. Quality control checks are regularly performed on that data. The analysis methodology as well as updates to the analysis are publicly available on our website. The agency is confident of the quality of this data and stands by previous scientifically based conclusions regarding global temperatures."

[96] http://network.nationalpost.com/np/blogs/fpcomment/archive/2009/11/26/skewed-science.aspx#ixzz0Y6KcQceK.

The word "hide" has obviously attracted a lot of attention lately – "hide the decline" even occasioning its own song.

Today I'd like to discuss the following remarkable instructions by a NASA employee in the recently disclosed NASA emails (available at Judicial Watch):

> *Robert please move to the CU site and **hide this after Jim checks it**. Darnell please send it out to Jim's email list. Jim said **if I don't want to** you should do…*

What is that they are planning to "hide"? And why would they be "hiding" it in the first place? And why would Hansen think that one of his employees wouldn't "want" to send something out to Jim's email list?

In order to forestall claims that I've shown these words "out of context", I've done a careful review of the events leading up to this email.

The context is the Hansen Y2K controversy in August 2007. On August 3 (10:46 am Eastern), I had published a post entitled Hansen's Y2K Error[97] in which I observed a previously unreported "Y2K error" in GISS USHCN conclusively disproved efforts by Eli Rabett (for example, here[98]) and Tamino to discredit Anthony Watts' surface stations project on the basis that NASA software could "fix" inhomogeneous station data. I observed in this post:

> *The input version [for the Detroit Lakes example shown] switches from the USHCN adjusted/TOBS version to the USHCN raw version (without time-of-observation adjustment). This imparts an upward discontinuity of 1 deg C in wintertime and 0.8 deg C annually. I checked the monthly data and determined that the discontinuity occurred on January 2000 – and, to that extent, appears to be a Y2K problem. I presume that this is a programming error.*

This post was the result of a lengthy process of cross-comparing different versions of station data in order to try to figure out the precise provenance of GISS data – a procedure reasonably described as "reverse engineering".

Within a few hours (13:21 Eastern), NASA blogger Gavin Schmidt, like the eye of Saruman ever alert to the smallest rustling in the blogosphere, noticed the CA post and immediately notified NASA employee Reto Ruedy :

> *If you didn't see it: www.climateaudit.org/?p=1854. There is something curious here, why does GISS raw go back to USHCN unadjusted in 2000? Shouldn't it have stayed with USHCN + TOBS? Gavin. PS if this is all as it should be, we need to make clear the reasons very quickly. Otherwise the myth of the "Hansen Y2K error" will be all around the place and once it's out, it won't go away.*

[97] http://www.climateaudit.org/?p=1854.
[98] http://rabett.blogspot.com/2007/08/its-not-watt-you-think-tony-watts.html.

Ruedy quickly realized that there was indeed a problem and suggested to Gavin that they could adjust the USHCN data prior to 2000 to match the post-2000 GHCN version. Gavin wondered whether it might make sense to adjust the post-2000 GHCN data (a logical suggestion – one that I made independently – but one that wasn't followed).

On August 4, I sent an email to Hansen notifying him of the problem.

> *In your calculation of the GISS "raw" version of USHCN series, it appears to me that, for series after January 2000, you use the USHCN raw version whereas in the immediately prior period you used USHCN time-of-observation or adjusted version. In some cases, this introduces a seemingly unjustified step in January 2000.*
>
> *I am unaware of any mention of this change in procedure in any published methodological descriptions and am puzzled as to its rationale. Can you clarify this for me?*
>
> *In addition, could you provide me with any documentation (additional to already published material) providing information on the calculation of GISS raw and adjusted series from USHCN versions, including relevant source code. Thank you for your attention, Stephen McIntyre*

The emails now show a steady stream of discussions by and between NASA employees.

