

Is the Western Climate Establishment Corrupt?

The public might not understand the science, but they do understand cheating

Dr. David Evans, 11 Nov 2010 (last minor update 22 Nov 2010)

Web Address: jonova.s3.amazonaws.com/corruption/climate-corruption.pdf

FOREWORD BY JOANNE NOVA

How many excuses does it take? The western climate establishment has allowed egregious mistakes, major errors, and obvious biases to accumulate — each factor on its own might be hard to pin down, but the pattern is undeniable.

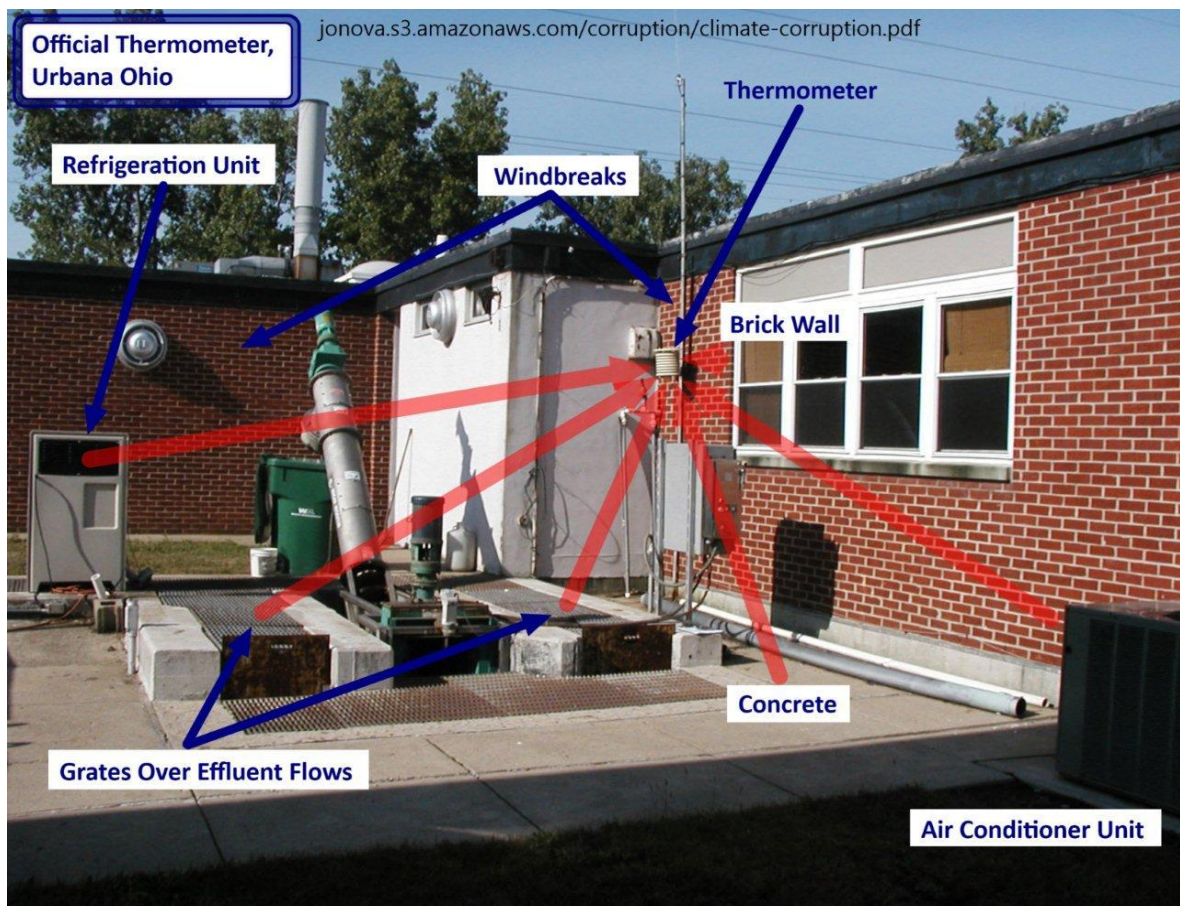


Figure 1: An official thermometer at a waste water treatment plant. It gets extra warming from air conditioning and refrigeration exhaust, concrete, a brick wall, and some equipment. It is protected by windbreaks. In addition, the effluent flowing under the grates is well above freezing in winter when vapor can be seen rising from the grates. (The red lines show possible heat paths; obviously only a small portion of the heat from each source gets to the thermometer.) [Photo](#) courtesy of Anthony Watts, www.surfacestations.org and Steve Tiemeier.

The Western Climate Establishment is Cheating

- Official thermometers are overwhelmingly in warm localities such as near air conditioner exhaust vents, buildings, concrete, tarmac, or asphalt.
- Officials hide the Argo data, which shows the world's oceans are cooling.
- They ignore hundreds of thousands of weather balloon results that show the climate models overestimate future warming by at least 300%.
- Climate scientists frequently point to the last 130 years of global warming, but don't mention the full story: the planet started warming before 1700, over a century *before* humans started pumping out meaningful amounts of CO₂.
- Leading authors publish a crucial graph with a deceptive colour scheme that imitates the results they wish they'd got. Why did a leading peer-reviewed climate journal publish such a naked and childish attempt at cheating?
- Their adjustments blatantly transform the original raw data from thermometers into rising trends. And they selectively ignore thousands of other thermometers where there is less warming.
- The Russian, Chinese and Indian climate establishments, which are financially independent of the western climate establishment, are all skeptical. As are many scientists from other branches of science, and many retired climate scientists (who no longer have anything to lose by speaking their minds).

Of course adding more carbon dioxide to the atmosphere makes the world warmer, but the relevant question is: ***how much warmer?*** The western climate establishment have exaggerated substantially, in a myriad of ways.

Only a Fool Would Ignore the Message in the Pattern

Once one or two major news outlets start printing these photos of official thermometers near artificial heating sources, and point out the deception, the rush will be on for our elected representatives to abandon the Global Warming Crusade. No one wants to be seen to be taken in by half-truths and shameless deception. Who wants to look gullible because they didn't ask the obvious burning questions?

Those who support conclusions based on corrupt behaviour will be seen as negligent for not having considered the serious evidence here. Dr Evans is a scientist who was on the climate gravy train, and was horrified by what he saw. He first blew the whistle in a [polite way in 2008](#). Too many of the world's politicians have not yet woken up, so here he collects the worst examples of climate shenanigans and explains them powerfully in terms that any politician can understand.

These photos speak for themselves. The corruption of climate science has become so blatant, so obvious, that even non-scientists can no longer throw their hands in the air and say "I didn't know". You don't need a PhD to know it is cheating to place thermometers near artificial heat sources and call it "global warming".

WHY DO THEY MEASURE TEMPERATURE LIKE THIS?

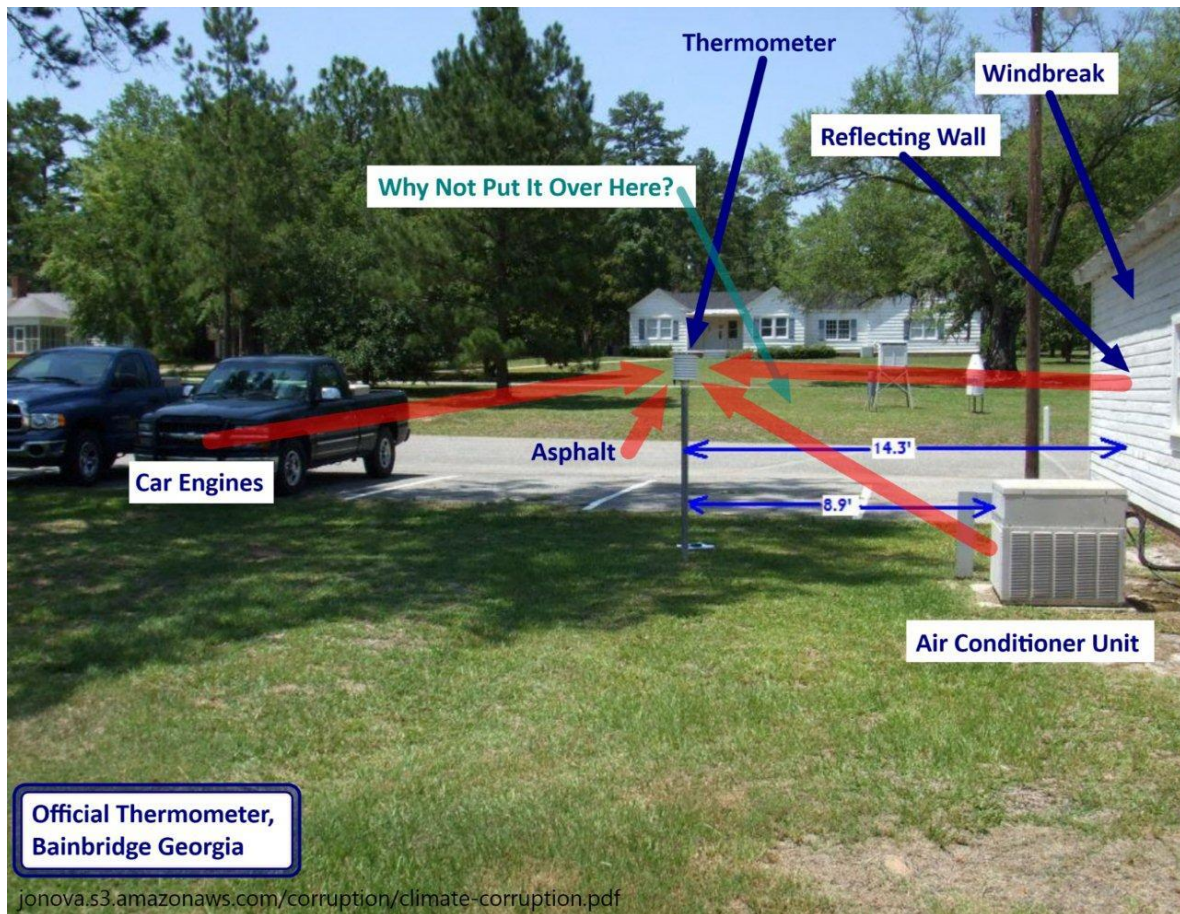


Figure 2: There is a better site on the grass just across the car park, so why is the thermometer near the air conditioner, car engines, asphalt, and reflecting windbreak? [Photo](#) courtesy of Anthony Watts, www.surfacestations.org and Joel McDade.

Global warming is measured in tenths of a degree per century, so any slight artificial nudge to the thermometer is important.

To avoid such nudges, the official siting requirements say that the thermometer must be at least 100 feet (30 meters) from any paved or concrete surface, in a level open clearing, with ground cover typical of the region.¹

Anthony Watts², a 25-year broadcast meteorology veteran, recruited 650 volunteers to inspect and document the 1,221 land-based thermometers overseen by the National Oceanic and Atmospheric Administration (NOAA) in the USA.³ Of the 860 thermometers inspected by early 2009, 89% fail to meet the official siting requirements because they are too close to an artificial source of heat (including artificial sources of reflected or radiated heat).⁴

Why does the climate establishment persist in measuring the official temperature record from thermometers that are nearly all too close to artificial sources of heat?

What motive could there be, other than to inflate official temperatures?

Why have we only found out about it because volunteers went out and photographed the official thermometers?

Money can hardly have been the problem: NOAA's budget is now over \$4 billion per year.^{5, 6}

Over 2001 – 2008 NOAA finally took some steps to fix the problem, setting up a new network of 114 properly-sited thermometers that “50 years from now can with the highest degree of confidence answer the question: How has the climate of the nation changed over the past 50 years?”.⁷ However the old network still provides the official temperatures.

NOAA have stopped using a handful of the poorly-sited thermometers whose photos have been circulating around the Internet. But the temperature data from those thermometers is still in the official temperature records.

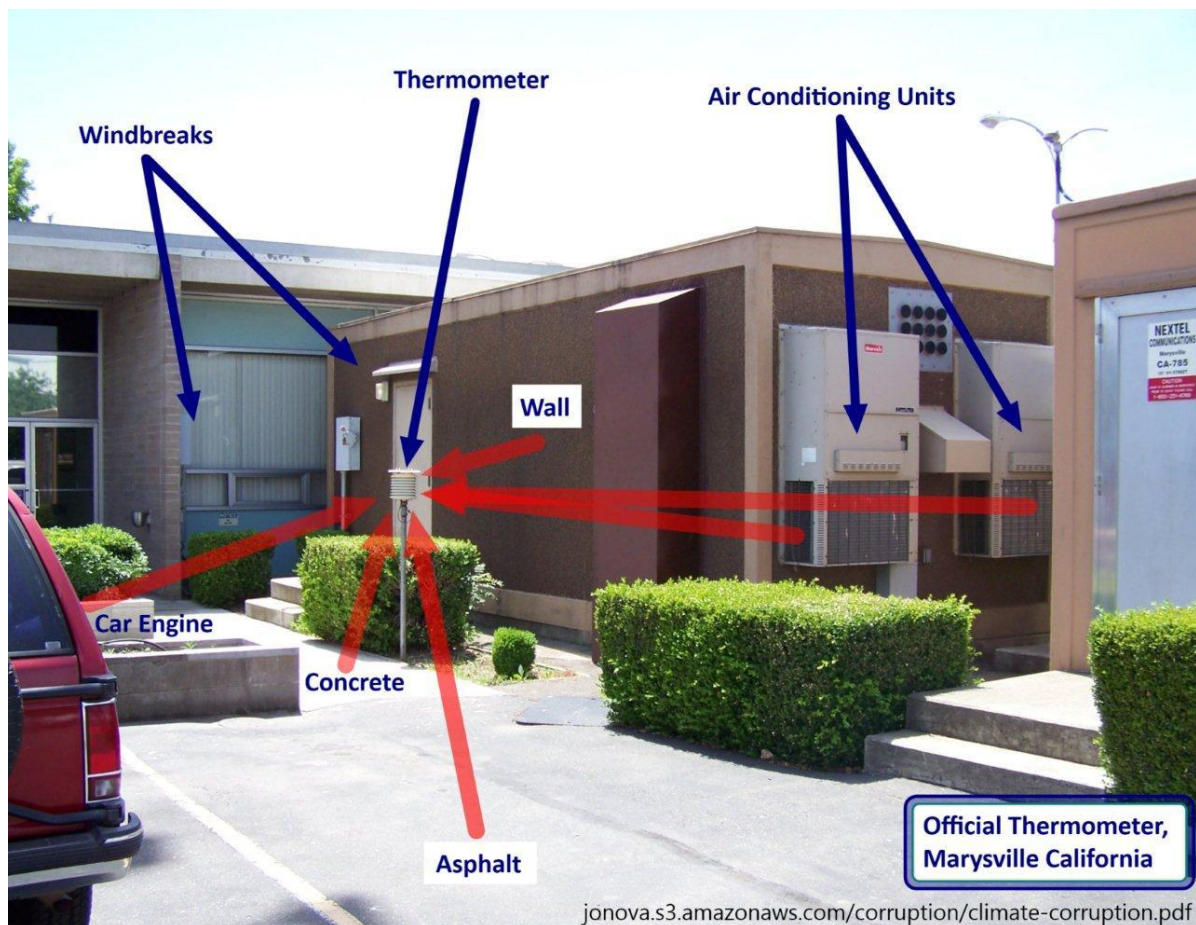


Figure 3: The thermometer at Marysville California⁸. Extra warming from car engines in the parking bays, air conditioner exhaust, asphalt, concrete, a wall, wind breaks, and (see Figure 4) reflections from a steel cell phone tower. [Photo](#) courtesy of Anthony Watts and www.surfacestations.org.

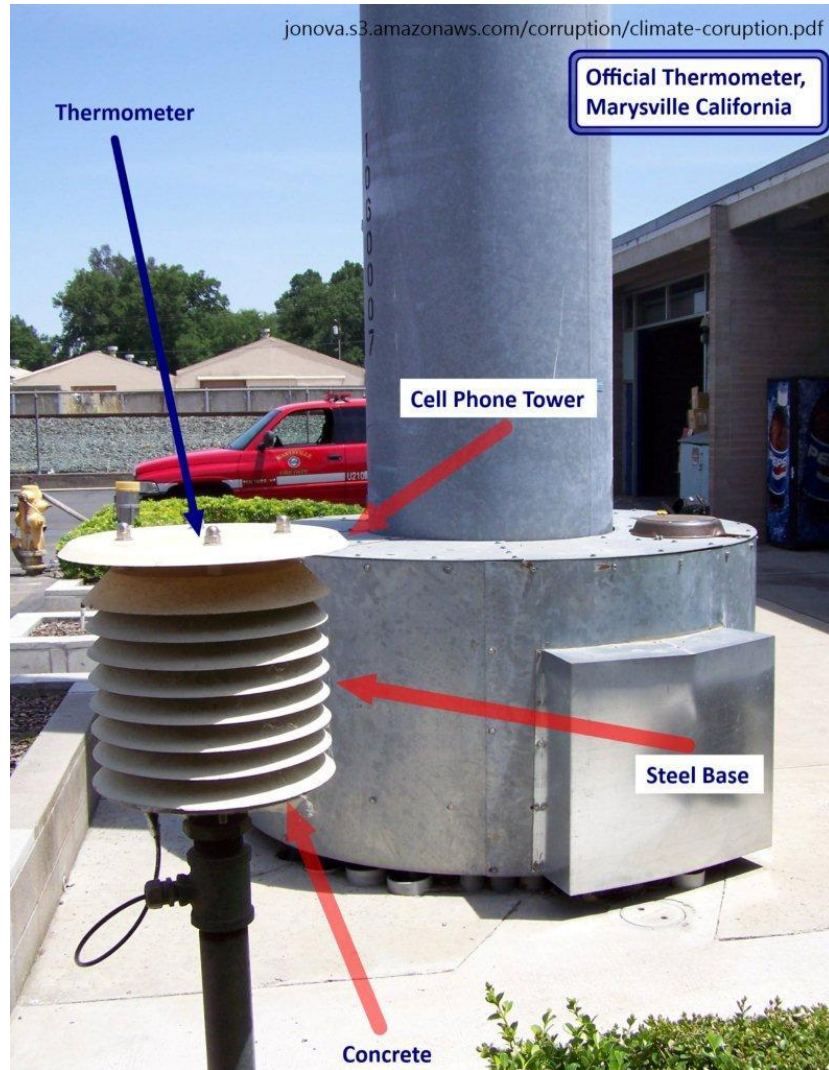


Figure 4: The same thermometer as in Figure 3, viewed from near the air conditioners. Extra warming reflected from a steel cell phone tower. [Photo](#) courtesy of Anthony Watts and www.surfacestations.org.

