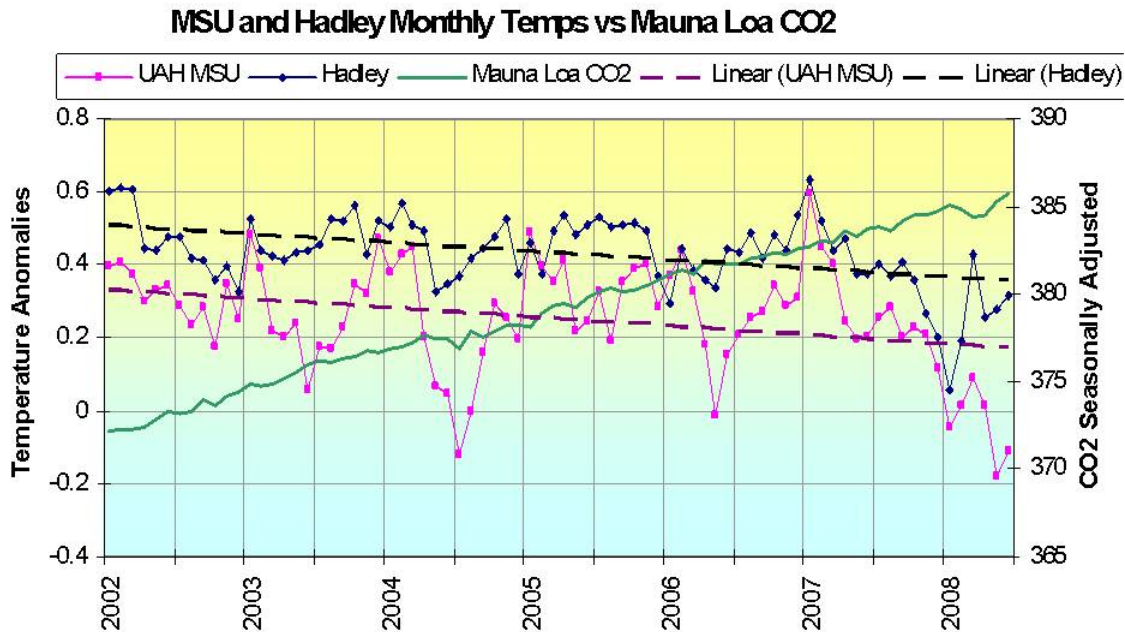


RECENT COOLING AND THE SERIOUS GLOBAL DATA BASE ISSUE

By Joseph D'Aleo, CCM, AMS Fellow

All the global data sources have updated for June. NOAA GHCN data was a clear outlier. NOAA called this the eighth warmest June on record for the globe in the 129 years since records began in 1880. The University of Alabama, Huntsville MSU satellite based global assessment reported the 22nd warmest in the 30 years of records in their data base (in other words the 9th coldest). In fact, their global mean was actually below the average (base period 1979-1998) with a value of -0.11°C (-0.19°F). This is a full 1.1°F degrees colder than the NOAA guesstimate. The other NASA satellite source, RSS had June as the 13th coldest out of the last 30 years.

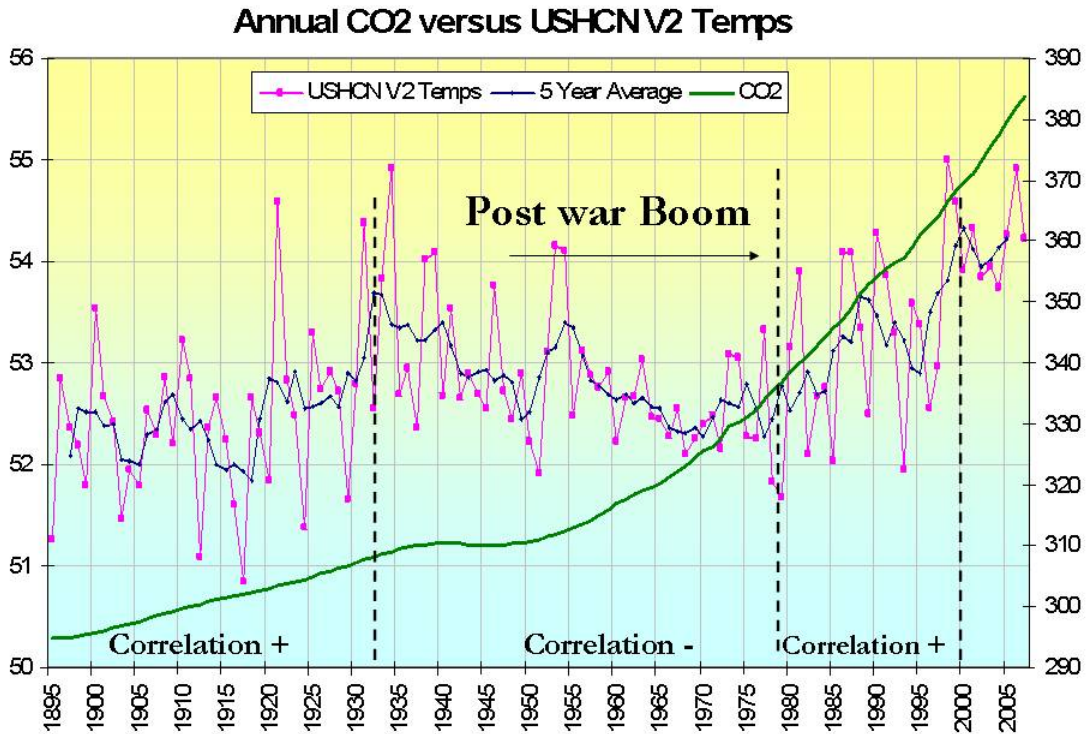
Hadley came in today with their CRUV3 data update. They also were in disagreement with the satellite data sets with $+0.316^{\circ}\text{C}$, the 10th warmest June. However both the Hadley and MSU do show a downtrend since 2002 of 0.15 to 0.2°C with a rather strong negative correlation ($r = -0.44$ with Hadley) with CO₂ which increased 3.5% over the period.