On Monday morning (Aug 6), Ruedy described me to Hansen as follows:

> *Steve is the person who appointed himself auditor of all web sites and organizations that have to do with global warming in order to debunk this "hoax". He is maintaining a blog – a website called climateaudit.org , a site containing among justified concerns (caveats that we stress in all our papers) obvious fabrications and vicious attacks … I expect only a minor effect since the offsets average out to ~0 over all USHCN stations"*

On Monday evening August 6 (23:19 Eastern), I published my own first estimate of the impact of the error in the post Quantifying the Hansen Y2K Error[99]. I showed a bimodal distribution of the step discontinuities and that the distribution was not symmetric. I estimated that there would be an upward step at January 2000 of about 0.18-0.19 deg C (not a bad estimate as things turn out),

> *The step in January 2000 is clearly visible and results in an erroneous upward step of about 0.18-0.19 deg C. in the average of all unlit stations. I presume that a corresponding error would be carried forward into the final GISS estimate of US lower 48 temperature and that this widely used estimate would be incorrect by a corresponding amount. The 2000s are warm in this record with or without this erroneous step, but this is a non-negligible error relative to (say) the amounts contested in the satellite record disputes.*

[99] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/.

The next morning (Aug 7), Ruedy sent Hansen and Gavin a draft reply to my email. He reported a US error of 0.15 deg C (a bit lower than my estimate the previous night.) The draft reply satirized the idea (then being promulgated by Rabett and Tamino) that GISS software could "fix" defects in surface data:

> *I had no idea what code you are referring to until I learned from your article "Hansen's Y2K Error (which should really be Reto's Y2K error) that GISS is in possession of some magical software that is able to "fix" the defects in surface data. No wonder you would like to get your hands on that – so would I. Unfortunately your source totally misled you in that respect. I'm a little amazed that you uncritically present it as a fact given that a large part of your web site is devoted to convincingly prove that such software cannot possibly exist.*

Gavin suggested a pared down reply which Ruedy agreed to, replying:

> *Any attempts to teach or outsmart Steve are counterproductive and a total waste of time.*

Let's just say that I disagree that the "teaching" part would be "counterproductive and a total waste of time". After a number of exchanges, Hansen weighed in, with Ruedy seizing on Hansen's suggestions as a means to "ignore" Climate Audit even though we now know that the blog was the original source of their knowledge of the error:

> *Jim, thanks – with your suggested change, we totally ignore his blogs.*

The nuance here is that they would (for a very short time) acknowledge me *personally* without acknowledging the blog – even though it turns out that they learned of the problem from the blog. (A few weeks later, they deleted the acknowledgement.) Late in the afternoon, Ruedy replied to me by email (which I noted that evening in an update here[100].)

Through the two days, NASA employees were busy re-calculating the adjusted USHCN network, discussing this passim in August 7 emails. Instead of adjusting the post-2000 GHCN values, they adjusted the pre-2000 USHCN values. This led to changes in literally millions of individual values in their database.

Early in the morning of August 8, CA readers began to become aware of the wholesale changes – see comments in the Quantifying[101] thread.

Reader Mikel was the first[102] to observe changes in the US history. Jerry Brennan was the first to notice changes in individual station data, and shortly afterwards confirmed[103] "completely new" pre-2000 numbers in a spot check of three stations:

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[100] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/.
[101] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/.
[102] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/#comment-98188.
[103] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/#comment-98192.

> *I looked at three of the stations that I checked a few days ago, and all three have completely new pre 2000 numbers in the GISS "raw" files.*

Following Jerry Brennan's lead, I also checked some stations, also confirming[104] massive changes to pre-2000 values:

> *#45. I checked Hopewell and I agree. Jeez, they've been crazy busy the last couple of days. I'm not sure what they're doing but they're really going at it fast. IF Hopewell VA is typical, they'll have changed all the GISS raw and GISS adjusted versions in the U.S. before 2000.*
>
> *I think that they are trying to do things too fast without thinking it through. If this is what they've done (and I'm not sure yet), the pre-2000 GISS raw (which was fairly stable) has been changed into pre-adjusted versions that now don't track to original sources, whatever those sources were.*
>
> *My, my…*
>
> *If it were me in their shoes, I'd have kept the pre-2000 data intact and adjusting the post-2000 data. Far too many changes in what they're doing. But it will take a couple of days to assess the situation.*

A bit later, I observe[105]:

> *Here's something interesting. If you compare "old" Hopewell VA numbers (fortunately preserved due to my much criticized "scraping" of GISS data) to the "new" Hopewell VA numbers, the GISS "raw" data for say June 1934 or June 1935 has gone up by 0.7 deg C, while the GISS "adjusted" data has gone up by only 0.1 deg C. So in some cases, their "UHI" adjustment as applied offsets what was a programming error. Makes you wonder about the validity of the UHI adjustment. BTW as Jerry previewed, their US data set is now a total mess. Everything's been written over prior to 2000.*

In the early afternoon of August 8 (14:51 Eastern), I wrote a short post[106] on changes in the "leaderboard". This short and simple post attracted a lot of attention and infuriated Hansen:

[104] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/#comment-98193.
[105] http://climateaudit.org/2007/08/06/quantifying-the-hansen-y2k-error/#comment-98196.
[106] http://climateaudit.org/2007/08/08/a-new-leaderboard-at-the-us-open/.

> *There has been some turmoil yesterday on the leaderboard of the U.S. (Temperature) Open and there is a new leader.*
>
> *A little unexpectedly, 1998 had a late bogey and 1934 had a late birdie. (I thought that they were both in the clubhouse since the turmoil seemed to be in the 2000s.) In any event, the new leader atop the U.S. Open is 1934.*
>
> *2006 had a couple of late bogeys and fell to 4th place, behind even 1921. I think that there's a little air in the 2006 numbers even within GISS procedures as the other post-2000 lost about 0.15 strokes through late bogeys, while it lost only 0.10 strokes. It is faltering and it might yet fall behind 1931 into 5th place.*
>
> *Four of the top 10 are now from the 1930s: 1934, 1931, 1938 and 1939, while only 3 of the top 10 are from the last 10 years (1998, 2006, 1999). Several years (2000, 2002, 2003, 2004) fell well down the leaderboard, behind even 1900. (World rankings are calculated separately.) Note: For the new leaderboard see http://data.giss.nasa.gov/ gistemp/graphs/Fig.D.txt. The old data has been erased; by sheer chance, I had the old data active in my R-session but I can't give a link to it.)*

As events proved out, Hansen didn't need Saruman to bring the matter to his attention. It's interesting in retrospect to review the ripples from the blog to NASA as a media exercise – as the story spread first through specialist blogs, then into the media, at which point Hansen paid attention.

The first blog coverage appears to be on August 8 by Anthony[107] – then a fledgling blog, a long way from being #2 at Wikio.

The next day (Aug 9), it got mentioned at realclimate, where Gavin dismissed[108] the point as insignificant and, despite Climate Audit's obvious priority in identifying the spliced data sets, falsely credited GISS themselves with pinning down the precise error:

> *Once notified of the problem, GISS investigated immediately, **found the error**, and added an extra step to the analysis to remove any jump at the transition*

At 10:30, Noel Sheppard at Newsbusters posted[109] on the story, restricting the point (as I had done) to the US, rather than global, temperatures. An hour later, the story was reported at dailytech.com here[110], where it was also noted that the effect on global temperatures was minor, but the effect on the US was noticeable. Both stories commented adversely on NASA's changing the data without an explicit change notice.

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[107] http://www.norcalblogs.com/watts/2007/08/1998_no_longer_the_hottest_yea.html.

[108] http://www.realclimate.org/index.php/archives/2007/08/the-co2-problem-in-6-easy-steps/comment-page-3/#comment-45781.

[109] http://newsbusters.org/blogs/noel-sheppard/2007/08/09/did-media-or-nasa-withhold-climate-history-data-changes-public.

[110] http://www.dailytech.com/article.aspx?newsid=8383.

In the early afternoon (14:28), Andy Revkin asked Schmidt and/or Hansen about the story, again noting the restriction to the US:

> *"you probably noticed the Mcintyre et al depiction of GISS annual temp estimates for US over time. Were the revisions published yet or are they updated in databases alone? Also are you doing same for global mean temp or is this specific issue related to US?"*

An hour later, Gavin had drafted a reply, which he forwarded to Ruedy. Ruedy quickly responded that the issue was a "red herring" because the values in their 2001 (!) paper were unaffected, as the data used in the paper ended in 1999 before the splice:

> *"none of the figures in our latest (2001) paper were affected since it was written in 2000 and only data up to 1999 was used for the figures in that paper… a red herring"*