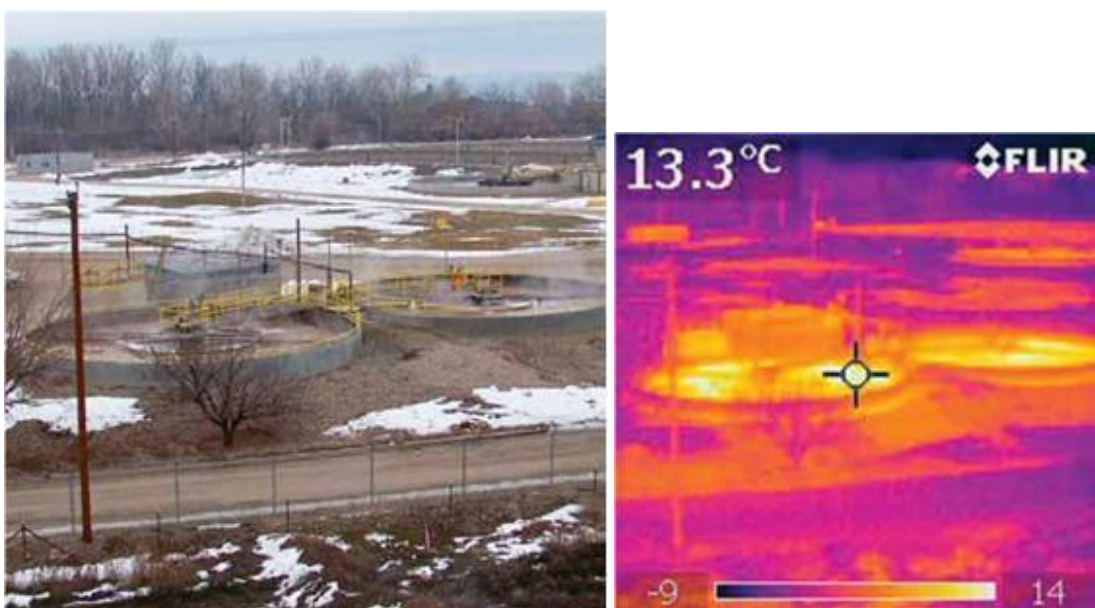


Figure 5: Waste water is warm (due to the decomposing organic matter)—notice the lack of snow near these wastewater tanks, the rising vapor above the tanks, and how warm they are in the infrared picture. Now see the next two figures. Ontario Oregon, Figures 18 and 19 [here](#).

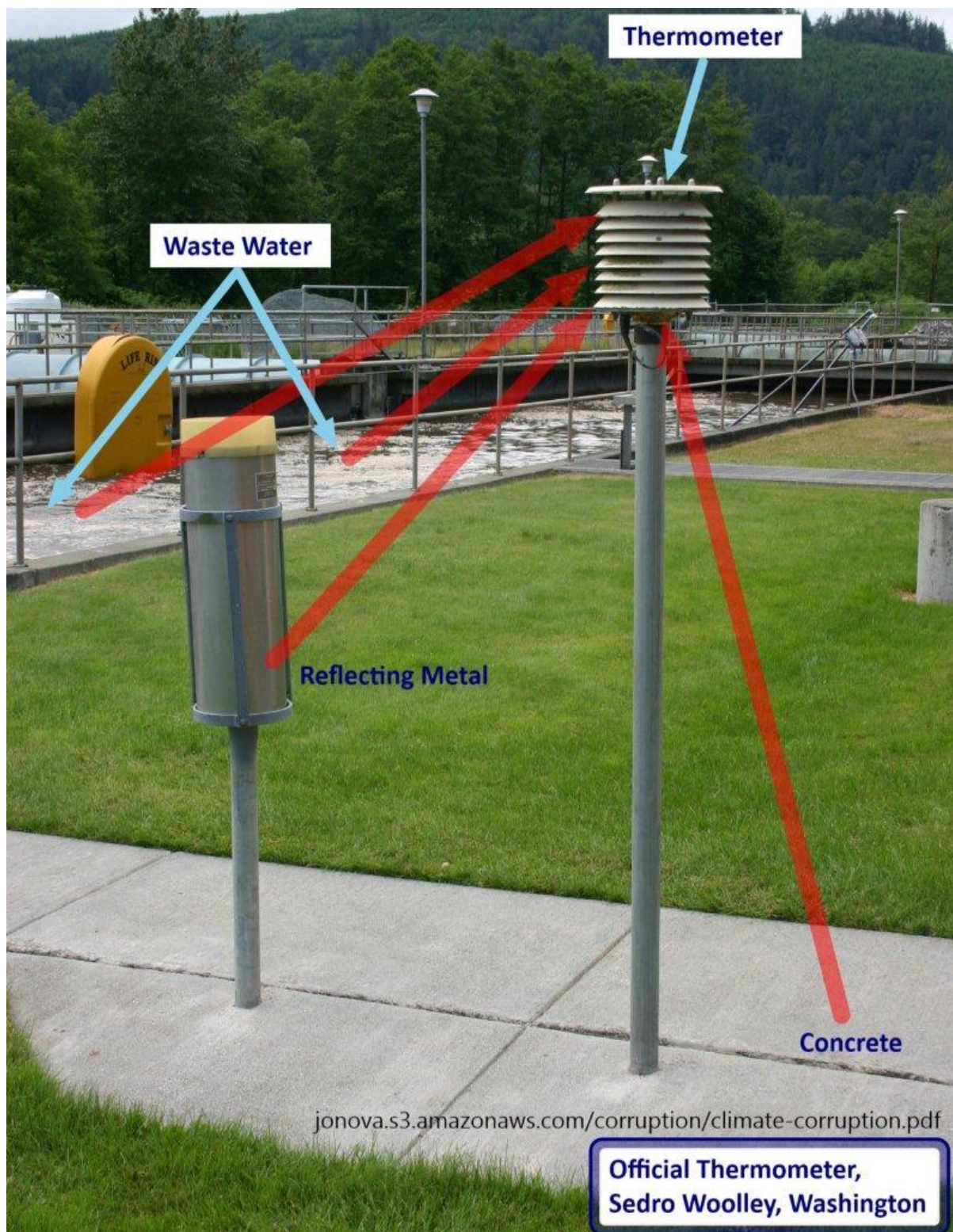


Figure 6: This official thermometer is warmed by the decomposing organic matter in the waste water (the previous figure, of different tanks, shows that waste water is warmer than its surroundings). [Photo](#) courtesy of Anthony Watts, www.surfacestations.org and Don and Liz Healy.

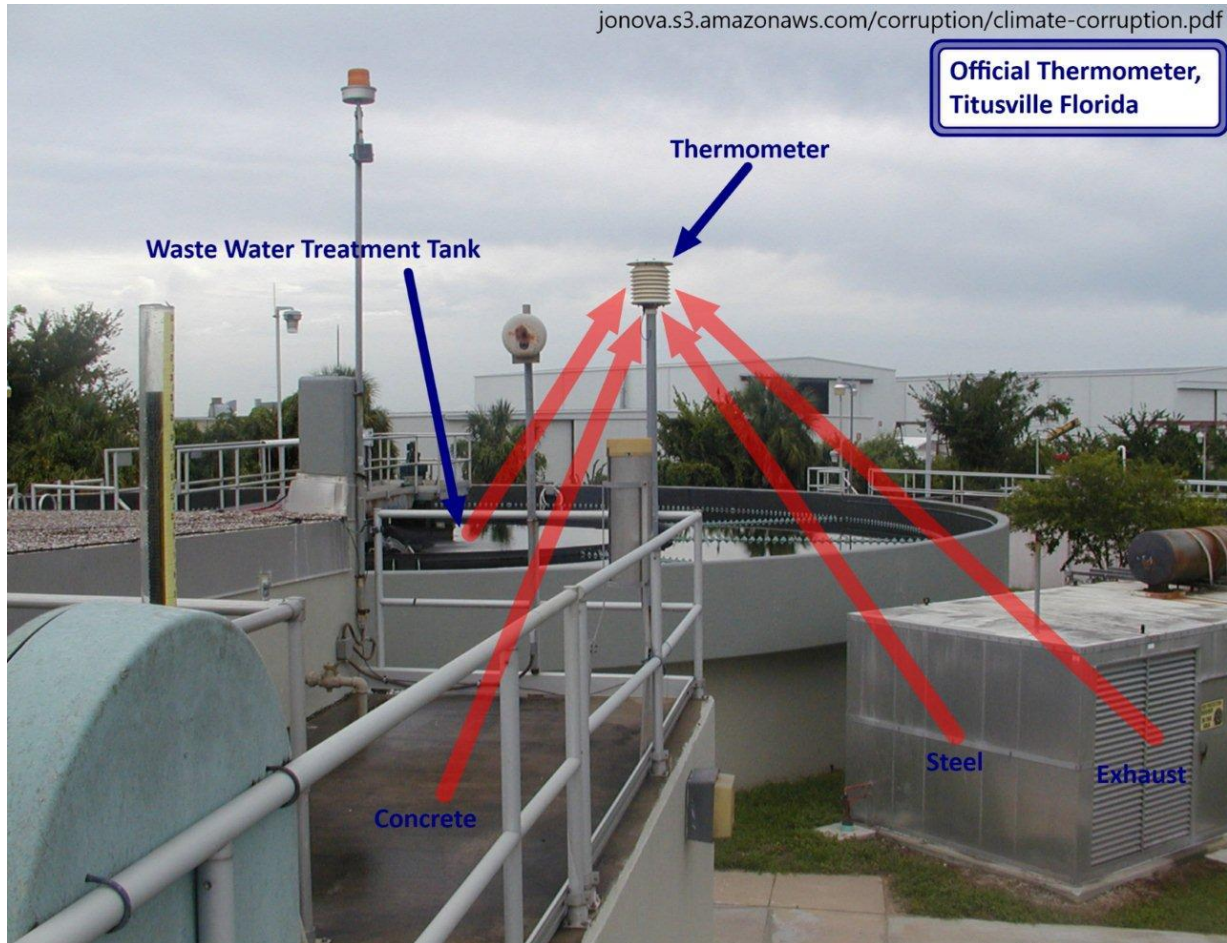


Figure 7: This official thermometer gets warming from nearby waste water, machinery, and metal and concrete surfaces. (There is also another waste water treatment tank behind the camera, and an air conditioning outlet at ground level just below and to the left of the thermometer, out of view.) Not exactly a level open clearing, with ground cover typical of the region, as per the official siting requirements. [Photo](#) courtesy of Anthony Watts, www.surfacestations.org and Don Kostuch.

Why hasn't the mainstream media published any of these photographs? All it takes is to send a reporter or television crew. The thermometers are generally in public places, and their locations are available from the NOAA website⁹. Everyone understands that it's cheating to put a thermometer near an artificial heat source and pretend that it shows the temperature of the local area.

Is the mainstream media failing to do their job and covering up for the climate establishment?

Is real debate even allowed in the media? The issue of thermometer location is substantive and highly relevant to the existence and rate of global warming, but has never been discussed in the mainstream media.¹⁰

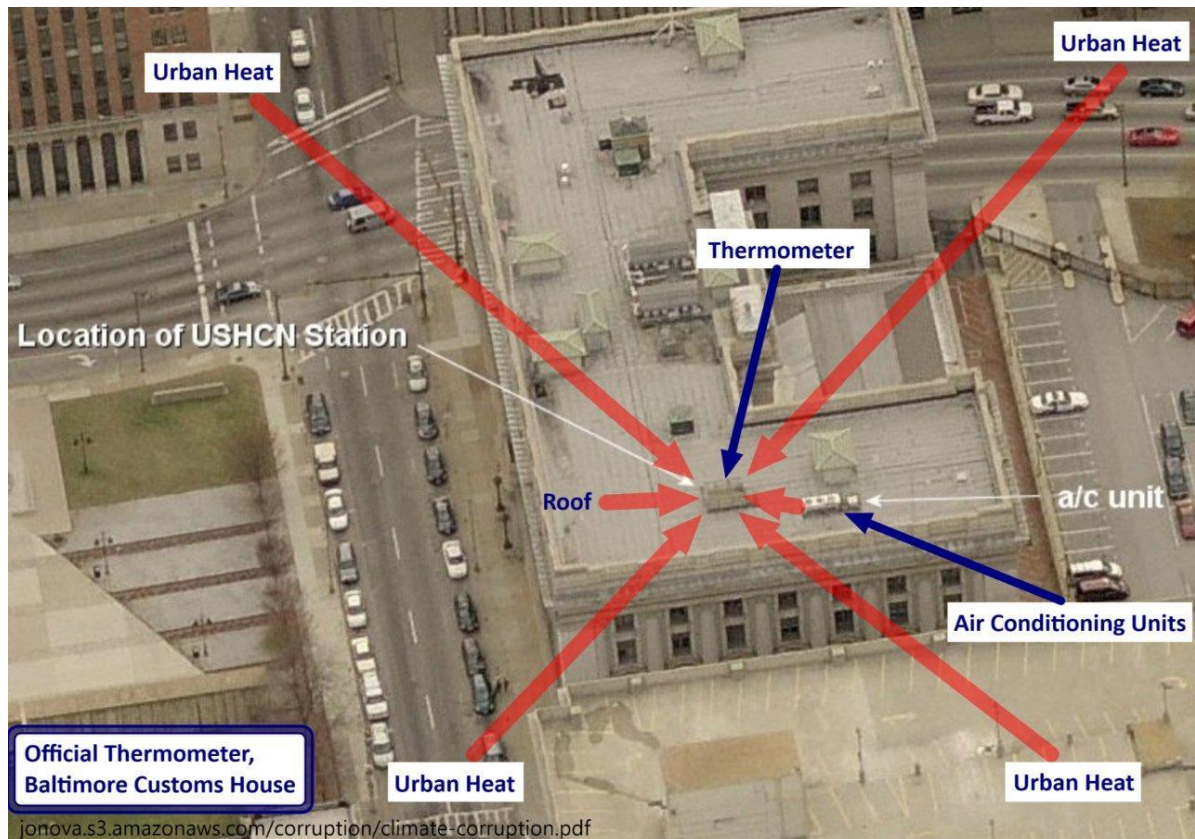


Figure 8: This thermometer gets warming from the roof surface, which reflects and radiates heat, and from a nearby air conditioner outlet. (Couldn't they at least move the thermometer further away from the a/c?) The urban landscape, with its heat-emitting cars, offices, home, etc., and many radiating surfaces, provided increased heat as Baltimore grew. Spot the "level open clearing, with ground cover typical of the region". [Photo](#) courtesy of Anthony Watts and www.surfacestations.org.

Land-based thermometers are frequently compromised by the **urban heat island** effect. The microclimate around a land-based thermometer can change due to urban encroachment, such as nearby asphalt, concrete, buildings, air conditioners, cars, electrical appliances, or changes in vegetation. The annual average air temperature of a city with 1 million people can be 1–3°C (2–5°F) warmer than its surroundings. In the evening, the difference can be as high as 12°C (21°F).¹¹

These thermometers measure urban growth and increased use of air conditioners, cars, wastewater plants, etc.. Why do the climate establishment represent their temperatures to the public as "global warming"?



Figure 9: The Sydney Observatory in about 1874, with the official thermometer out the front. Temperature records for Observatory Hill in Sydney date from 1858, when Sydney's population was less than 60,000. [Source: Anthony Watts' Australian tour 2010, [BOM](#)].

