



This is the print version of the [Skeptical Science](http://sks.to/temp) article [Temp record is unreliable](http://sks.to/temp), which can be found at <http://sks.to/temp>.

Are surface temperature records reliable?

What The Science Says:

The warming trend is the same in rural and urban areas, measured by thermometers and satellites, and by natural thermometers.

Climate Myth: Temp record is unreliable

"We found [U.S. weather] 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. We 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, we found that 89 percent of the stations – nearly 9 of every 10 – 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 radiating/reflecting heat source." ([Watts 2009](#))

Temperature data is essential for predicting the weather. So, the U.S. National Weather Service, and every other weather service around the world, wants temperatures to be measured as accurately as possible.

To understand climate change we also need to be sure we can trust historical measurements. A group called the [International Surface Temperature Initiative](#) is dedicated to making global land temperature data available in a transparent manner.

Surface temperature measurements are collected from about 30,000 stations around the world (Rennie et al. 2014). About 7000 of these have long, consistent monthly records (Fig. 1). As technology gets better, stations are updated with newer equipment. When equipment is updated or stations are moved, the new data is compared to the old record to be sure measurements are consistent over time.

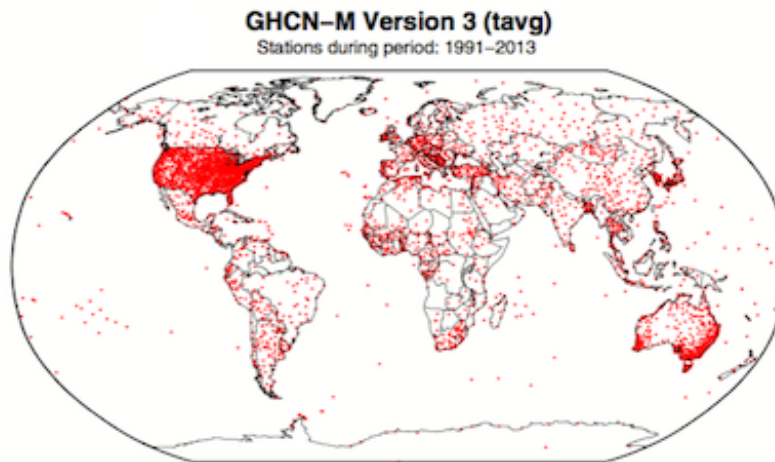


Figure 1. Station locations with at least 1 month of data in the monthly Global Historical Climatology Network (GHCN-M). This set of 7280 stations are used in the global land surface databank. (Rennie et al. 2014)

In 2009 some people worried that weather stations placed in poor locations could make the temperature record unreliable. Scientists at the National Climatic Data Center took those critics seriously and did a careful study of the possible problem. Their article "On the reliability of the U.S. surface temperature record" (Menne et al. 2010) had a surprising conclusion. The temperatures from stations that critics claimed were "poorly sited" actually showed slightly *cooler* maximum daily temperatures compared to the average.

In 2010 Dr. Richard Muller criticized the "hockey stick" graph and decided to do his own temperature analysis. He organized a group called Berkeley Earth to do an independent study of the temperature record. They specifically wanted to [answer the question](#) is "the temperature rise on land improperly affected by the four key biases (station quality, homogenization, urban heat island, and station selection)?" Their conclusion was [NO](#). None of those factors bias the temperature record. The Berkeley conclusions about the urban heat effect were nicely explained by Andy Skuce in an [SkS post in 2011](#). Figure 2 shows that the U.S. network does not show differences between rural and urban sites.

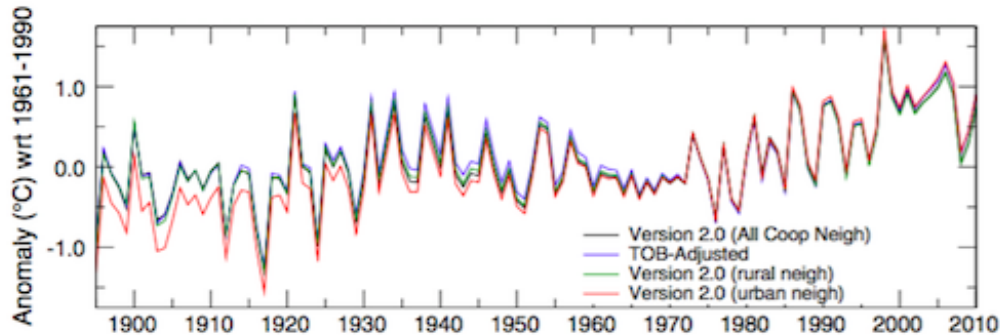


Figure 2. Comparison of spatially gridded minimum temperatures for U.S. Historical Climatology Network (USHCN) data adjusted for time-of-day (TOB) only, and selected for rural or urban neighborhoods after homogenization to remove biases. (Hausfather et al. 2013)

Temperatures measured on land are only one part of understanding the climate. We track many indicators of climate change to get [the big picture](#). All indicators point to the same conclusion: the global temperature is increasing.

See also

[Understanding adjustments to temperature data](#), Zeke Hausfather

[Explainer: How data adjustments affect global temperature records](#), Zeke Hausfather

[Time-of-observation Bias](#), John Hartz

[Berkeley Earth Surface Temperature Study: "The effect of urban heating on the global trends is nearly negligible."](#) Andy Skuce

Check original data

All the Berkeley Earth data and analyses are available online at <http://berkeleyearth.org/data/>.

[Plot your own temperature trends](#) with Kevin's calculator.

Or plot the differences with rural, urban, or selected regions with [another calculator by Kevin](#).

[NASA GISS Surface Temperature Analysis](#) (GISSTEMP) describes how NASA handles the urban heat effect and links to current data.

NOAA [Global Historical Climate Network \(GHCN\) Daily](#). GHCN-Daily contains records from over 100,000 stations in 180 countries and territories.



Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a [college textbook on climate change](#) and the book [Climate Change Denial: Heads in the Sand](#). Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.



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