Negative correlation since 2002

R = -0.44 with Hadley, -0.30 with MSU

Recall the CO2 was negatively correlated for almost 4 decades from the 1940s through the 1970s. It was positively correlated from 1900 to 1930s and again 1979 to 1998. This on-again, off-again relationship suggests CO2 is not driving the climate bus but maybe a passenger in the back.



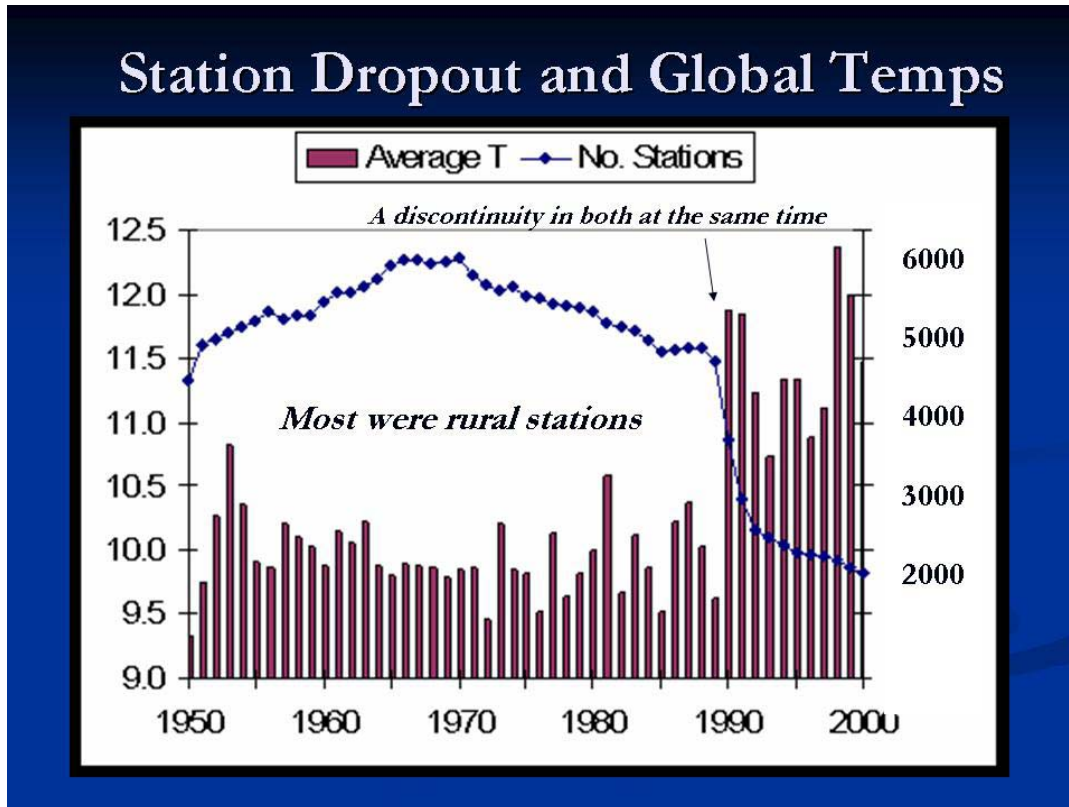
THE DATA BASE ISSUES

But why the discrepancy of satellite and surface based data bases? A statement is frequently made that the current warming is unprecedented and that using the global data bases something like “the 12 warmest years have occurred in the last 13 years.” This is nonsense.