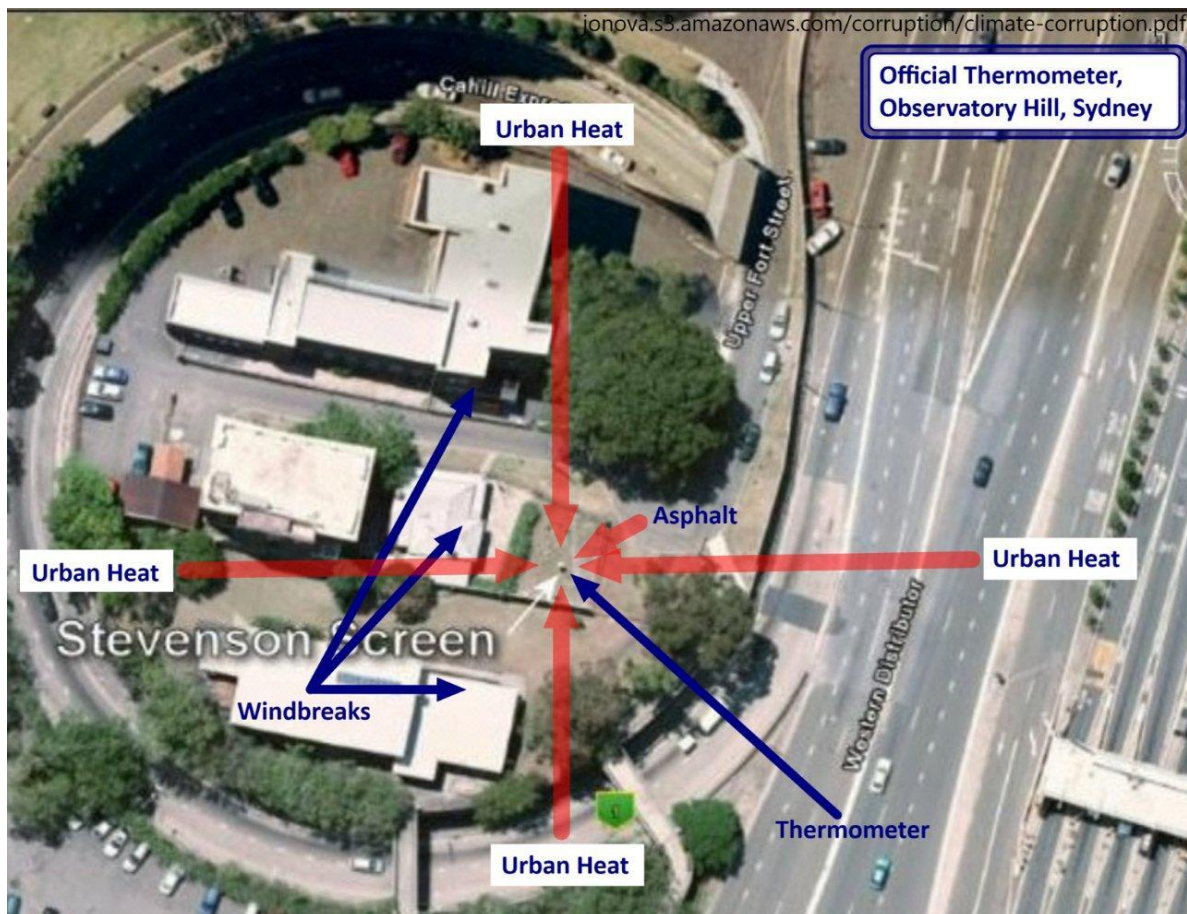


Figure 10: The current site of the official thermometer for Observatory Hill (moved 150 meters across the hill from the observatory (previous figure) in 1917). Sydney's population is now 4.5 million, and there is urban heat generated by cars, industry, homes, and so on. [Source: Anthony Watts' Australian tour 2010, [BOM](#)].

The global network of land-based thermometers has 1,079 official thermometers¹², at least 54% of which are at airports¹³. Airports have lots of tarmac, which radiates heat at night and thereby raises the temperature recorded at the airport.¹⁴ At many airports, thermometers also get occasional warming blasts from jet aircraft.

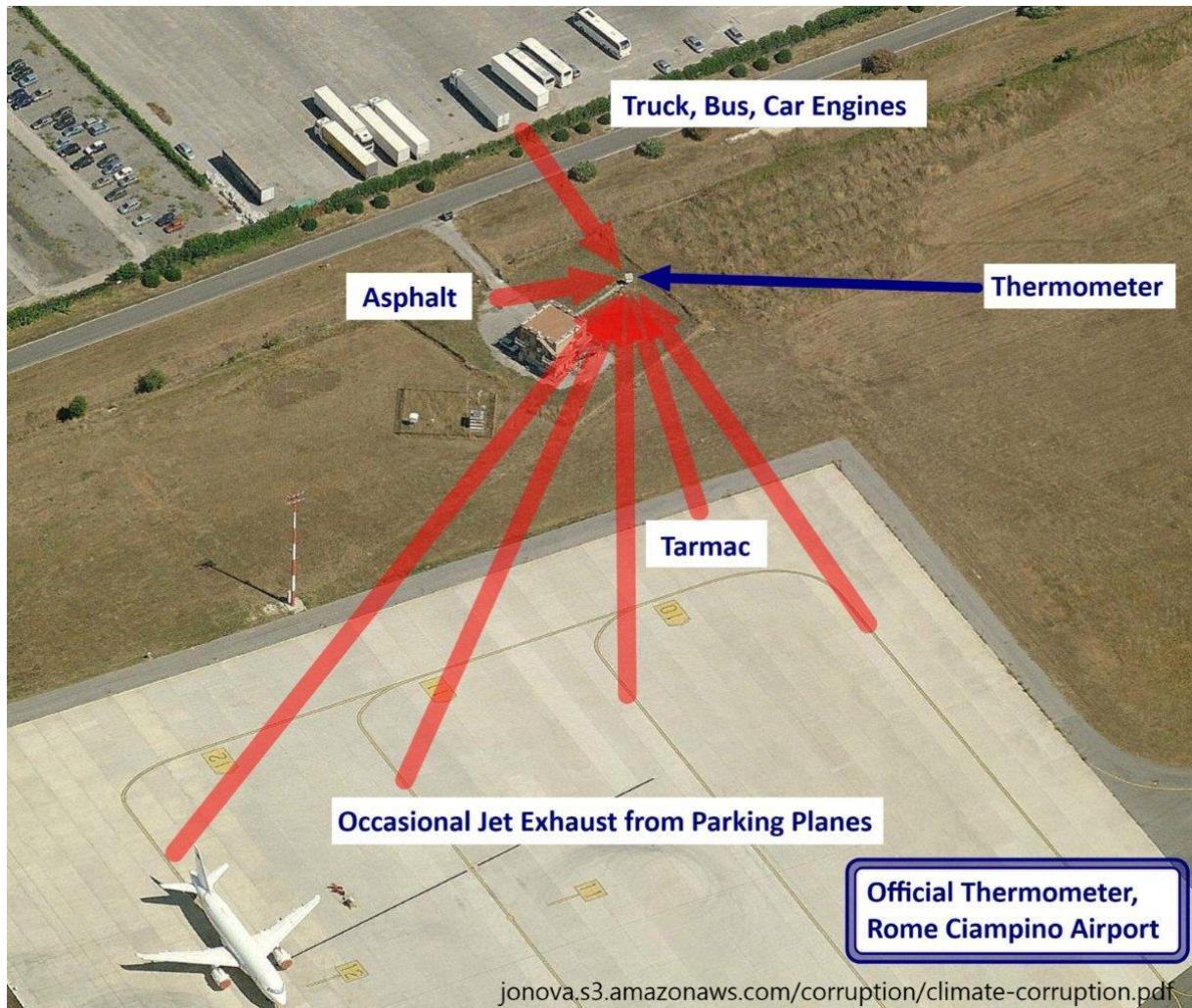


Figure 11: This official thermometer gets some blasts of jet exhaust from parking planes, as well as from several heat sources within 30 meters (100 feet). [Notes](#). [Source](#).

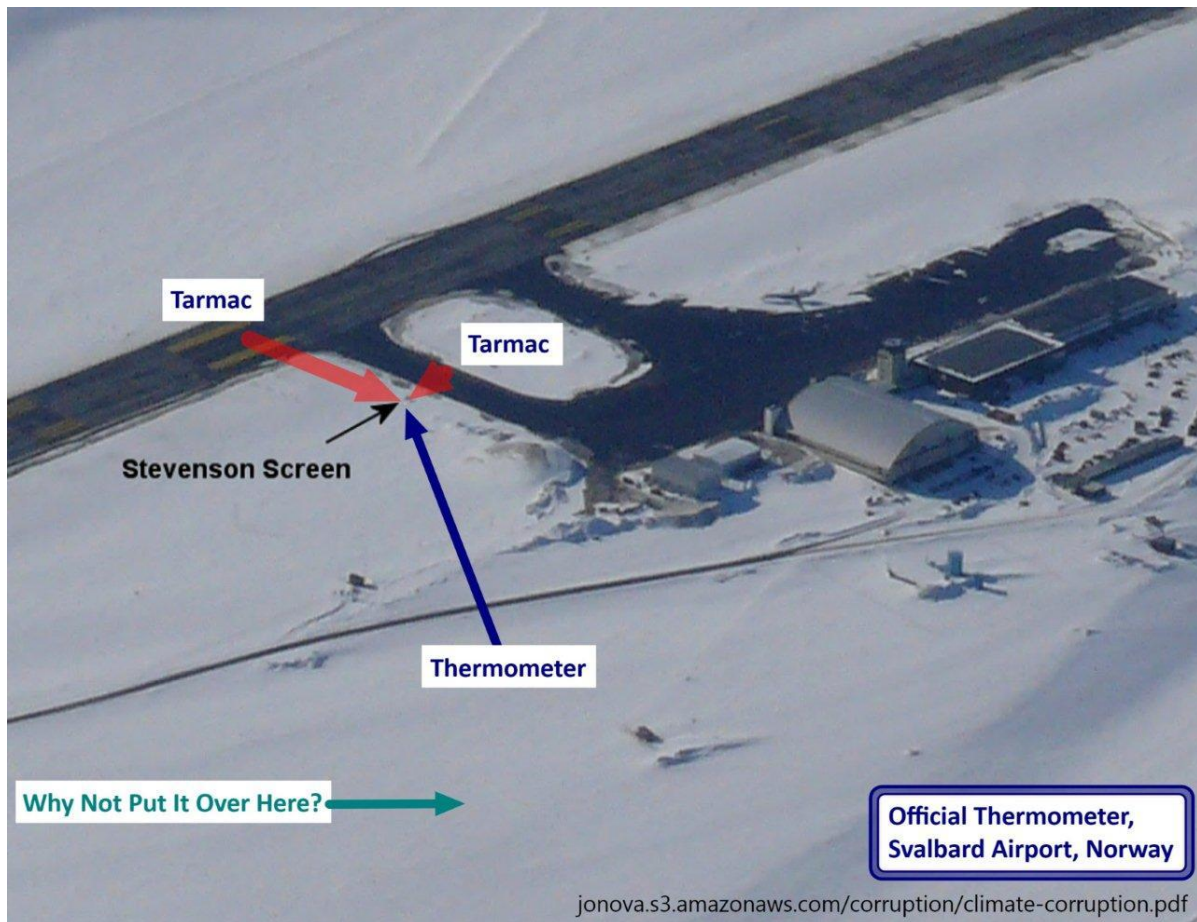


Figure 12: This thermometer is at the edge of the tarmac, which is kept clear in winter. The tarmac is easily the warmest surface around, so the thermometer measures warmer than if properly sited (that is, out in the snow more than 30 meters (100 feet) from any artificial structure). It also gets warming nudges from jet exhaust and steam de-icers. [Notes](#).

More than 80% of thermometers in the official global network are in urban areas or at airports, which are both unnaturally warm localities.¹⁵ Take a look out the window when you fly—the vast bulk of the earth’s surface is not at an airport or in an urban area.

Isn't the climate establishment measuring urban warming and airport warming rather than global warming? They have placed their thermometers to measure the growth and use of cities, air conditioners, planes, water treatment plants, cars, buses, trucks, asphalt, concrete, and tarmac. They measure temperature ***in many of the globe's warmest localities***, but not global temperature. Yet they report those temperatures as “global warming”.

How have they been able to get away with this?

Where are the auditors or the regulators to check on the climate establishment? If a financial organization or drug company tried to pull this kind of deception they would get busted.

MORE THERMOMETER TRICKS

There are lots of ways to find “faster warming”. More tricks from the climate establishment:

- They removed inconvenient thermometers. There were nearly 6,000 thermometers in the official global network in the 1980s, but there are now just 1,079.^{16,17} The removals increased the proportion of thermometers:
 - At airports¹⁸ (which are warmer than surroundings).
 - Nearer the equator¹⁹ (it is hotter at the equator).
 - At lower altitudes²⁰ (it is colder in the mountains).
- They “adjust” the raw temperature data to increase the apparent warming trend, by inflating recent temperatures or making the past colder. This is under the guise of filling in missing data, accounting for thermometer moves, accounting for the urban heat island effect, and various technicalities. The effect is to substantially increase the warming trend.^{21, 22} In the country with the best thermometer network, the USA, the official adjustments account for almost the entire temperature rise from the 1930s to the 1990s.²³
- They revise the official (adjusted) temperatures after a decade or so have passed, to increase recent warming and remove any recent cooling.²⁴
- They hide their temperature data, both their raw data and how they adjusted it.²⁵ They evaded Freedom of Information (FOI) requests to make the data, which is publically owned data, available.²⁶ They even claim to have lost original data!²⁷

Why would the climate establishment play these tricks, if their case and data were strong? Don't these tricks strongly imply that their case is weak or wrong, and that they know it?



Scientists Caught Cheating: The official temperature record for New Zealand shows warming of 0.92°C (1.66°F) in the 147 years since records began. This 0.92°C warming played a central role in forming New Zealand’s (and Australia’s) climate policies. However the raw temperature data for New Zealand shows no warming. The New Zealand skeptics took the matter to court,²⁸ whereupon the NZ climate establishment, in its legal defense, formally denied any responsibility for its temperature record, even saying there was no such thing as an official NZ temperature record!²⁹

WHAT DIFFERENCE DO THEIR TRICKS MAKE?

The climate establishment always quotes the land-thermometer temperature records as the global temperature, usually the one by NASA GISS:

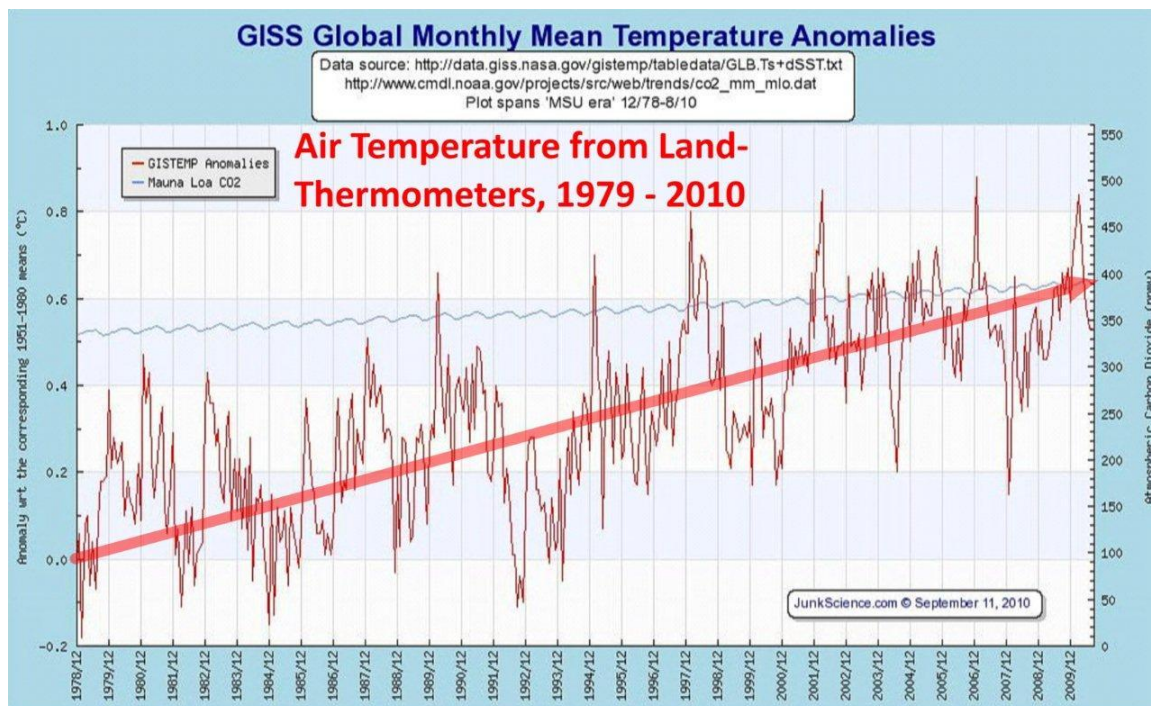


Figure 13: From the Goddard Institute for Space Studies (GISS) at NASA, run by Jim Hansen³⁰, the “father of global warming”. From land-based thermometers (such as those in Figure 1 – 12) and a few ocean thermometers, but no satellite data (despite the “Space” in GISS). Same timeframe and format as the satellite data in the next figure, for easy comparison. [Source](#) (updated monthly).

The main features:

- The warmest year appears to be 2006.
- The warming trend appears to continue through 2010.

But there is an alternative method of measuring global temperatures—with satellites.



Illustration: NASA's Aqua satellite, used by UAH to measure the global air temperature data shown in Figure 14. [Source](#).

Satellites measure the temperature 24/7 over broad swathes of land and ocean, across the whole world except the poles. While satellites had some initial calibration problems, those have long since been fully fixed to everyone's satisfaction. Satellites are mankind's most reliable, extensive, and unbiased method for measuring surface temperatures.