Around 6 pm Aug 9, a citizen emailed Hansen directly asking for a comment. Hansen forwarded the email to Ruedy and Gavin. Around 7 pm, Ruedy suggested to Gavin that the inquiry either be "ignored" or that they "set matters straight" at RealClimate:

> *"Jim gets many of these kinds of responses – a change whose effect we described as well within the margin of error has become an "astonishing change"…. I guess the best thing is to ignore it and – if at all –* ***set matters straight in a place like RealClimate.***

At 19:12, Gavin replied tersely, agreeing that the matter should be dealt with at RealClimate (which he did in a post the next day):

> *Agreed.*

Later in the evening, Hansen, apparently never bothering to read what I'd actually written on the topic, sent an email to Revkin calling the incident a "tempest inside somebody's teapot dome" – a phrase that Hansen seemed to like as he re-used it , fuming:

> *This seems to be a tempest inside somebody's teapot dome… It is unclear why anyone would try to make something out of this, perhaps a light not on upstairs? Or perhaps this is coming from one of the old contrarians? They can't seem to get over the fact that the real world has proven them full of malarkey! You would think that they would be ready to crawl under a rock by now.*

On August 10, the story gets covered in a few more places. The New York Times Opinionator reported on the dailytech column around 9 a.m. A reporter from the National Post in Canada inquires at to several NASA employees, referring to Anthony Watts' post of two days earlier.

At 10:23 Hansen complained that he is being "besieged" by emails (either the FOI is incomplete or, in Hansen-world, a few inquiries constitute a siege) and decided to "do something":

I am being besieged by emails and calls about this, so we need to do something promptly as there will be stories written today for publication tomorrow… By the way, Makiko, do you remember if we ever make any statement about how different years ranked for the U.S. temperatures? There are several demands that we issue a press release correcting our wrong results and declaring that 1934 is now the warmest year on record in the US and also that 4 of the 10 warmest years were in the 1930s and only 3 in the last 10 years.

In the late morning, Ruedy answered Leslie McCarthy (apparently the PR person) sycophantically describing Hansen's tirade to Revkin as answering in the "clearest and most beautiful way", before making various accusations against me:

Andy Revkin asked the same question and Jim's answer below says it all in the clearest and most beautiful way… The blog you attached is a prime example of what gives bloggers a really bad name; somebody with no idea what he is talking about is spouting absolute nonsense, making no distinction between what is essential (the facts he conveniently omits) and what is pure noise (which he is concentrating on exclusively). ..

He finds it astounding that the years 1934 and 1998 reversed ranks, not remembering that the corrections only affected years 2000-2006, hence there is no possible connection there. By speaking of warmest year (rather than warmest year in the US time record), he successfully deceived people like Mark Taylor."

Just before noon Aug 10, Hansen again complains about being "besieged", but this time with a knot in his stomach as he's just been told that the earlier results have been "thrown away", making a before and after comparison impossible. Hansen pleads for his subordinates to retrace their steps or they will "never live this down" and sensibly recommends that they save their results at least once a year in the future:

I am being besieged by these… The appropriate response is to show the curves for U.S. and global temperatures before and after McIntyre's correction. ***Makiko doubts that his is possible because the earlier result has been 'thrown away'. We will never live this down if we give such a statement****. It must be possible to reconstruct the "before" result. Unfortunately this needs to be done soon as there are various writers with deadlines this afternoon. .. By the way, I think that we should save the results of the analyses at least once a year, so we will have a record of how they change.*

An hour later, Ruedy told Hansen, much to his relief, that the data had not been thrown out and that they could do the desired comparison. So Hansen started writing what became his "Lights On Upstairs" jeremiad.