Though there has clearly been some cyclical warming in recent decades, the global surface station based data is seriously compromised by urbanization and other local factors (land-use /land-cover, improper siting, station dropout, instrument changes unaccounted for and missing data) and thus the data bases overestimate the warming. Numerous peer-reviewed papers (referenced at end) in the last several years have shown this overestimation may be the order of 30 to 50%. I believe the recent warming is comparable or less than the warming in the 1930s and is now over.

STATION DROPOUT

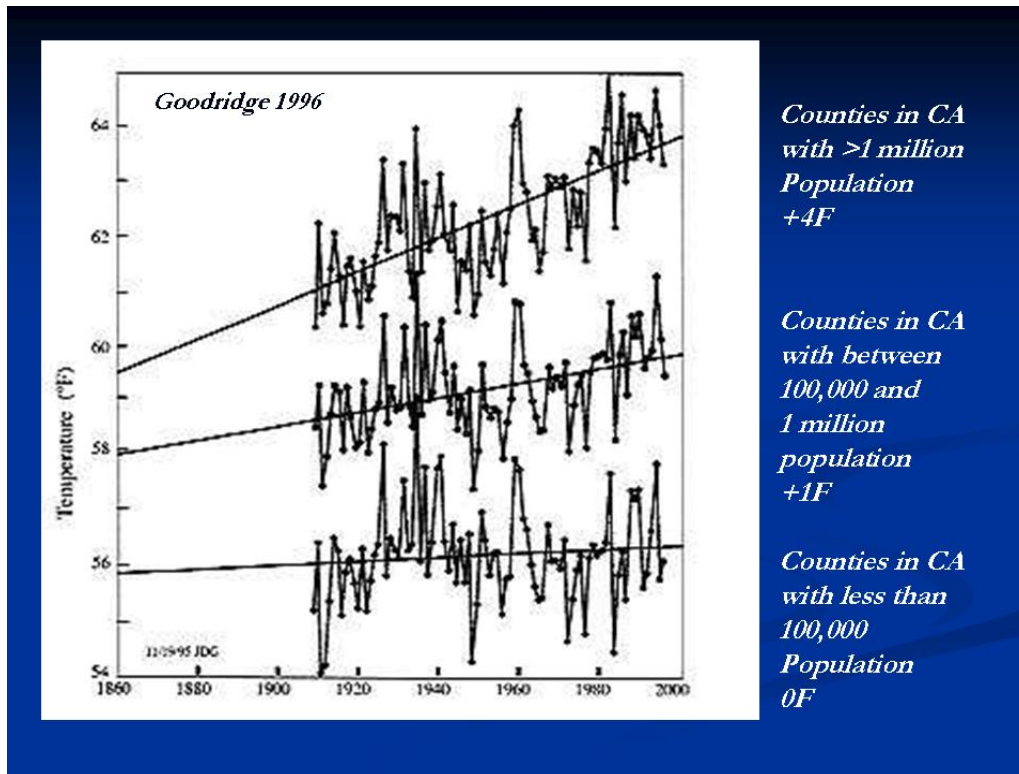
Station drop-out has occurred-- from a peak of 6,000 stations in 1970 to 2,000 today. The biggest dropoff occurred around 1990. Many of the stations that were dropped were rural. A larger percentage of the stations remaining were urban.



To see for yourself how rapid and extensive this is, look at [this animation](#) of reporting stations in recent decades, see the stations drop out rapidly around 1990.

URBANIZATION

Dr. Thomas Oke (the winner of the American Meteorological Society Helmut Landsberg award in 2007 for his pioneer work in urbanization), in 1973 showed how even cities with 1000 population could have a significant warming relative to urban areas (2°C). The global data bases do not consider an area a city and adjust for urbanization until the population exceeded 100,000. This introduces a warm bias into the data bases.



Zhou et al (2005) have shown global data bases (for China) not properly adjusted for urbanization. Block (2004) showed the same problem exists in central Europe. Hinkel et al (2003) showed even the village of Barrow, Alaska with a population of 4600 has shown a warming of 3.4°F in winter over surrounding rural areas.

More and more of the world is urbanized (population increased from 1.5 B to 6.5 B today). Cities grow around airports where we measure temperatures. See [this detailed review](#) of this Urban Heat Island (UHI) issue. NOAA, Hadley and NASA have argued urban contamination is not an issue mainly using the flawed discredited papers by Jones, Parker and Peterson. NASA's adjustments have been shown by Steve McIntyre to be erratic with the majority actually warming urban areas instead of adjusting temperatures down.