There are two independent satellite temperature records, and they agree with each other. Here is one:

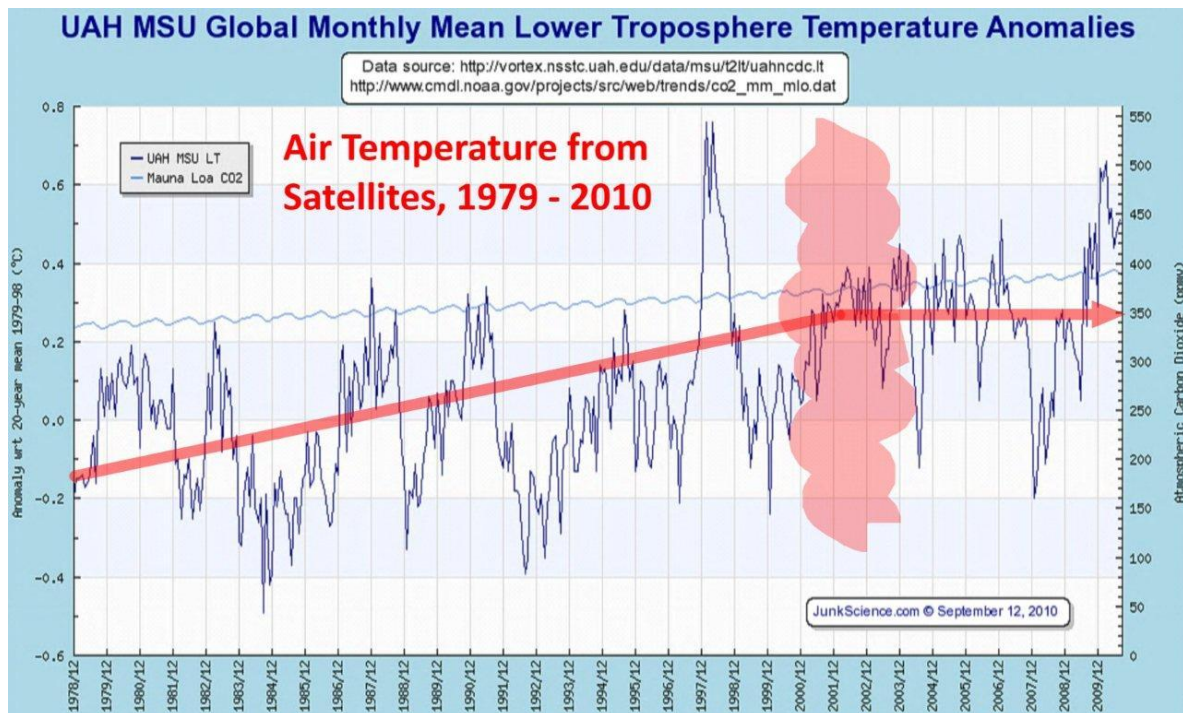


Figure 14: Satellite data from the University of Alabama in Huntsville, using the NASA Aqua satellite. Same timeframe and format as the land-based thermometer data in the previous figure. [Source](#) (updated monthly).

The main features:

- The warmest year was 1998.
- A generally rising trend until somewhere around 2001, then a levelling off (or slight cooling).
- A large spike in 1998 due to an El Nino, a Pacific Ocean phenomenon which raises surface temperatures for about a year then passes.
- A large spike in 2010, also due to an El Nino, that peaked in January to March and is now (Sept 2010) presumably on the way back down.

Obviously this has different political implications from the land-based thermometer data.³¹

An important admission. Shortly after the ClimateGate scandal broke, a leading member of the climate establishment, Dr. Phil Jones, Director of the Climate Research Unit (CRU) at the University of East Anglia in the UK, in an interview with the BBC, agreed that

“from 1995 to the present there has been no statistically-significant global warming”³².

Jones also noted that it has been cooling since 2002, but that this trend was too short to be statistically significant.

Their thermometer tricks create the picture of ever-rising temperatures that they need politically, but contrasts with the superior and unbiased satellite picture that shows global warming paused around 2001.

Why do the climate establishment use the land- thermometer temperatures in their communications with the public, when they could use the satellite data instead?

They have tacitly admitted their land-thermometer data is deeply flawed by setting up a new network of properly sited thermometers (which won't produce a meaningful trend for 50 years) and by ceasing to use individual thermometers that get ridiculed on the Internet. Obviously this goes beyond mere incompetence.

OCEAN TEMPERATURES: THE ARGO SCANDAL

Measuring ocean temperature globally is harder than it sounds.³³ The Argo network of over 3,000 duck diving floats has finally overcome many of the problems, but only became operational in mid-2003. Ocean temperature data before Argo is nearly worthless.³⁴

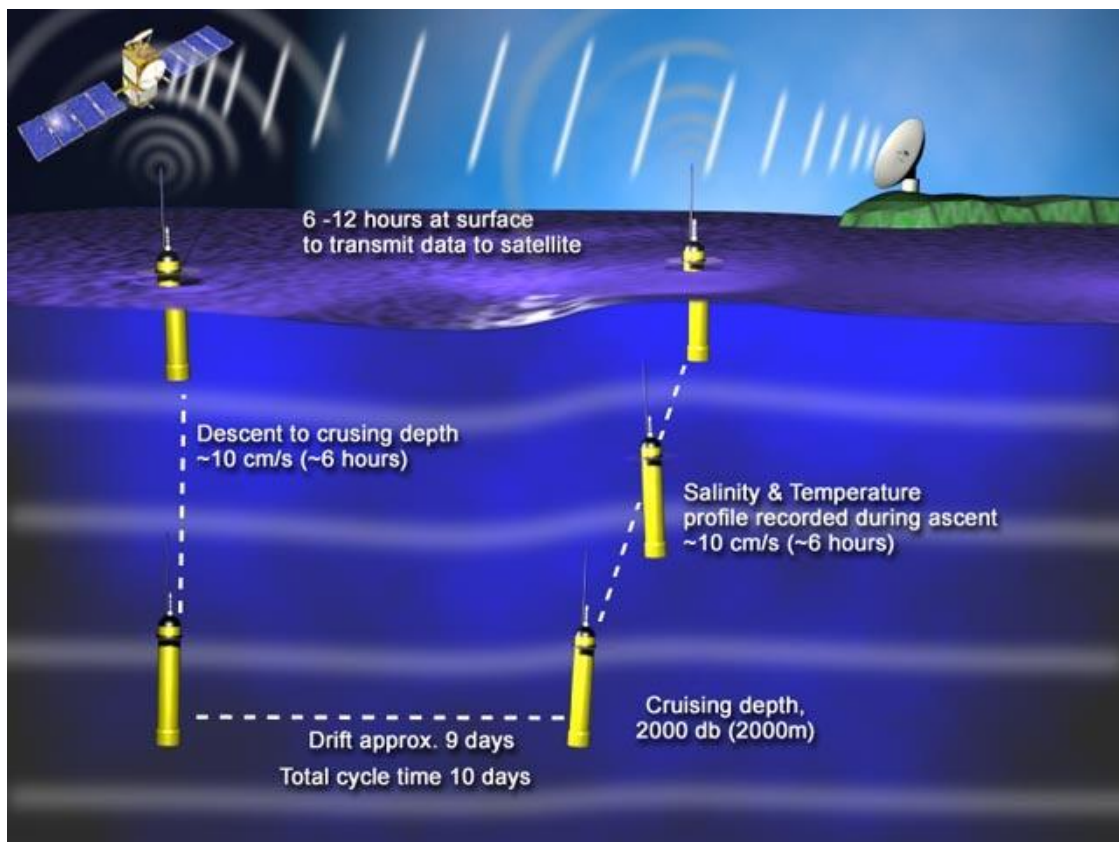


Figure 15: The Argo network has over 3,000 floats measuring temperature in all of the oceans. [About Argo](#), [Source](#).

Argo found that the oceans have been in a slight cooling trend since at least late-2004. Josh Willis of NASA's Jet Propulsion Laboratory, in charge of the Argo data, said in March 2008 on NPR³⁵: "There has been a very slight cooling, but not anything really significant".

The Argo data originally showed a strong cooling trend. Josh Willis was surprised at the results³⁶: "every body was telling me I was wrong", because it didn't agree with the climate models or satellite observations of net radiation flux.³⁷ Willis decided to recalibrate the Argo data by omitting readings from some floats that seemed to be giving readings that were too cold.³⁸ The Argo results shown here are the new data, **after** those omissions were made:

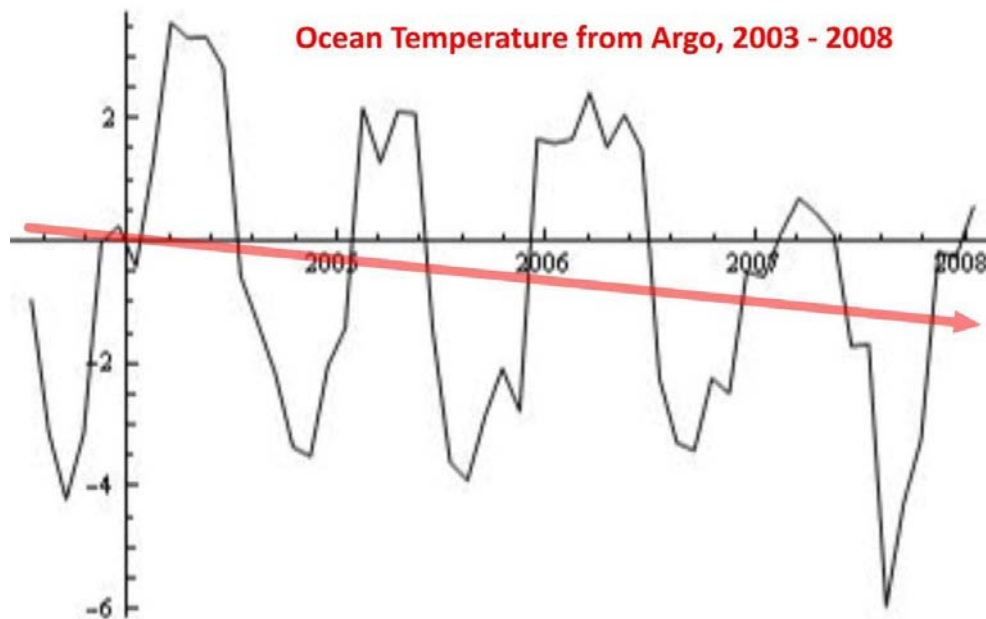


Figure 16: The ocean heat content from mid 2003 to early 2008, as measured by the Argo network, for 0 – 700 meters in depth. The vertical axis measures changes in units of 10^{22} Joules (about 0.01°C , or 0.018°F). There is seasonal fluctuation because the oceans are mainly in the southern hemisphere. [Source](#), plus private correspondence with the author on depth and smoothing.

The western climate establishment run the Argo network, but they have made it extraordinarily difficult to obtain the ocean temperature from the Argo data.³⁹ Basically the only way to get Argo's ocean temperatures is to ask Josh Willis (above) and get lucky. (Somewhat-skeptical climate scientist Roger Pielke recently asked Josh Willis for the global ocean temperature data, and the answer wasn't "it's at this website Roger" it was (effectively) "no".⁴⁰)

Why is there no website showing the latest global ocean temperature as measured by Argo? The western public have paid for this data and it is crucial to the climate debate, so why isn't it freely available?

If the Argo data showed a warming trend, don't you suppose it would be publicized endlessly? The climate establishment and the mainstream media are keen to trumpet any evidence of warming. Good news! From the silence we can only conclude that Argo is not showing any ocean warming.

In science, data is supposed to be shared. *The climate establishment's behavior over ocean temperatures proves they are more interested in shaping the public's perception than finding the truth.*

THEY DON'T TELL YOU THE CURRENT GLOBAL WARMING TREND IS OVER 300 YEARS OLD



Illustration: A Scene on the Ice, by Hendrick Avercamp, circa 1600.⁴¹

Satellite data only goes back to 1979, and global land-thermometer records only go back to 1850. Before that we have to resort to “proxies”, which are various natural phenomena from which temperature can be deduced. As we go further back in time, the errors and uncertainties increase.

Here is a best estimate of the global air temperature for the last 2,000 years, using the best available source for each period:⁴²

- 1979 – Now: Satellite data (UAH, see Figure 14).⁴³
- 1850 – 1979: Land thermometer record (HadCrut3, from the UK Met Office Hadley Centre and the Climatic Research Unit, slightly less tricked up than the GISS data).⁴⁴
- 16 AD – 1850: Loehle’s reconstruction⁴⁵ in 2007 based on all temperature proxies *except* tree rings (which make poor proxies⁴⁶). It used 18 proxies over a wide geographical range, including sediments, boreholes, pollen, oxygen-18, stalagmites, magnesium to calcium ratios, algae, and cave formation. First reconstruction in which every proxy was calibrated to temperature in a peer reviewed article; arguably about as good as it gets.^{47, 48, 49}

The land thermometer records exaggerate the rate of warming using the tricks documented above, but they are the best data we have for 1850 – 1979. However we need a rough idea of historical temperatures in that period to make several crucial points, so we will go with that data.

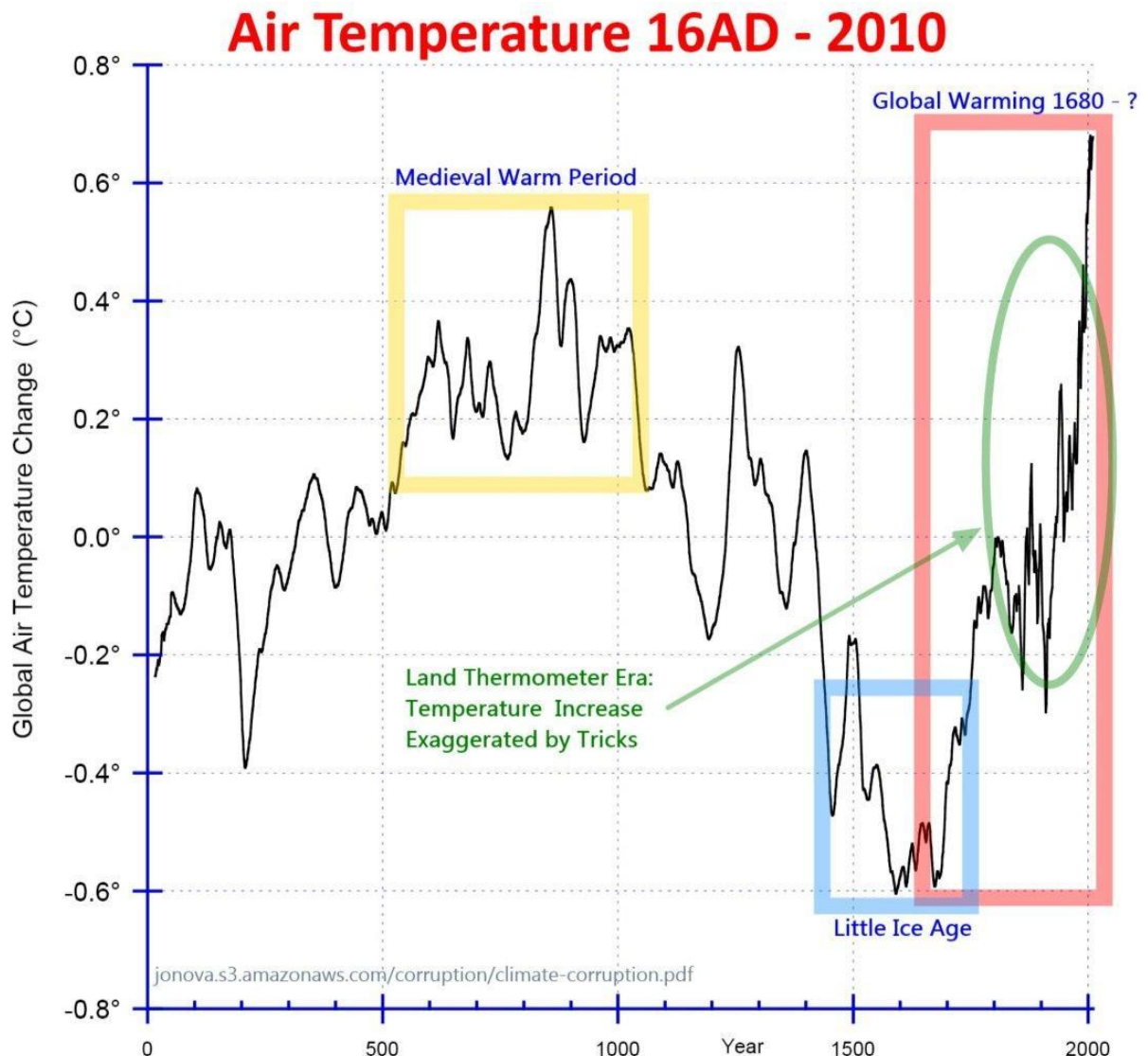


Figure 17: The best and latest temperature picture. The current global warming trend started around 1670 to 1700, over 300 years ago. The current temperature is probably less than the medieval peak—the land thermometer data from 1850 to 1980 exaggerates temperature increases, though no one knows by how much. Sources: See text above.

The current global warming trend started before 1700, some 310 years ago. That was pre-industrial, so a natural climate force must have started the current global warming trend.