Meanwhile, Gavin was responding to inquiries from Stewart Gaffin about the Opinionator piece, which recapped the dailytech article that stated that I had " "reverse engineered" the data to find NASA's algorithm, discovered that a Y2K bug had played havoc with some of the numbers and notified the space agency." Gavin disparaged my role in the matter, again attributing the precise diagnosis to NASA (though it was me who had spotted the change in

data sets) and denying that I had had to do "reverse engineering" to figure out the problem – even though that was precisely what I had had to do (in the form of patient comparison of multiple versions of different data sets):

> *The opinionator piece is mostly made up… The issue is that McIntyre noticed an odd jump in some US stations at the switch between 1999 and 2000. He sent a letter pointing out the jump, the GISTEMP people looked into it, saw the problem and fixed it in less than a day. No "reverse engineering". Nobody 'always puzzled by the gaps' and no havoc.*

Meanwhile, Hansen had finished his draft Lights Out Upstairs editorial and circulated it to his staff at 15:54, noting that it still "needs the figures and links".

Concurrently, Sato sent a note to Hansen reminding him that 1934 and 1998 had changed places (this is covered more thoroughly in a later Sato memo) and that earlier in the year (January), 1998 was in first place.

> *Let's try to remember what statements we made about US temperature. … (3) In January 2007, I showed on my "Some Extra" page which most people don't look at: 1834 1.23, 1998 1.24 and 2006 1.23.*

She added that, while NASA didn't usually publicize US rankings, NOAA did (e.g. their January 2007 press release[111] (which was headlined "NOAA REPORTS 2006 WARMEST YEAR ON RECORD FOR U.S." and which was very much in the air at the time).

In response to Hansen's attempt to restrict attention to global trends, Revkin reminded Hansen that USA temperature trends had been frequently used in advocacy (and thus the point could not be dismissed quite as easily as Hansen wanted):

> *Given that quite a few folks (Gore and some enviros particularly) have often used the USA temp trends in arguments for action (string of record years) it's hard for me to ignore the reanalysis of those annual temps – even though my own focus remains global mean temps. …happy to discuss by phone til 6 pm or so.*

During the next few hours, Hansen's subordinates worked busily to get Lights Out Upstairs ready for showtime. At 16:04, Schmunk checked with Hansen on which precise 2001 reference he wanted to link to. At 16:18, Sato asked whether the figures were too large or too small. At 16:26, Sato confirmed to Schmunk that a fresh version had been sent to Hansen and asked Schmunk about links. At 16:29, Hansen sent out a revised version for comment to Schmunk, Ruedy, Sato and Darrell Cain. At 16:35, Ruedy notified Sato of a few typos. At 16:43, Schmunk advised Sato on pdf linking style. At 16:50, Sato sent minor edits to Hansen. At 17:09, Hansen reverted with two small changes. At around 17:30, Sato sent a final version to Schmunk, Hansen and Cain, telling Schmunk to move the essay to CU (Hansen's

[111] http://www.noaanews.noaa.gov/stories2007/s2772.htm.

"personal" site) and "hide" it at the NASA site and telling Darnell Cain that he had to send it out to Hansen's email list:

> *Jim, please check if everything is fine. Robert, please move to the CU site and hide this after Jim checks it. Darnell, please send it out to Jim's email list. Jim said if I don't want to, you should do, but it is not a matter of what I WANT TO or NOT WANT TO. I don't know how to.*

Within a couple of minutes of Sato asking Schmunk to "hide" the Lights Out Upstairs editorial on the NASA website, Gavin Schmidt (at 17:33), in accordance with his agreement with Ruedy the previous day, used RealClimate as a vehicle to set "matters straight" about Hansen's Y2K error (see here[112]) once again trivializing the issue. For my own take on the significance of the incident, see my contemporary editorial here[113] where I argued:

> *My own view has been that matter is certainly not the triviality that Gavin Schmidt would have you believe, but neither is it any magic bullet. I think that the point is significant for reasons that have mostly eluded commentators on both sides.*

Back to the Lights Out Upstairs editorial. At 17:55, Schmunk reverted to Sato and the others with slightly edited doc and PDF versions. At 18:10, Schmunk notified Darnell Cain that the PDF was going up at Hansen's personal (CU) website. At 18:22, Hansen thanked the NASA team for their help in disseminating "A Lights On Upstairs[114]":

> *Thanks to all of you for the rush job! I think that it is very clear.*

At 18:27, A Light on Upstairs? was online at Hansen's personal website here[115]. Despite Sato's notice to Hansen that 1998 had ranked first in NASA rankings earlier that year, Hansen stated that they had ranked 1934 first in their 2001 paper and falsely and stubbornly asserted that it ranked first both "before and after" the Y2K correction:

> *our prior analysis had 1934 as the warmest year in the U.S. (see the 2001 paper above), and it continues to be the warmest year,* ***both before and after the correction to post 2000 temperatures.***

Hansen then complained once again about being "besieged" – this time by "rants" and not by "emails" and, apparently proud of his bon mots about "tempest inside someone's teapot dome" and a "light not being on upstairs", included these phrases in his jeremiad:

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[112] http://www.realclimate.org/index.php/archives/2007/08/1934-and-all-that/.
[113] http://climateaudit.org/2007/08/11/does-hansens-error-matter/.
[114] http://www.columbia.edu/~jeh1/mailings/2007/20070810_LightUpstairs.pdf.
[115] http://www.columbia.edu/~jeh1/mailings/2007/20070810_LightUpstairs.pdf.

> *Somehow the flaw in 2001-2007 U.S. data was advertised on the internet and for two days I have been besieged by rants that I have wronged the President, that I must "step down", or that I must "vanish". Hmm, I am not very good at magic tricks.*
>
> *My apologies if the quick response that I sent to Andy Revkin and several other journalists, including the suggestion that it was a tempest inside somebody's teapot dome, and that perhaps a light was not on upstairs, was immoderate. It was not ad hominem, though.*

So why did Sato want to "hide" A Lights On Upstairs? at the NASA website. And why did Hansen think that Sato might not want to distribute the Lights On email for him? And, after NASA employees had worked all afternoon on Lights Out Upstairs, why did Hansen post Lights Out Upstairs at his "personal" website rather than at the NASA GISS website?

Obviously we don't *know* the answers. But it's not hard to speculate on why Hansen chose to publish the article at his "personal" website. NASA has policies and regulations on the dissemination of NASA information – see a CA discussion from late 2007 here[116]). Would Lights Out Upstairs – with its whiny and juvenile tone – comply with NASA peer review procedures? Seems pretty unlikely to me. And I'm sure that Hansen was as aware of this as anyone.

The most plausible explanation for Sato wanting to "hide" Lights Out was presumably to avoid the article being deemed to require NASA peer as required for all NASA work product, a classification that Hansen seems to want to avoid in this case.

For some reason, Hansen seemed to have thought that Sato didn't "want" to send out the email for him and had already instructed Darrell Cain to send out the email if Sato didn't "want" to. We don't know why Hansen thought this about Sato. Perhaps she didn't think that it was appropriate for a NASA employee to be providing personal services to her boss (something not encouraged in NASA codes of conduct). Or maybe it was something very mundane.

Exactly why Hansen asked NASA employees to send an editorial being published on his "personal" webpage to his "personal" email list is also unclear. Perhaps Hansen was either unable or unwilling to do anything quite so menial as sending his work product to his "personal" email list. Maybe he was delivering insulation materials to a poor family. Maybe he was planting a tree.

In any event, the emails show that either Lights Out Upstairs was NASA work product (and not personal) or that NASA employees were diverted from NASA business to provide personal services for their boss. Something to keep in mind when contemplating the ongoing conundrum of how Gavin Schmidt operates RealClimate on his "personal time" – which elastically includes NASA working hours.

[116] http://climateaudit.org/2007/12/28/nasa-evasion-of-quality-control-procedures/.

Postscript: *On August 13, NASA headquarters sent an inquiry to NASA GISS about the Y2K controversy, then in its second wind. Even though the matter was 10 days old, there was no assessment at the NASA GISS website. Instead of publishing an assessment at the NASA website – the logical place, Hansen and Schmidt responded in off-balance sheet venues: Hansen at his "personal" website and Gavin, in accordance with his agreement with Ruedy, at RealClimate. So instead of being able to refer NASA headquarters to a clear and professional assessment at the NASA website, Hansen's answer was:*

> *"Send them Lights On Upstairs."*

See Steve's post and comments here[117].

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[117] http://climateaudit.org/2010/01/23/nasa-hide-this-after-jim-checks-it/#more-9903.
[118] http://www.kusi.com/weather/colemanscorner/81583352.html.

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