NASA Urban Adjustments

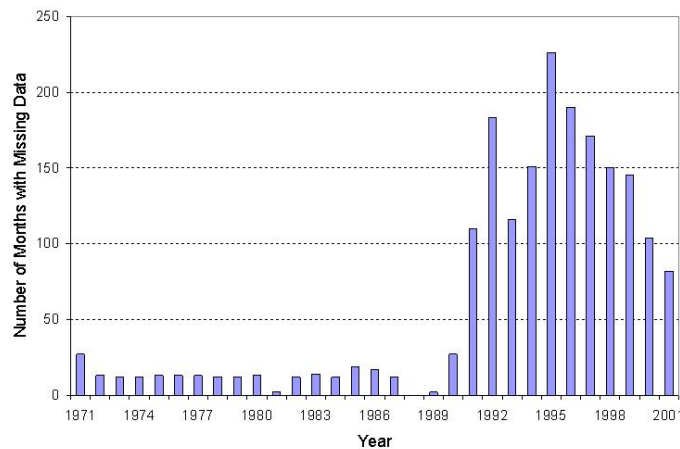
Negative adjustments	1848	45%
Positive adjustments	2236	55%
Total adjustments	4084	100%

Steve McIntyre, Climate Audit

MISSING DATA

Another issue that has been an issue over the entire history of observations is the erratic nature of station histories and the missing data that must be somehow accounted for.

Number of Missing Months



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

Try this to see for yourself how bad the global station data is. Go to [this site](#) (GISS - virtually the same as NOAA's GHCN though the adjustments made differ), scroll down to the map and click on any region. You will see stations listed - notice the highly variable reporting periods. Start clicking on stations. You will get plots. But before you move to other stations go to the bottom and click on "Download monthly data as text". You will see for many/most stations numerous "999.9"s meaning missing data. How do you come up with annual averages when one to multiple months are missing? I was told that in most cases the data is available (Environment Canada tells us they have their data we show as missing) but that NOAA and NASA is making no efforts to go out and get it.

INSTRUMENTATION CHANGES UNADJUSTED FOR

Stephen McIntyre has shown in [The HO-83 Hygro-thermometer](#) that the change to the HO-83 went unadjusted for even though Karl 1995 noted a discontinuity of about 0.5°C before and after switchover.

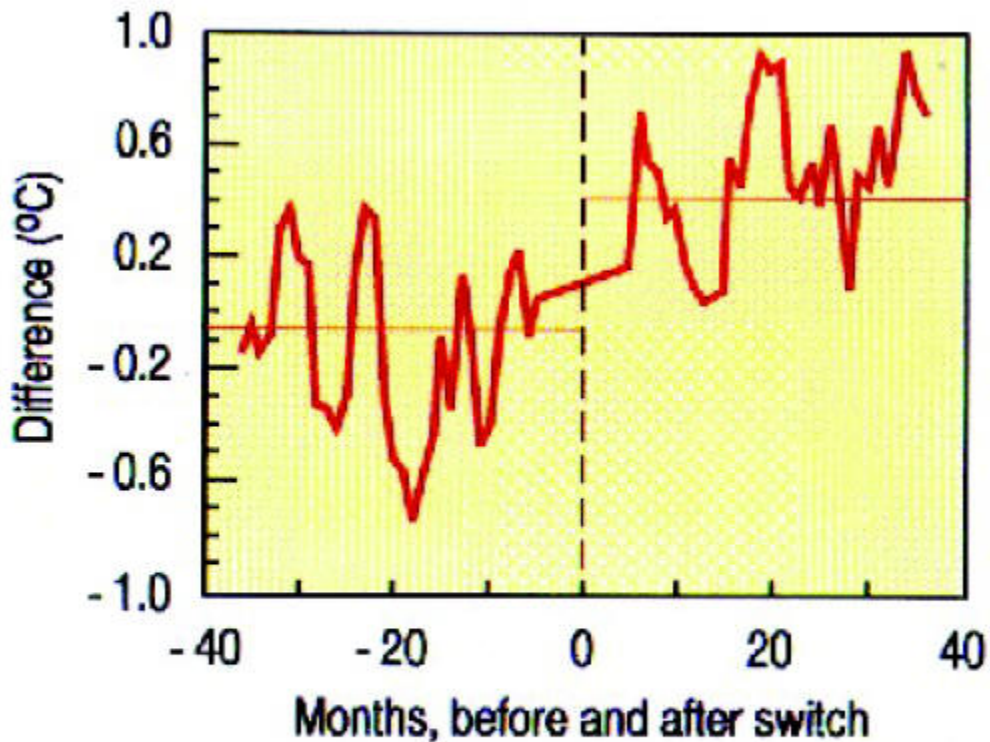
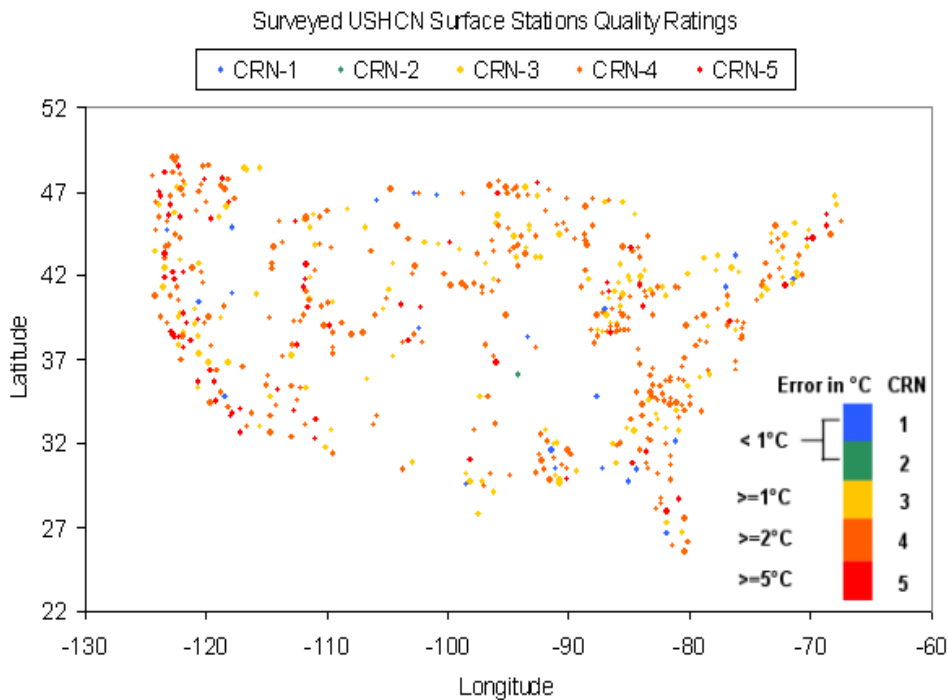