That the medieval warm period existed is well documented in European history. That it was worldwide is verified by hundreds of peer-reviewed studies, by over 700 scientists from over 400 separate research institutions, most of whom found that the period was probably warmer than today.⁵⁰ The studies are from all over the world (except Australia)—there is a stunning illustration that makes that point [here](#).

Likewise the little ice age is well documented in European history. It forced an end to the Viking colonization of Greenland in about 1430⁵¹, the Thames River in London froze over most winters but the last time it froze was 1804, and in the 1600s and 1700s animals in Europe would die of cold inside barns which never happens now. Like the medieval warm period, temperature proxies around the world confirm that it was worldwide.

THEY DON'T TELL YOU THAT GLOBAL WARMING ALTERNATES WITH GLOBAL COOLING WITHIN THE WARMING TREND

If we zoom in on just after 1850⁵², we can see an interesting pattern:

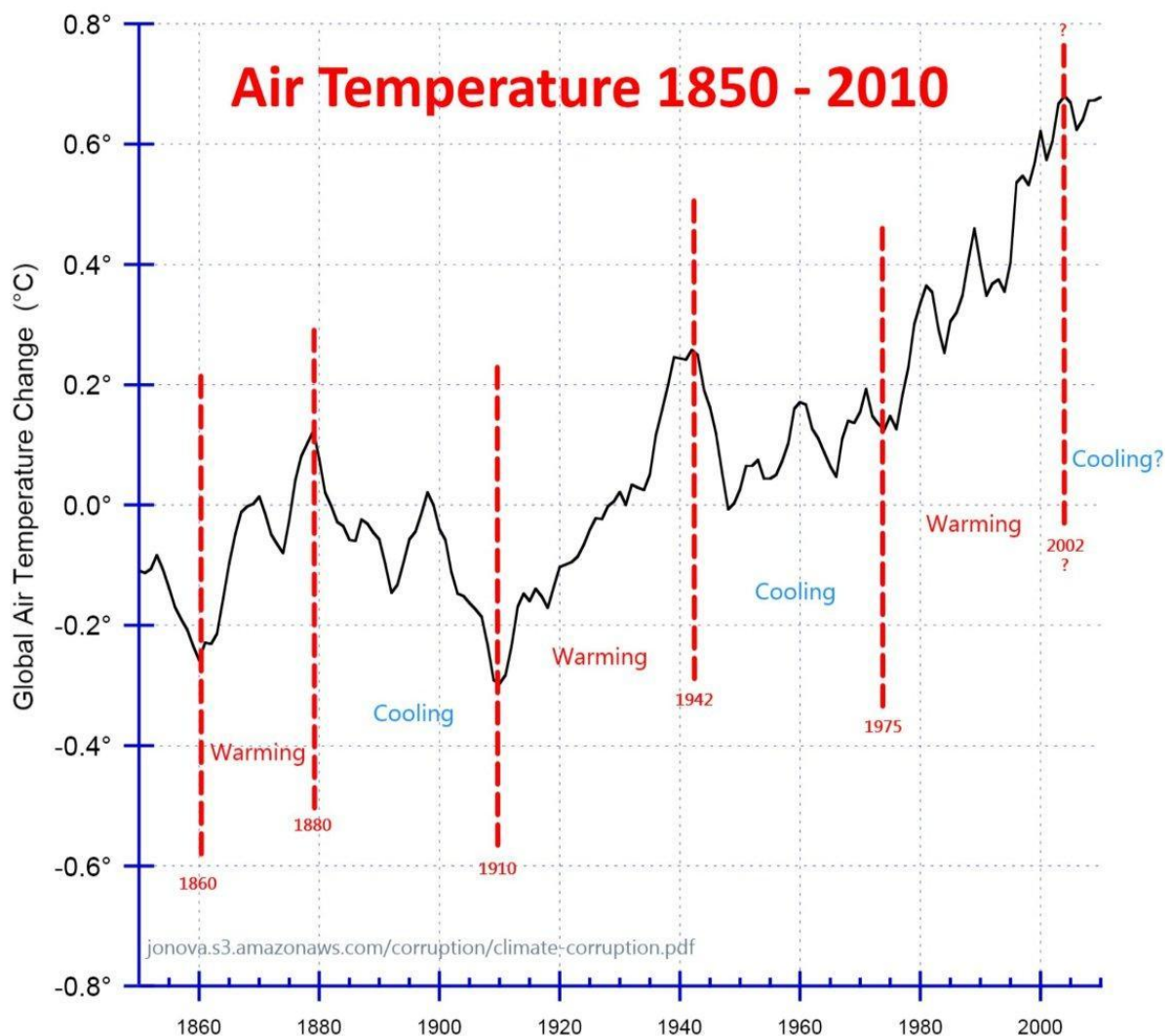


Figure 18: Alternating periods of warming and cooling, within the overall warming trend. The periods last about 20 – 33 years each. Warning: This uses land thermometer data to 1980, which has been subjected to tricks and revisions (especially 1940 – 1975)—the turning points shown are the generally agreed ones, except that 2002 is still ambiguous because it is not yet confirmed by a definite subsequent decline (see Figure 14). Source: Figure 17.

If the pattern continues, the next 12 – 35 years will see cooling.

How many in the public or the political class are aware of this pattern? Everyone has heard the climate establishment's forecast that the strong warming of the last three

decades will continue while we continue emitting CO₂. *But the establishment does not tell people that some or all of that strong warming since 1975 is due to a cyclic phenomenon that is now entering a cooling phase.*

NOTICE HOW THEY NEVER DIRECTLY COMPARE TEMPERATURE WITH HUMAN EMISSIONS OF CO₂?

According to the man-made theory of global warming promoted by the western climate establishment, the recent global warming is due to human emissions of greenhouse gases, which are dominated by carbon dioxide (CO₂).

So let's compare the alleged cause (human emissions of CO₂) with the alleged effect (temperature). The allegation is that human emissions were the main cause of global warming, and that curbing our emissions will significantly decrease future warming.

Human emissions of CO₂ have been estimated from historical data for the period 1751 (before the industrial revolution) to 2007 for the major sources—coal, gas, and petroleum use, cement production, and gas flaring—by the US Department of Energy.^{53, 54}



Bundesarchiv, Bild 183-1990-0509-018
Foto: Weisflog, Rainer | Mai 1990

Illustration: New CO₂ is injected into the climate system and biosphere by burning coal or other fossil fuels⁵⁵.

Air Temperature vs Human CO2 Emissions, 16AD - 2010

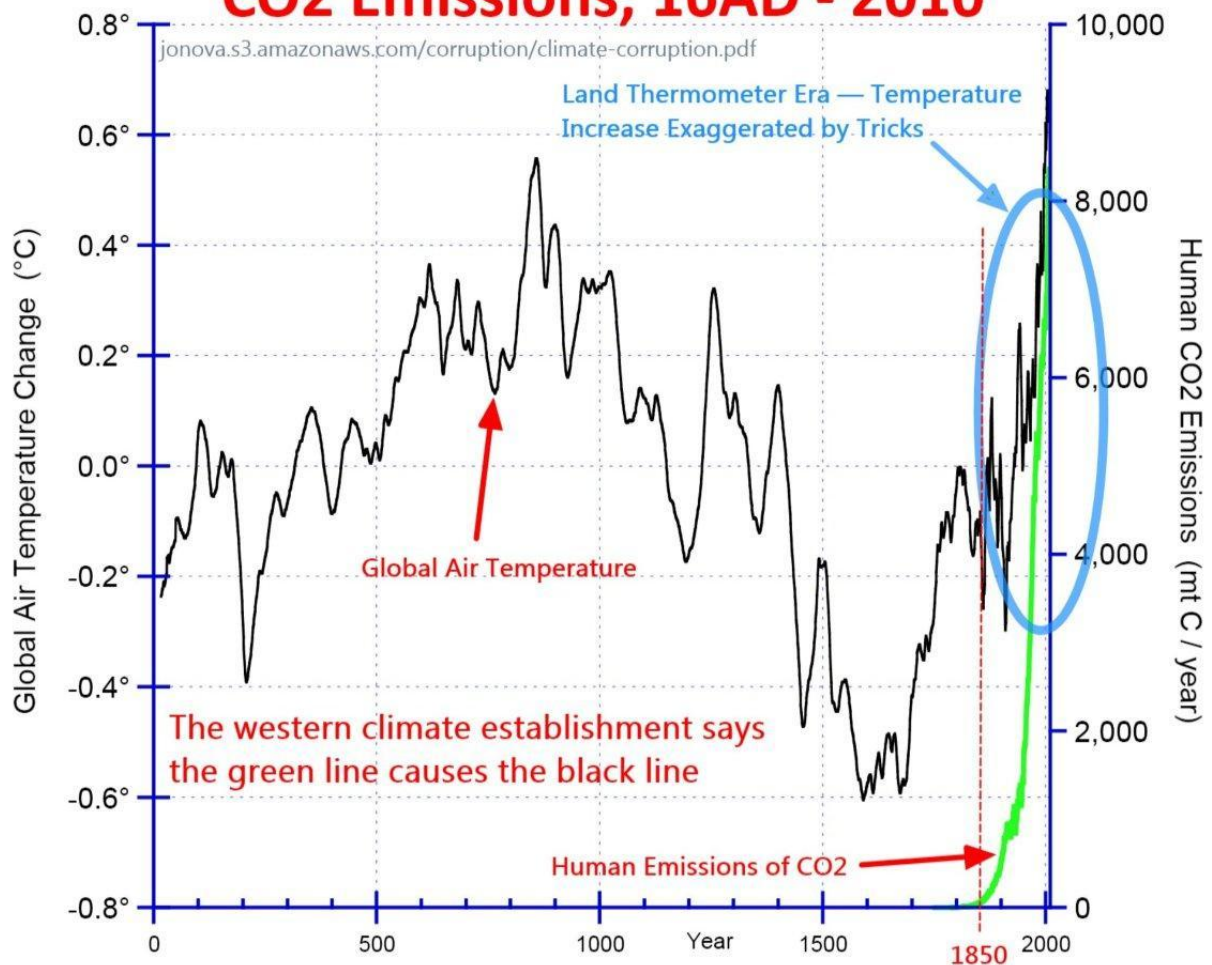


Figure 19: Comparison of temperature with human emissions of carbon dioxide. Human emissions were negligible before 1850, so how could they have caused the global warming from 1700 to 1850? Source: Temperature as per Figure 17, emissions see text.

The current global warming trend started before 1700, yet human CO₂ emissions were negligible before 1850. So the theory that humans started the recent global warming is absurd and obviously wrong.

Have you ever seen a graph of human CO₂ emissions versus temperature (the alleged cause and effect) anywhere in the media or from the climate establishment? Why not?

Why do the climate establishment and mainstream media instead show us graphs of atmospheric CO₂ levels versus temperature? Isn't this misdirection to disguise the almost complete non-correlation between our emissions and the temperature?

Perhaps human emissions of CO₂ merely aggravated or extended the current global warming trend? Let's zoom in on the era since 1850, when human emissions are significant:

Air Temperature vs Human CO2 Emissions, 1850 - 2010

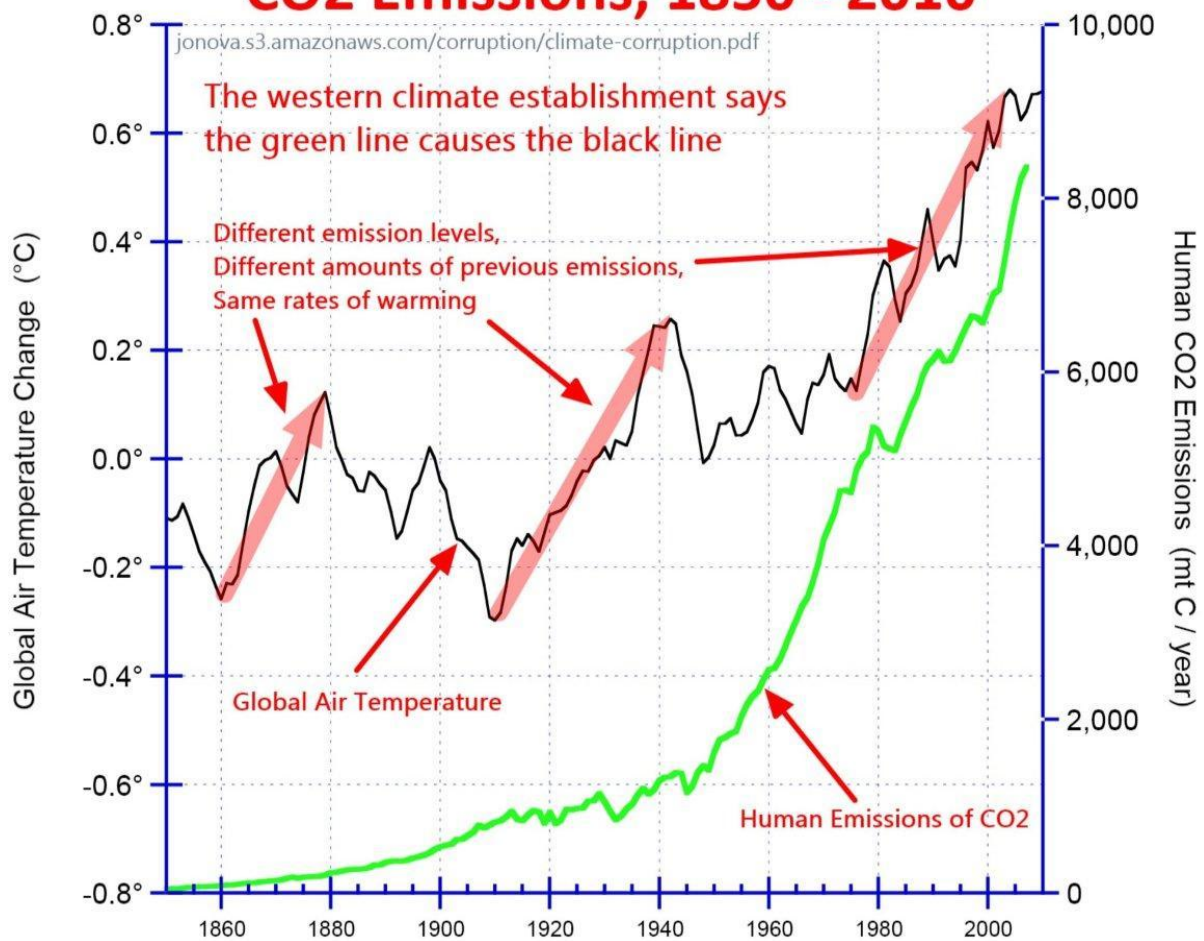


Figure 20: Comparison of temperature with human emissions of carbon dioxide, over the period when the latter are significant. Source: As per Figure 19 (warning: the temperatures from 1850 to 1980 are suspect because they come from land-thermometers).

Important admission. Leading member of the climate establishment, Dr. Phil Jones, again: the rates of global warming from 1860-1880, 1910-1940 and 1975-1998

"are similar and not statistically significantly different from each other"⁵⁶.

The rates of warming during the warming periods are the same. We know theoretically that CO2 emissions must cause some warming, but that warming does not appear to be large enough to show up in a comparison with temperature.

Nearly all our emissions are quite recent—85% of all our emissions ever occurred after 1945, as post-WWII industrialization greatly accelerated emissions:

Year	Percentage of All Human CO ₂ Emissions (to 2010) Emitted By That Year
1850	< 1%
1910	5%
1945	15%
1963	25%
1984	50%
1998	75%
2010	100%

There has been no significant global warming since 1998 (as Figure 17 shows, and Dr Phil Jones agrees). Yet a quarter of our emissions have occurred since then. If our emissions cause global warming, how come the last 25% of our emissions, concentrated in just 12 years, have not caused further global warming?

THE HOCKEY STICK

Faced with the obvious disconnect between human CO₂ emissions and temperature (Figures 19 and 20), the climate establishment either had to **change its theory or change its data**.⁵⁷



*Illustration: Norsemen landing in Iceland, Oscar Wergeland.*⁵⁸

They chose not to change their theory, so they had to **change their data**.⁵⁹ Because the CO₂ figures come from historical consumption data that are very hard to dispute, all the changes had to be in the temperature data.

They needed to move the start of the global warming trend from before 1700 to a time when human emissions were becoming significant compared to today's level—to say 1910, which is also at a minimum in the warming-cooling pattern.⁶⁰

And to make the current warming unprecedented, they needed the current temperature to be greater than anything in the last thousand years. In a rare insight or slip, one of the leading establishment climate scientists sent University of Oklahoma geoscientist David Deming an email in 1995 that said "We have to get rid of the Medieval Warm Period", according to a statement by Deming to a US Senate Committee.⁶¹

This is what the climate establishment believed until 1998:

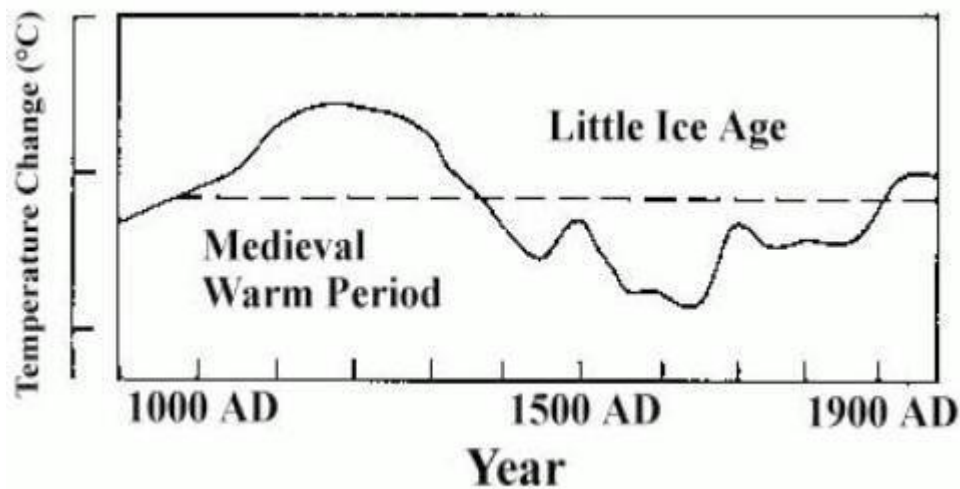


Figure 21: The climate establishment's temperature picture in 1990: the current global warming trend starting around 1650. From the [First Assessment Report](#) of the IPCC, page 202.

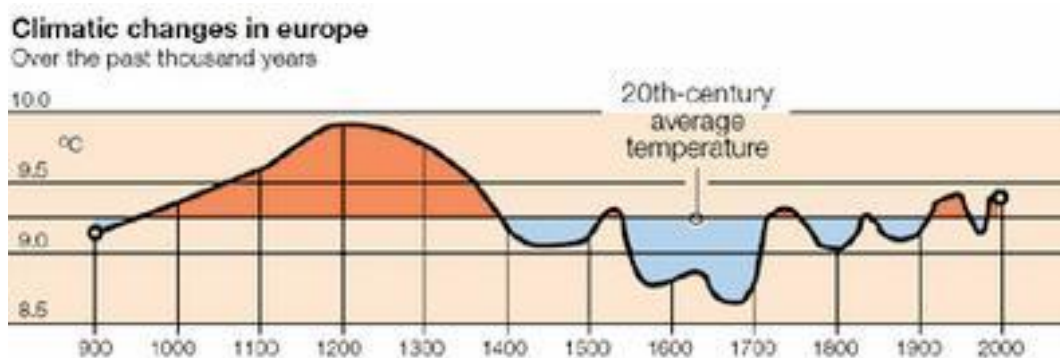


Figure 22: The climate establishment's temperature picture in 1995: the current global warming trend starting around 1680. From the *Second Assessment Report of the IPCC, 1996*, via [here](#).

But by 2001 the climate establishment had radically changed its mind on what past temperatures were, to:

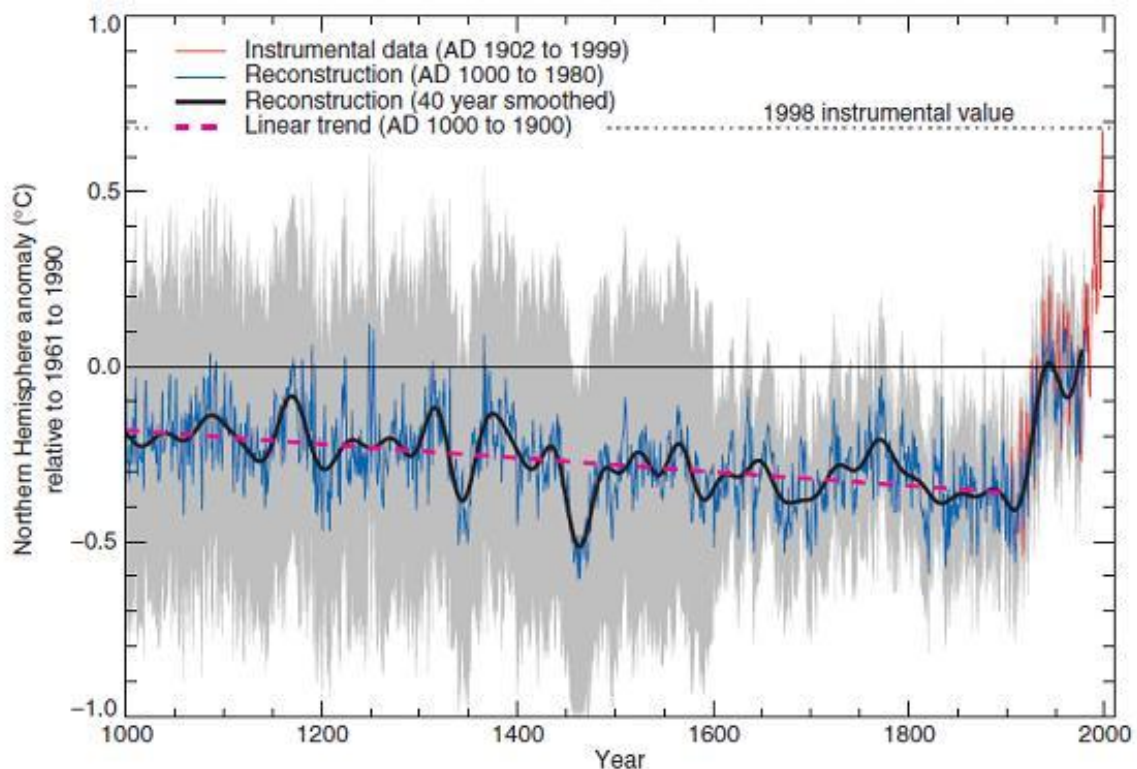


Figure 23: The climate establishment's view by 2001 has completely changed: they now say the current global warming trend started in 1910. This is the hockey stick graph by Michael Mann, 1998, so called because it has a long handle and a short upward blade, like an ice hockey stick. For the northern hemisphere. From the IPCC [Third Assessment Report](#), 2001, page 134.

Michael Mann's hockey stick graph is the most prominent and persuasive graph in the global warming debate. Most people who believe that man is responsible for global warming believe some version of the hockey stick. It was very widely publicized, and was even adopted by the IPCC for its logo (though later dropped).

The hockey stick is widely discredited in scientific circles outside climate science:

- The statistical processing used by Mann puts a lot of weight on any hockey-stick shaped inputs and puts very low weights on temperature proxies with other shapes. Although Mann used a variety of temperature proxies as inputs, only the tree rings from bristlecone pines really counted.⁶²
- Bristlecone pines are problematic because that species is notorious for having a growth spurt in the twentieth century for reasons not directly connected to temperature.^{63, 64}
- In 2006 the US Congress requested a committee of three independent statisticians, headed by eminent statistics professor Edward Wegman⁶⁵, to look into Mann's hockey stick. From the findings:⁶⁶

"In general, we found [Mann's methods] to be somewhat obscure and incomplete⁶⁷ and the criticisms [by their main critics] to be valid and compelling.

... It is important to note the isolation of the paleoclimate community; even though they rely heavily on statistical methods they do not seem to be interacting with the statistical community.

... Moreover, the work has been sufficiently politicized that this community can hardly reassess their public positions without losing credibility.

Overall, our committee believes that Mann's assessments that the decade of the 1990s was the hottest decade of the millennium and that 1998 was the hottest year of the millennium cannot be supported by his analysis."

The climate establishment persists with putting forward similar temperature pictures.^{68, 69} Mann still defends his hockey stick, but gets badly rubbished.⁷⁰

Why don't the media inform us of the problems with the hockey stick picture, to counteract the earlier wide publicity it received?

OTHER CLIMATE ESTABLISHMENTS DISAGREE

The western climate establishment consists of the climate science research bodies in the western world, and their climate scientists. The leading organizations are the IPCC⁷¹ of the United Nations, the CRU⁷² in Britain, and GISS⁷³ and NOAA⁷⁴ in the United States. Personnel move around within the establishment, getting funding from the same sources, collaborating on projects, and publishing in the same journals.

There are other climate establishments in this world, and they haven't come to the same conclusions about what causes global warming.



The Chinese torpedoed the Copenhagen negotiations in 2009, refuse to commit to any quantified emissions reduction targets, and say more research is needed to establish whether warming is man-made.⁷⁵ In August 2010 a book appeared in state-sanctioned bookstores in China that strongly suggests the Chinese government completely rejects the theory of man-made global warming (*Low Carbon Plot*, by Gou Hongyang):⁷⁶

" Will the increase in Carbon Dioxide definitely lead to the planet warming? Although there have been many many reports published by research institutes that verify this, but from the viewpoint of the history of man, and scientific method, the theories have not yet achieved scientific proof.

But, after many years of repeated indoctrination from every kind of propaganda machine, and the mixing together of environmental pollution and the exhaustion of natural resources, people have already formed a conditioned reflex, when the wind blows, the grass bends with it, and quickly hang these things on the hook of "carbon", and attempted to get rid of carbon at a faster rate."

The book argues that the theory of man-made global warming is “a conspiracy between western governments and business to protect their own way of life, at the expense of the entire developing world—in other words, 80% of the world’s population.”⁷⁷



Russian climate scientists have long spoken out against the theory of man-made global warming, saying the climate is heavily influenced by solar cycles.^{78, 79, 80} Many “reject the very idea that carbon dioxide may be responsible for global warming.”



India issued a *National Action Plan on Climate Change* in 2008 that says “No firm link between the documented [climate] changes described below and warming due to anthropogenic climate change has yet been established.”⁸¹ In February 2010, the Indian government established its own body to monitor the effects of global warming because it “cannot rely” on the IPCC, which is headed by its own leading scientist Dr R.K Pachauri.⁸²

The four biggest emitters of CO₂ are China, the USA, Russia, then India. Their climate establishments are more or less financially independent, but three of the four don’t agree that humans are causing global warming.

Our media often remind us that almost all climate scientists agree that humans are causing global warming. No, only most western climate scientists.

Even in the West, support is receding. In September 2010 the **French Academy** debated climate science—and could only agree that while the direct effects of extra CO₂ were well known, the effects of the all important feedbacks were “still controversial”.⁸³

Also in September 2010, **Britain’s Royal Society** moved its position on climate change away from total support of the climate establishment toward expressing much more uncertainty. While still claiming “strong evidence”⁸⁴ that the global warming since 1960 “has been caused largely by human activity”, it notes that “the size of future temperature increases ... are still subject to uncertainty.” The report makes no mention of what happened before 1850. Nor did it offer explanation for why global warming did not occur from 1940 to 1975. It concludes that “It is not possible to determine exactly how much the Earth will warm or exactly how the climate will change in the future”.⁸⁵

MOST WESTERN CLIMATE SCIENTISTS BELIEVE GLOBAL WARMING IS MAN-MADE: TRUE BUT MURKY

The vast majority of scientists in the western climate establishment believe in the theory of man-made global warming.⁸⁶ But here's where it gets murky.

The believers basically took over western climate science in the late 1980s and early 1990s, and since then have:

- Fired anyone who expresses disagreement with their theory, or hindered their career (publishing, promotions, funding). Al Gore sacked a few skeptics in his time as Vice-President of the USA.⁸⁷
- Hired into climate science positions only people who agreed with their theory.

Government-funded institutions are the only employers of “climate scientists”⁸⁸, so once the believers were in control of the few bodies that determine funding of government science, it was game over. Believers got all the funding and positions; skeptics were forced out. There are no checks and balances in government funded science, no competition from privately-funded science in the climate area, no auditing⁸⁹ as there is in financial matters, no regulation as with food and drugs, and no organized and funded opposition to test the theories and champion alternatives.

Within organizations that receive money for working on global warming, anyone who speaks out against the theory of man-made global warming gets peer pressure to shut up, because it threatens the funding and career prospects of colleagues. Scientists have mortgages and children too, and who else would employ a sacked or shunned climate scientist?

So the takeover is complete, and it's never going to change. The good 'ol boys are in charge for the foreseeable future.

The only current “climate scientists” who don't pay lip service to the theory that global warming is predominately man-made are a few old blokes who were appointed before 1990 and refuse to budge (for example Richard Lindzen at MIT, now approaching 70).⁹⁰

Ever notice that nearly all the climate scientists who speak out against the man-made theory are retired—no longer dependent on government climate money? For example, Joanne Simpson⁹¹, the first woman to receive a PhD in meteorology and “among the most preeminent scientists of the last 100 years”, worked for NASA but in retirement said:⁹²

“ Since I am no longer affiliated with any organization nor receive any funding, I can speak quite frankly. ... virtually all of the claims are derived from either flawed data sets or imperfect models or both ... But as a scientist I remain skeptical.”



Figure 24: Joanne Simpson, the first woman to receive a PhD in meteorology, only expressed her skepticism from retirement. She explicitly pointed out that could speak frankly because she was no longer funded by anyone.

I have received communications indicating that the level of support for the theory in some leading western climate institutions is much lower than the public believes, but they cannot say anything publicly, and urged me to continue criticizing the theory.

A huge number of scientists from other areas have seriously looked into climate science issues, and many (most?) have concluded that something is amiss or seriously amiss. It is obvious to many outsiders that the scientific method is not being observed in the climate sciences (for example, the missing hotspot—up next). Which is why so many prominent skeptics are scientists from other areas.

HOW DID THIS DEVELOP?

Climate science is totally funded by government. The system rewards the views it wants with grant money, publications in peer reviewed journals, promotions, even fame—the climate scientists with the right views are the rock stars of science, appearing in the press and in demand as speakers. Other scientists see what gets the desired outcomes, and imitate. Soon all the scientists involved have the same opinions—those rewarded by the system—and it's mutually reinforcing. Mere evidence is ignored or explained away. Voilà—a consensus!

In climate science this process started in the mid to late 1980s. It's not a conspiracy, just a toxic interaction of science, government funding, and media reporting. Given the system, the result was inevitable.

It has also spawned a huge and diverse gravy train of vested financial interests, from renewables manufacturers to lawyers in carbon trading. Many in the political system are heavily invested in it. It is too big to die. It's the **irresistible force** of human affairs. But what happens when it collides with the **immovable object** of scientific evidence and the inevitable eventual cooling? So far the crucial evidence (next) has been ignored and fudged, and sufficient cheating and mis-reporting of global temperatures might even keep this new religion alive for centuries. Or will word of the cheating leak out to a public no longer willing to fund the gravy train?

THEY NEGLECT TO MENTION THAT EVIDENCE FOR ONE LINK OF THEIR THEORY IS MISSING

The argument for man-made global warming consists of three links:

1. We humans are raising the levels of CO₂ in the atmosphere by our emissions.
2. Increasing CO₂ levels causes the temperature at the surface of the earth to rise, because CO₂ is a greenhouse gas. This is the “direct” warming effect of the extra CO₂.
3. The Earth responds to the direct warming in many ways, called “feedbacks”. The feedbacks warm the earth further, amplifying the direct warming about threefold.



All three links must be true for the theory to be valid; a chain is only as strong as its weakest link.

There is ample evidence for the first two links, and they are rarely disputed. The third link is where the dispute lies. In the establishment’s climate models, this amplifying feedback provides about **two-thirds** of the projected warming—without it there is only mild warming due to human emissions and no cause for climate alarm. There is no evidence for this amplifying feedback, but it is built into the climate models.^{93, 94}

If there was evidence for the threefold amplification by the feedbacks, surely we would have heard all about it, just like we hear about the evidence for the first two links? Instead we are just referred to climate models and told how terrific they are. But models are just computerized calculations; they are not evidence.

The climate establishment and media only talk about the first two links. Hardly anyone knows about the third link, which is responsible for most of the projected warming. If the case for man-made global warming is strong, why this obfuscation?

The effect of the feedbacks is the crucial question in climate science.

EMPIRICAL TEST FOR THE LINK IN QUESTION

To appreciate the desperation and sheer chutzpah of the establishment’s shenanigans, you need to know a tiny bit about the feedbacks.

The dominant feedback involves the extra water vapor⁹⁵ that evaporates, mainly off the oceans, due to the direct warming due to the extra CO₂. There are basically two possible alternatives for this extra water vapor:

- It can tend to accumulate in the atmosphere, increasing the depth of humid air in the atmosphere⁹⁶. Because water vapor is itself a greenhouse gas, this further increases the amount of greenhouse gases in the air. This in turn causes *more* warming, thereby amplifying the direct warming.⁹⁷
- It can form clouds, without increasing the depth of humid air in the atmosphere. Extra clouds reflect more sunlight back out to space, causing cooling which counteracts the direct warming of the extra CO₂, thereby moderating the direct warming.⁹⁸



Illustration: Clouds reflect sunlight back into space, creating cool shadows on the surface. [Photo](#) by Ave Maria Möistlik.

The threefold amplification assumed by the climate establishment can only occur if the first alternative is correct. To confirm that the feedback is amplifying, we need to see the depth of humid air increase during a period of global warming. The humid air is also warmer than the dry air above it⁹⁹, so we need to see it become warmer at heights initially just above the humid air.¹⁰⁰ The climate models all specifically say that this happens.

Here is a “prediction” by the climate establishment that the feedbacks are amplifying, expressed as a pattern of warming in the atmosphere. This prediction is empirically testable.