FIG. 2. Effects of changing instruments from the HO63 to the HO83 series on the maximum temperature in the United States (Karl et al. 1995).

BAD SITING

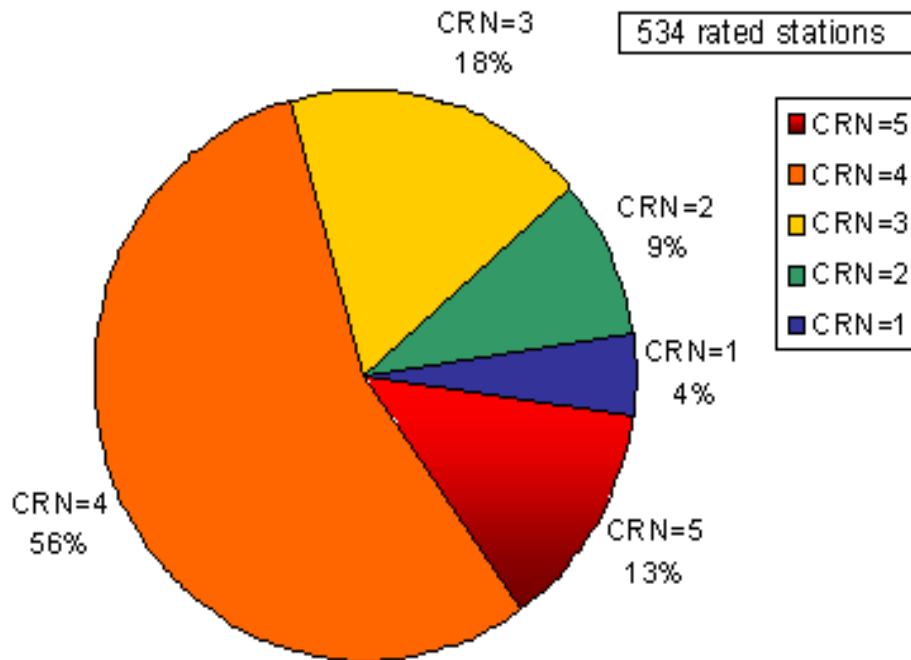
Pielke and Davey (2005) found a majority of stations including climate stations in eastern Colorado did not meet WMO requirements for proper siting. He has extensively documented poor siting and land use change issues in numerous peer review papers, many summarized in the landmark paper [Unresolved issues with the assessment of multi-decadal global land surface temperature trends](#) (2007).

Anthony Watts started a volunteer effort to document siting issues with all 1221 stations in US. He and his team is now through over 554 stations. He and his team is now through over 554 stations. See the results on <http://surfacestations.org> and numerous examples highlighted on <http://wattsupwiththat.wordpress.com>. Most of these siting issues identified introduce a warm bias.