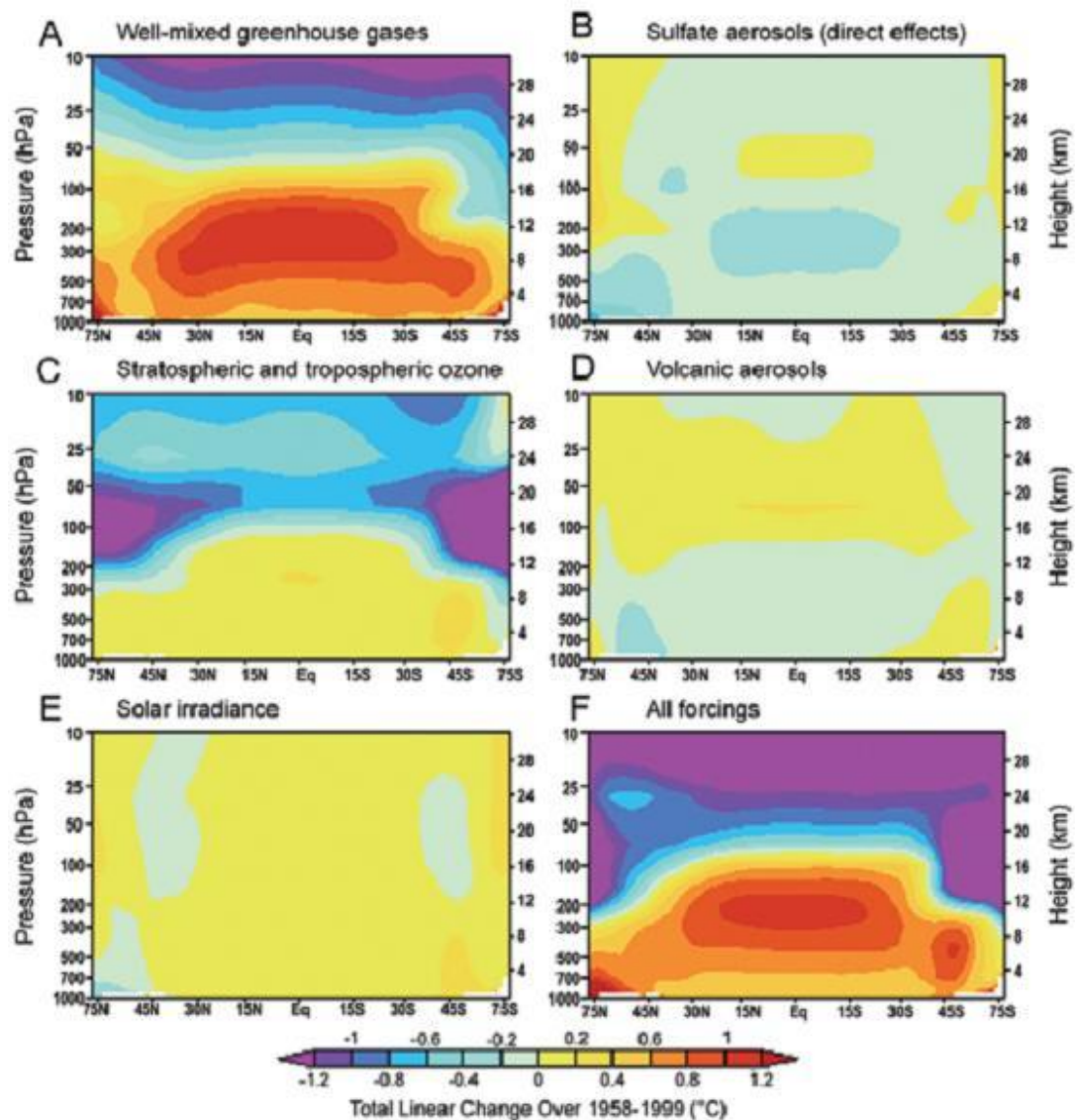


Figure 25: The theoretical warming patterns for 1958 to 1999, calculated by the establishment's climate models, in °C per 42 years. From the [US CCSP of 2006](#), Figure 1.3 on page 25.¹⁰¹

This is the pattern of atmospheric warming that the climate establishment say occurred, according to their climate models. Each of the six diagrams shows temperature changes by latitude (x-axis) and by height in the atmosphere (y-axis, height in kilometers on the right).^{102, 103}

Diagram A is the warming pattern due to an increase in greenhouse gases other than water vapor—that is, essentially from CO₂ emissions. Diagram F is the warming pattern expected from the sum of all the five patterns A – E in the proportions the establishment believe those causes contributed to global warming; it is dominated by signature A because the establishment's theory is that the warming was mainly due to CO₂ emissions.

Notice the large prominent red “hotspot”, about 12 km high in the tropics, in F. The detection of this theoretical hotspot would go a long way to confirming the feedbacks are amplifying; its absence would prove that the feedbacks are not amplifying.

The outcome of the climate debate hinges on this issue: a hotspot confirms their theory, its absence falsifies their theory.

THE THEORY OF MAN-MADE GLOBAL WARMING FAILED AN EMPIRICAL TEST

The last period of global warming was 1975 to 2001 (Figures 14 and 18). Fortunately, during the whole of this period there was a worldwide program of measuring the temperature at all altitudes using radiosondes—weather balloons with thermometers that radio back the temperature as they ascend through the atmosphere. Over 30,000 radiosondes were released *each month* from 1979, from hundreds of locations all around the world.¹⁰⁴



Illustration: Radiosonde (weather balloon). [Source](#).

During the early and middle 1990s the climate establishment were expecting the radiosondes to find the hotspot, confirm the presence of amplifying feedbacks, and thus prove the last link in their theory of man-made global warming. But then their world fell apart.

By 1999 the results were in, but there was no hotspot. Not even a small hotspot.

Why didn't the climate establishment rush out to the world with the good news, that they had overestimated the projected temperature increases, that there was now little cause for alarm over the climate? Why is the climate establishment and media now so quiet about it?

As it happens, around that time they were publicizing the hockey stick (Figure 23), and basking in the attention, status, and research grants from a concerned world.

They finally published the radiosonde observations in 2006, buried among four other diagrams from climate models at the back of a report.¹⁰⁵ Here is that diagram:

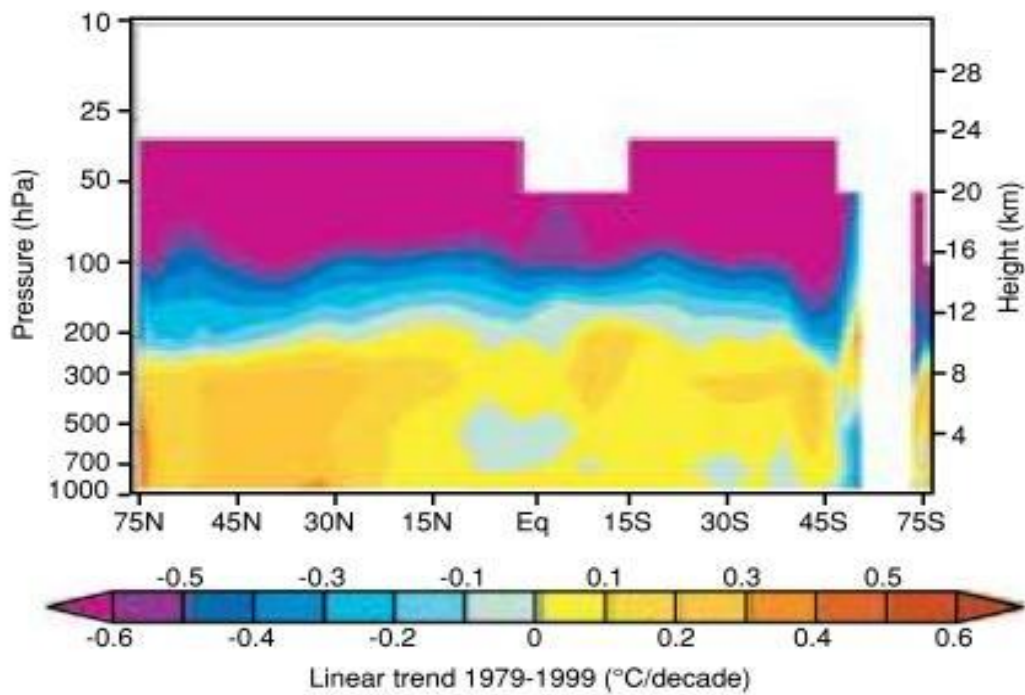


Figure 26: The observed pattern of atmospheric warming, 1979 – 1999, as per the US CCSP of 2006, part E of Figure 5.7 in [section 5.5](#) on page 116. (Axes deblurred.)

This is all the data we will ever have about that warming period, because we cannot go back in time and take more or better measurements. We are only interested in the atmospheric pattern when there is warming, so this is all the data we have about hotspots until there is another period of warming (see Figure 18).

Atmospheric Warming 1979 - 1999

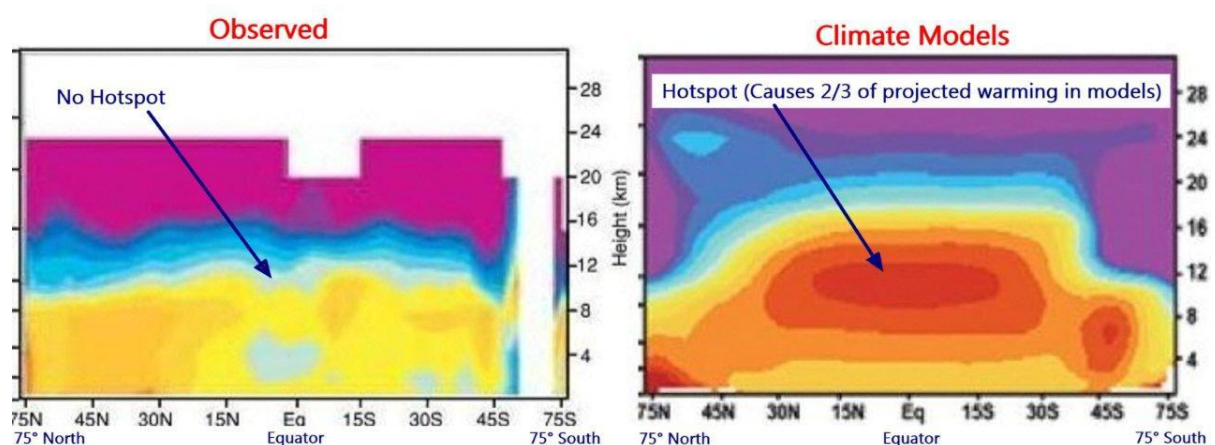


Figure 27: Figures 26 and 25-F, side by side for comparison.

The observed pattern is nothing like the “predicted” pattern, so the climate models are wrong. There was no hotspot in reality, so the theory of man-made global warming is greatly exaggerated (because there are no amplifying feedbacks).¹⁰⁶

THE RESPONSE OF THE CLIMATE ESTABLISHMENT

First they ignored it. For several years.¹⁰⁷

Then, in 2008, they denied the data. Ben Santer¹⁰⁸ emphasized the uncertainties in the data from the radiosonde thermometers. On the basis of a complex statistical argument he argued that it was possible that the observed data (Figure 26) was so error-ridden that the predicted hotspot (Figure 25) might in fact be present in the observed data. However radiosondes reliably detect temperature differences of 0.1°C (0.2°F) when correctly calibrated and operated, and the hotspot is at least 0.6°C (1.1°F) of warming. Some radiosondes may have been faulty, but hundreds of them could not all have failed to detect any hotspot.

Then, also in 2008, after nine years and with no new data, they claimed to have found the hotspot! Steven Sherwood adjusted the data in accordance with various theories and wind data from the radiosondes, and processed it on his computer to arrive at a new view of the data:

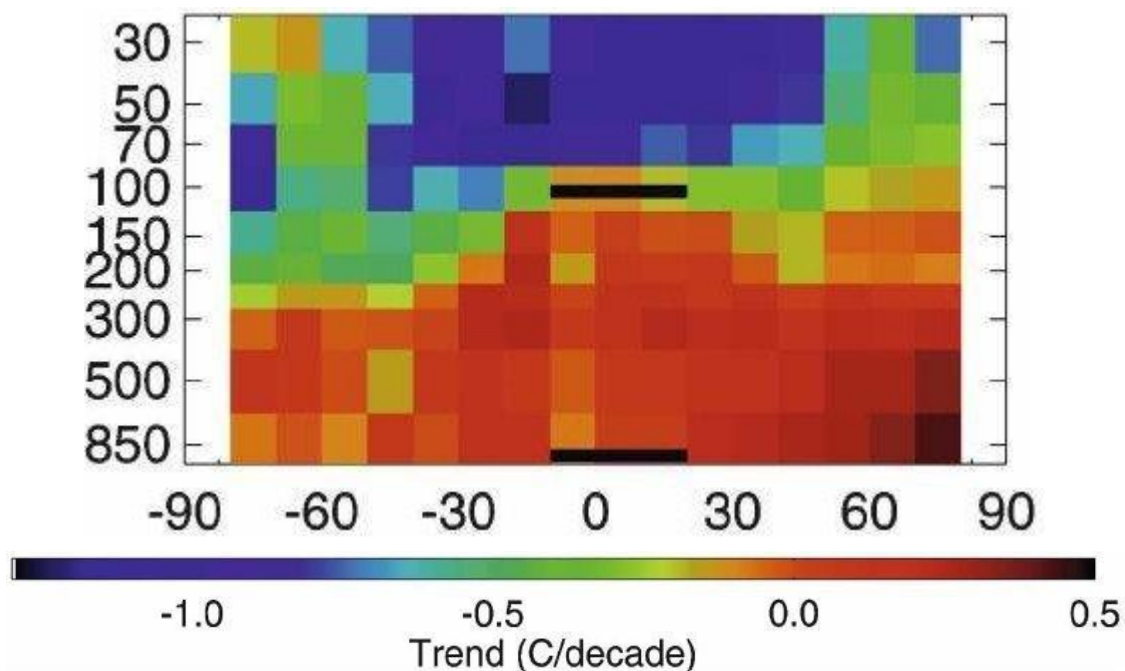


Figure 28: The atmospheric warming observations from Figure 26, after adjustments by Sherwood, including using radiosonde wind data, extended to 1979 – 2005. From Fig. 6 (top) of [Sherwood 2008](#), “short thick bars indicate latitudes discussed in text where sonde adjustments in the troposphere still appear inadequate”. **He pulled the old color-scale trick!**

Looks like the predicted hotspot, right? But look closely at the color scale and note the color of zero change—it’s red! So if the atmosphere stayed at exactly the same temperature everywhere, Sherwood’s interpretation would be an all-red graph!¹⁰⁹ The reds in his diagram blend together and it is impossible to see where his “hotspot” might be—but his “hotspot” is too faint anyway, because the hotspot in the climate models is at least 0.6°C (1.1°F) over two decades.

If Sherwood used the same color scale as in Figures 25 or 26, it would be obvious that he had not found the hotspot. **Why would a leading climate scientist play a “trick”**

like choosing the color scale such that no change or even slight cooling was in red? What purpose could there be, except to mislead?

Even if you don't understand the significance of the hotspot, isn't a tricky color scale like this a sign of deception, a solid hint that they are trying to hide something?

Sherwood's paper appeared in the *Journal of Climate*. Professor Sherwood was at Yale from 2001 to 2008, and is now at the Climate Change Research Centre at the University of NSW in Sydney.¹¹⁰

WHY IS THE OFFICIAL LANGUAGE SO ORWELLIAN?

It used to be called "global warming", then when warming paused it became "climate change". And as of September 2010, it appears they are switching to "global climate disruption".¹¹¹

It keeps getting less specific and less falsifiable. If the world hasn't warmed by several degrees by the end of the century then man-made "global warming" was dead wrong, ok.¹¹² But "climate change"? The climate changes all the time, like the weather, just give it a decade or two (see Figure 17).

And now "climate disruption"? So they are going to blame our carbon emissions for large storms, droughts, and floods? In biblical times they blamed the gods, to whom only certain members of the establishment had a hotline—hmmm, better do what the establishment guys tell us to do or there'll be a climatic disruption headed our way! How times change.

Evidence of warming is conflated with evidence of the causes of warming. Any sign of warming (and it has been warming now for over 300 years, see Figure 17) is taken by the governments and media as evidence of global warming, and while the audience is shocked at the implications (or just numb from the repetition or sheer boredom), they simply assert that it is due to carbon emissions. Repetition, over and over...

They say that people who don't believe in the theory of man-made global warming (and there are a lot of us nowadays) "don't believe in climate change". Taken literally, that is a stupendously stupid thing to say—everyone I know believes climate changes. It happens all the time: just in the last two thousand years we have had a medieval warm period and a little ice age, and 20,000 years ago New York was under thousands of feet of ice because there was an ice age going on. But of course the climate establishment and their believer-supporters are just using it as a propaganda term to isolate and mock those who disagree with them. George Orwell would have admired their flair for propaganda.



Illustration: The government and media have stepped into an Orwellian twilight zone with global warming. [Source](#).

They say that someone skeptical of the theory of man-made global warming is a “denier”. That’s hate speech. It deliberately equates critics of their global warming theory with anti-Semitic apologists for the holocaust in WWII. Spin, spin, spin, and intimidation.

“The debate is over.” Could someone please show me when and where there was ever a debate? The establishment would only say this to **avoid** debate. We’ll get a debate with the climate establishment only when the bulk of the population see through them and are demanding that politicians ... (gasp) ... cut their funding. Then, suddenly, they will want to debate.

They frame the debate as whether one believes that CO₂ causes **any** warming or not. That misrepresents and demonizes opponents of their theory as ignorant fools. The issue in dispute is quite different, namely **how much** warming will our CO₂ emissions cause? If only 0.5 – 1.0°C (0.9 – 1.8°F) of extra warming by 2100, as most skeptics suspect, then it is not a problem worth doing much about; if it will cause 2.5 - 8.0°C (4.5 – 14°F) of extra warming as the climate establishment say, then we have a serious problem.