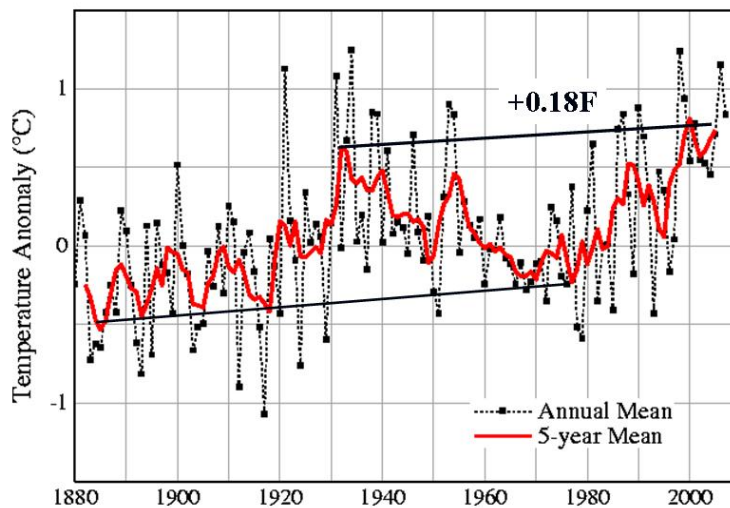
Using the government's own rating system, Anthony has shown a majority of the stations are inadequately sited (87% are CRN 3-5).

Surveyed CRN Site Quality Rating



Even with the issues, the US network because it does not suffer from the same extent of station dropout and missing data shows minimal warming since the last cyclical peak in 1930.

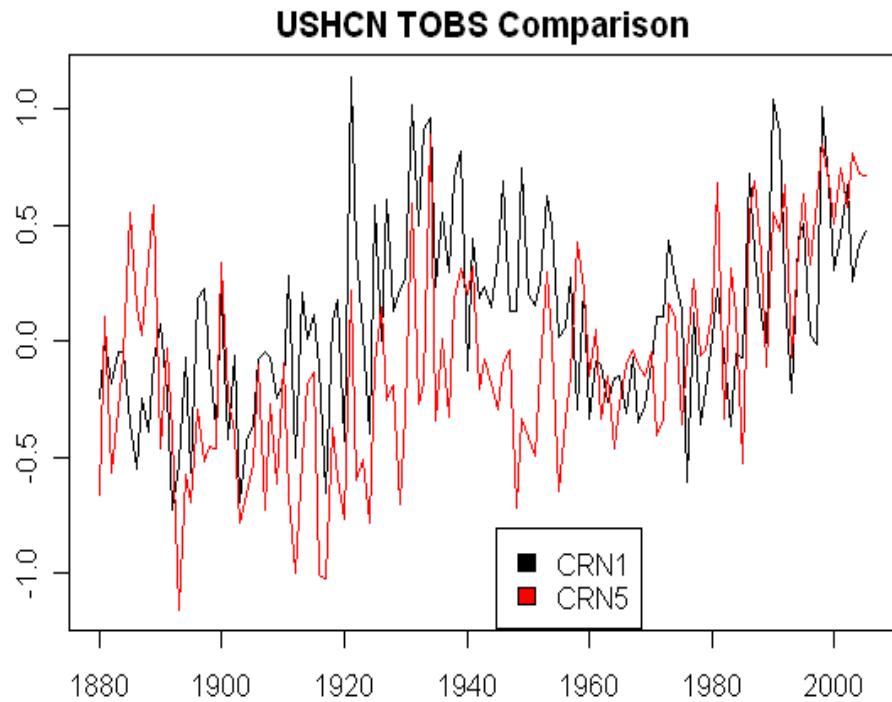
NASA GISS US DATA



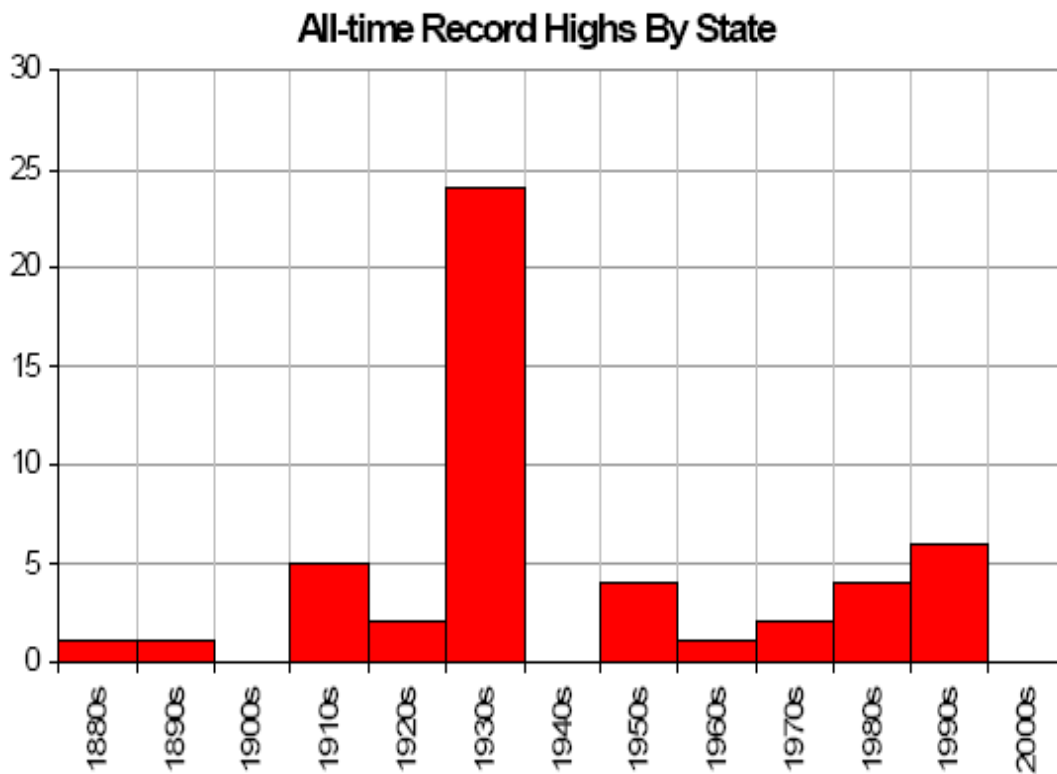
Even with siting and urbanization issues, not much warming

If the estimates of the warming are exaggerated by a 30-50%, the warming is within the margin of error for the instrumentation.

In fact the trend for only the stations rated CRN 1 show a lower second peak.

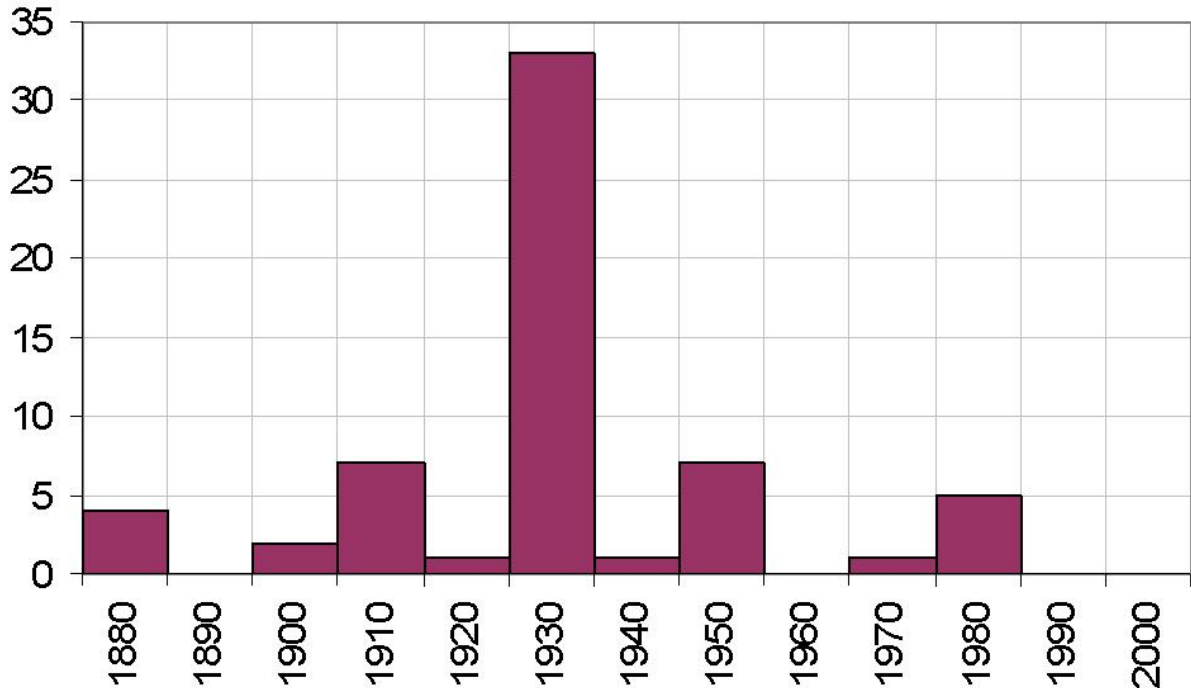


This is supported by the plot of All-time Record State Temperatures in which 37 of the 50 states set their new records in the decades prior to 1960.



Also the record daily highs in June and July in Des Moines show the dominance of the early 20th century with 55 of the 61 records prior to 1960.

Daily Record Highs in June and July in Des Moines, Iowa by Decade



OCEAN TEMPERATURE MEASUREMENTS

The change of methodology from buckets to ship intake and satellite raise question as to the accuracy of the global ocean temperatures. Since 70% of the world is ocean, this is no small issue.

GLOBAL EXTREMES

Even the global continental extremes show no recent decade represented. All the heat records were before 1950 with the exception of Antarctica which showed its warmest temperature in 1974. There probably was very little monitoring in prior years there.

WORLD EXTREME HEAT RECORDS (°F)

<i>Continent</i>	<i>All-time High</i>	<i>Place</i>	<i>Date</i>
Africa	136	El Azizia, Libya	September 13, 1922
North America	134	Death Valley, CA	July 10, 1913
Asia	129	Tirat Tsvi, Israel	June 22, 1942
Australia	128	Cloncurry, Queensland	January 16, 1889
Europe	122	Seville, Spain	August 4, 1881
South America	120	Rivadavia, Argentina	December 11, 1905
Oceania	108	Tuguegarao, Philippines	April 29, 1912
Antarctica	59	Vanda Station, Scott Coast	January 5, 1974

Some other anecdotal evidence that the recent warmth was not as extreme as the 1930s: Hottest in Canada: 45°C 5 July 1937 in a small town in Saskatchewan. Elsewhere in Canada, most of the hottest temperatures were recorded in the 1930s, ex: 44.4°C in Manitoba 1936, Alberta, 43.3°C July 1931. Also in eastern Canada, August 18/19, 1935 recorded temperatures of 36°C to 39°C. Downunder, the recorded hottest days in Adelaide, Melbourne and Sydney were during a heatwave in January 1939.

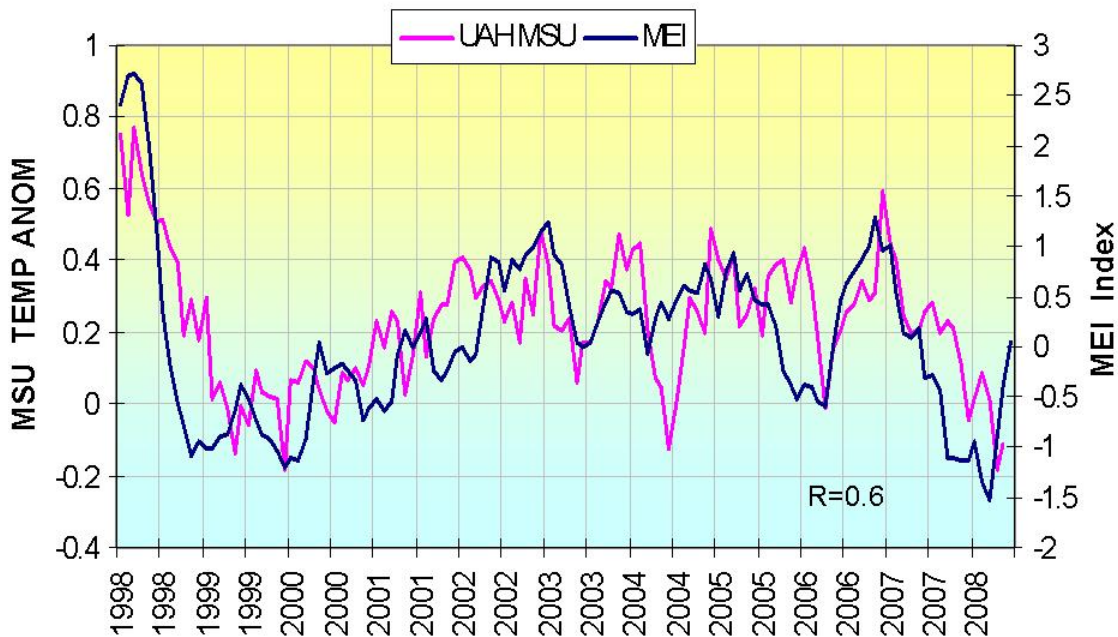
SUMMARY

The global data bases have serious problems that render them useless for determining accurate long term temperature trends. Though the ability to detect a 0.1°F temperature change is claimed, the many problems according to one well-known statistics expert question accuracy to within the order of 1, 2 even 5°F!

As stated earlier and shown here, though there has clearly been some cyclical warming in recent decades, the global surface station based data is seriously compromised by urbanization and other local factors (land-use /land-cover, improper siting, station dropout, instrument changes unaccounted for and missing data) and thus the data bases overestimate the warming. Numerous peer-reviewed papers (referenced below) in the last several years have shown this overestimation may be the order of 30 to 50%. I believe the recent warming is at most comparable to the warming in the 1930s and may well now be over.

By the way in comparison to CO₂, the correlation of the temperatures the last decade with ENSO is rather strongly positive ($r=0.6$). We should spend our research dollars trying to understand ENSO, the multidecadal ocean cycles and the sun, the real drivers for climate change. I believe we would find the sun drives the ocean cycles which control the ENSO frequency which controls the global temperatures and precipitation.

MSU Temps vs ENSO



MEI is the Multivariate ENSO Index (Wolter)

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