Every molecule of CO₂ we emit causes some warming—something serious skeptics have always agreed with, and a straightforward question of radiative physics. The media willingly go along with mis-framing the issue like this, refusing to correct even the most blatant propaganda from the establishment. Which of course strengthens the climate of intimidation, silencing many who doubt the establishment’s theory. After all, who wants to have their doubts publicly misrepresented so they appear a fool?

If the case for man-made global warming is so strong, why the Orwellian language?

GORE'S CONVENIENT LIE

Al Gore's movie *An Inconvenient Truth* convinced large portions of the population that CO₂ levels and temperature are highly correlated and therefore raising CO₂ levels will raise temperatures.



Figure 29: Atmospheric CO₂ levels and global temperature move in lockstep on a timescale of thousands of years, as illustrated by Al Gore in his movie *An Inconvenient Truth*. The trouble is, Al deliberately left out a crucial point about timing, thereby lying by omission.

Not so fast Al. Obviously on a time scale of thousands of years CO₂ levels and temperature are closely linked¹¹³, so one is causing the other.¹¹⁴ What Gore omitted to say was that the changes in temperature occur 800 years on average *before* the corresponding changes in CO₂ levels. So it was the temperature causing the CO₂ levels, not the other way around.¹¹⁵ Gee Al, forgot to mention that little detail?

The 800 year lag of CO₂ had been firmly established by 2003 to everyone's satisfaction¹¹⁶, and Gore's movie was made in 2005. So Gore was lying, by omission. Mr Gore has become very wealthy by owning and running companies involved in curbing our carbon emissions, his net worth zooming from under \$2 million after the 2000 presidential election to approaching \$1,000 million in 2009.¹¹⁷

Why didn't the climate establishment or the media publicly correct Gore's lie?

Doesn't this show that the climate establishment and media are playing politics rather than disinterestedly searching for and publishing the truth?

CONCLUSION

Ok, until now this paper has been simple and direct as possible (though accurate and well referenced). It was written this way to cut through the clutter of words and rhetoric, so even jaded newspaper editors might pay attention. For everyone else, here are a few words of opinion and analysis.

The western climate establishment supports the concept that global warming is man-made, and disparages all other theories. They issue reports that overwhelm their readers with detail, written in dense language that is difficult for a layperson to decode. Basically their message is authoritarian: “we are the experts, it is very complicated, you can’t understand it, so just accept what we say.”

But their message is nonsense. Everyone is familiar with temperature, and everyone (except the “politically sophisticated”) knows that siting official thermometers near air conditioners is cheating. ***The reality is that the temperature and other data has become unfavorable to their climate theory, so they hide behind complexity and authority instead of simply telling you what is going on.***

While their theory seemed plausible 15 years ago, new evidence has proven the influence of CO₂ to be greatly exaggerated. There is a germ of truth to their theory, but our emissions are not nearly as serious as they make out. The western climate establishment does not want you to know this, presumably for fear of losing the considerable income, perks, status, and influence that has come their way since they started promoting their theory. ***So they have taken to bamboozling us with “science”, and to cheating.***

The public, politicians, and media do not generally understand science, but they do understand cheating. This paper focused on a few of the more easily understood or critical examples of establishment cheating.

The western climate establishment receives a great deal of public money as a result of their cheating. ***Obtaining money under false pretences, by deception, is technically fraud.*** We can leave it to government auditors and criminal investigators to sort that out as necessary, but in the meantime what matters most is whether the western climate establishment is right or wrong. If they are right, we aren’t doing enough to curb emissions and prevent disaster. If they are wrong, we are wasting time and resources that would be better spent elsewhere, entrenching a vast gravy train of parasites, and extending the influence of government into our economy.

The obvious cheating of the western climate establishment strongly suggests they are hiding something and that they are wrong.

That their cheating is so blatant suggests that the media has not put them under any real scrutiny. It is left to retired scientists and bloggers to point out their cheating and errors, over the Internet. Our media has been incapable or unwilling.

It’s been a lucrative theory for the western climate establishment, but reality will force them to abandon it eventually. And the political class will realize they were taken in.

WHAT YOU CAN DO

Spread the Word

The more people know about these problems in climate “science”, the less likely governments will pass unnecessary laws that make us all poorer. Link to this document: ionova.s3.amazonaws.com/corruption/climate-corruption.pdf.

Emails

For example of emails, small photos (suitable for emailing), and other suggestions, please see

ionova.s3.amazonaws.com/corruption/climate-emails.pdf.

In Australia: Call for a Royal Commission

Australia needs a Royal Commission to examine the arguments and evidence, ***under oath***. Support Dennis Jensen's [call](#) for one. Contact your parliamentarians at:

joannenova.com.au/global-warming/australian-elected-representatives-emails

www.aph.gov.au/house/members/index.htm#contact

www.aph.gov.au/Senate/senators/index.htm#contact

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ABOUT THE AUTHOR

Dr David Evans worked for the Australian Greenhouse Office (now the Department of Climate Change) from 1999 to 2005, modelling Australia’s carbon in plants, debris, mulch, soils, and forestry and agricultural products. Evans is a mathematician and engineer, with six university degrees including a PhD from Stanford University in electrical engineering. The area of human endeavor with the most experience and sophistication in dealing with feedbacks and analyzing complex systems is electrical engineering, and the most crucial and disputed aspects of understanding the climate system are the feedbacks. The evidence supporting the idea that CO₂ emissions were the main cause of global warming reversed itself from 1998 to 2006, causing Evans to move from being a warmist to a skeptic.

Inquiries to david.evans@sciencespeak.com.

¹ NOAA's siting requirement: www.nws.noaa.gov/om/coop/standard.htm

² After inspecting land thermometers and realizing what was going on, Anthony Watts became a skeptic and now runs the world's biggest skeptic science website, wattsupwiththat.com. When it comes to the thermometer siting, Anthony takes the view "*never attribute malice to that which can be explained by simple incompetence*". He points out that the volunteers who run these thermometers were never trained on the siting guidelines by NOAA, most had no idea that they were part of the official global warming thermometer network, and they were genuinely surprised when informed. Anthony says it is not his intent to impugn the volunteers, who have done a great public service with no compensation of any kind. However the larger issue of using these thermometers to measure "global" warming, and the subsequent data adjustments, are entirely different and problematic.

³ These grassroots auditors have put up photos and documentation of all the inspected thermometers at www.surfacestations.org.

⁴ The USA has the best land thermometer network of any country. Problems are generally greater elsewhere, especially in China and Siberia.

⁵ www.corporateservices.noaa.gov/nbo/FY09_Rollout_Materials/NOAA_One_Pager_FINAL.pdf

⁶ The climate establishment likes to say, when confronted with the obvious bias in its thermometers, that it's all ok because it corrects for the biases in its computers: they "adjust" the raw data on their computers. As it happens, this is just an opportunity to cheat further— they add even more warming in the adjustment process (see the "More Thermometer Tricks" section, below)! Anyway, who is to say their adjustments are correct: when they never measure the correct temperature in the first place, how would anyone know that measuring the temperature wrongly then adjusting it produces the right temperature? So why not just use thermometers that aren't biased? The current system allows them to effectively make up whatever temperature they want on their computers—effectively the thermometers are just a sham, for show.

⁷ www.ncdc.noaa.gov/crn/#

⁸ They stopped using this thermometer for official data in 2007, after photos of it first appeared on the Internet. But the data collected by this station (back to 1897) is still in the official record.

⁹ mi3.ncdc.noaa.gov/mi3qry/login.cfm (useful notes at www.surfacestations.org/USHCN_sites.htm)

¹⁰ As far as I know, and I've been looking out for it for years.

¹¹ www.epa.gov/heatisd

¹² As used by NASA GISS. The land thermometer networks used by NOAA and the CRU are almost identical, consisting of basically the same thermometers. 134 of these thermometers are in the US.

¹³ The airport thermometers were never intended to measure global temperature, just the conditions for aircraft using the airport.

¹⁴ The recorded daily temperature is typically the average of the maximum and minimum temperatures recorded in a 24 hour period.

¹⁵ wattsupwiththat.com/2009/07/15/giss-worlds-airports-continue-to-run-warmer-than-row. Only 128 of the 1,079 thermometers in the global network are definitely rural and not at airports, and a further 73 are rural but in areas of "dim" or "bright" lights.

¹⁶ Nice animation of global thermometer network from 1920 to 2010 at joannenova.com.au/2010/05/the-great-dying-of-thermometers

¹⁷ Page 10, rossmckitrick.weebly.com/uploads/4/8/0/8/4808045/surfacetempreview.pdf.

¹⁸ From about 30% to about 50%. Page 12, rossmckitrick.weebly.com/uploads/4/8/0/8/4808045/surfacetempreview.pdf.

¹⁹ The average distance of thermometers from the equator in degrees latitude dropped from 35° to 20°. Page 13, rossmckitrick.weebly.com/uploads/4/8/0/8/4808045/surfacetempreview.pdf.

²⁰ The average altitude of thermometers decreased from 480 meters above sea level to 350 meters. Page 14, rossmckitrick.weebly.com/uploads/4/8/0/8/4808045/surfacetempreview.pdf.

²¹ US and global: www.appinsys.com/GlobalWarming/GW_Part2_GlobalTempMeasure.htm, Australia: joannenova.com.au/2010/09/australian-temperatures-in-cities-adjusted-up-by-70, wattsupwiththat.com/2009/12/08/the-smoking-gun-at-darwin-zero

²² John Coleman the weatherman made a serious study, well presented in this video: www.youtube.com/watch?v=AsQfr7wRZsw&feature=player_embedded

²³ From NOAA data. Short and sweet: stevengoddard.wordpress.com/2010/09/25/thermometer-magic

²⁴ For example, 1965 went from being 0.3°C warmer than the 1970's in 1976 to 0.03°C cooler by 2007, presumably to erase the cooling period around 1960 – 75 when human carbon emissions

were increasing rapidly. joannenova.com.au/2010/03/the-mystery-deepens-where-did-that-decline-go

25 www.nature.com/news/2009/090812/full/460787a.html

26 camirror.wordpress.com/2009/11/21/test_blogs.news.com.au/heraldsun/andrewbolt/index.php/heraldsun/comments/the_warmist_conspiracy_tthe_emails_that_really_damn_professor_jones

27 rogerpielkejr.blogspot.com/2009/08/we-lost-original-data.html

28 www.quadrant.org.au/blogs/doomed-planet/2010/05/crisis-in-new-zealand-climatology

29 See links from here: joannenova.com.au/2010/10/new-zealand-niwa

30 In 2009 Hansen [endorsed a book](#) which claims “The only way to prevent global ecological collapse and thus ensure the survival of humanity is to rid the world of Industrial Civilization.”

31 The satellite data is inconvenient to the climate establishment, and they never refer to it. But they appear to have a strategy for dealing with it in future: they underfund the temperature satellites and do not fix flaws as they arise. canadafreepress.com/index.php/article/26603.

32 BBC interview February 2010: news.bbc.co.uk/2/hi/8511670.stm.

33 But crucial to understanding climate, because most of the heat in the climate system (water, air, ice, and snow) is stored in the oceans. Ocean temperature is a better indicator of global warming than air temperature, but we care more immediately about air temperature because we live on land.

34 Before Argo, starting in the early 1960s, ocean temperatures were measured with [bathythermographs](#) (XBTs). They are expendable probes lowered into the water, that measure temperature and pressure, and transmit the data back along a pair of [thin wires](#). 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 (they move too quickly through the water). www.metoffice.gov.uk/weather/marine/observations/gathering_data/argo.html, www.argo.ucsd.edu/Novel_argo.html, www.gizmag.com/argo-program-ocean-data/8446.

35 www.npr.org/templates/story/story.php?storyId=88520025

36 earthobservatory.nasa.gov/Features/OceanCooling/page2.php

37 Willis, who has written a paper with the father of alarmism James Hansen, had an “eye-opening” brush with Rush Limbaugh over the original data. www.usclivar.org/Newsletter/V6N2.pdf

38 This is an example of a general problem with data in climate science: believers hold all the authority positions in climate science and own (manage) all the datasets. Datasets that contradict their 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 theory of man-made global warming. It has happened several times now—but by chance alone you would expect technical adjustments to make the data less supportive of any given position about half the time. Don’t be surprised if the Argo data for the last few years is “revised” at some stage to show warming instead of slight cooling.

39 On the Internet you can find **raw** Argo data for individual floats, related results like some Pacific temperatures or temperature by depth at some locations, and float positions (www.nodc.noaa.gov/argo/latest_data.html, sio-argo.ucsd.edu, sio-argo.ucsd.edu/Marine_Atlas.html, www.coriolis.eu.org/cdc/argoftp/site.htm), but the computations to move from there to the global ocean temperature are prohibitively complex (because accounting for float proximity and nearby ocean volume is hard) and somewhat arbitrary (so even if you do it, your numbers will disagree slightly with Willis’ official numbers and they will say you are wrong). There is no graph of global ocean temperature or heat content from up-to-date Argo data on the public web (or the raw numbers from which to plot such a graph). In contrast there are several for air temperature, such as hadobs.metoffice.com/hadcrut3/diagnostics/global/nh+sh, data.giss.nasa.gov/gistemp/graphs, or junkscience.com/MSU_Temps/Warming_Look.html.

40 The graph here comes from Craig Loehle, who got the data from Willis a couple of years ago, analyzed it, and put the results in a peer reviewed paper available on the Internet. Willis now won’t give out the data (maybe it undermines the establishment?): [here](#) he turns down non-establishment climate scientist Roger Pielke Sr, in Sept 2010 (notice how Pielke asks for the data and Willis does NOT say “it’s at this website Roger”, which pretty much proves that it is still not publicly available).

41 commons.wikimedia.org/wiki/File:Avercamp-ijsvermaak.png

42 The three data sources are spliced together by simply resetting their anomaly origins so that the average of overlapping periods are equal. The annualized satellite and the land-thermometer data was smoothed with a five year filter. To avoid a discontinuity moving from land-thermometer to satellite data, the land-thermometer temperature was used for 1979, and the midpoints between the land-thermometer and satellite temperatures were used for 1980 and 1981.

43 Data: vortex.nsstc.uah.edu/data/msu/t2lt/uahncdc.lt

44 hadobs.metoffice.com/hadcrut3/diagnostics/global/nh+sh

45 Paper at www.ncasi.org/publications/Detail.aspx?id=3025, data at www.ncasi.org/programs/areas/climate/Loehle_Supplemental_Info.zip.

46 Tree rings make poor proxies: Tree growth depends heavily on water and mineral availability so it is often not proportional to temperature as assumed, tree populations genetically adapt to climate change so long term climate trends fade out, and individual trees respond differently to temperature so the choice of which individual trees to examine introduces subjectivity and bias. [See page 1050.](#)

47 climateaudit.org/2007/11/20/something-new-in-the-loehle-network

48 A second high quality reconstruction, with 30 proxies including six tree rings, but no bristlecone pines, was made by [Ljungqvist](#) in 2010. It basically confirms Loehle's results, estimates the current air temperature as about 0.1°C (0.2°F) less than its medieval peak in 950 AD, and confirms the start date of the current global warming as just before 1700.

49 The Greenland ice cores bear out the same story, and much more:

50 <http://wattsupwiththat.com/2009/12/09/hockey-stick-observed-in-noaa-ice-core-data/>

51 www.co2science.org/data/mwp/mwpp.php

52 www.wordiq.com/definition/History_of_Greenland

53 When the thermometer data starts, giving us a sharper picture of turning points. Proxies are too imprecise to determine turning points.

54 Carbon Dioxide Information Analysis Center, cdiac.ornl.gov/trends/emis/tre_glob.html. Cumulative figures here extrapolate to 2010 using average annual emissions for the previous 14 years.

55 We use these figures because they are the best available, but be aware that they are somewhat approximate because they omit some causes. The major omission is deforestation, but it is relatively minor:

- Deforestation is widely assumed to be about 20% of emissions in the last couple of decades, but recent calculations show it is more like 12% of emissions for 2008 (Van der Werf 2009, www.biology.duke.edu/jackson/ng09.pdf).
- Deforestation is counteracted to a large degree by reforestation, afforestation, and the growth of plants in the deforested areas. These new plants are consumers of CO2 from the air. Despite deforestation in places like the Amazon and southeast Asia, the total amount of plant growth on the planet *increased* by 6% over 1982 – 1999 (from NASA satellite observations, page 19 of www.siam.org/meetings/sdm04/files/IndGov_Coughlan.pdf).
- By 1500 Europe had cleared nearly all its forests, then switched to charcoal then coal for fuel. The world fossil-fuel emissions in 1751 were negligible on DOE figures—so the coal consumption in Europe and the deforestation it replaced were both small compared to today's emission rates.
- Global deforestation sharply accelerated around 1852 (en.wikipedia.org/wiki/Deforestation), roughly in parallel with fossil fuel use (fossil fuels make deforestation much faster). This suggests that deforestation might have been roughly proportional to fossil fuel use or availability.

No one knows what the net effect of deforestation, reforestation, afforestation, and any replacement plants are, even today, let alone in the distant past. It is not even clear what *ought* to count as a "forest emission due to humans", especially when forest and agricultural products are accounted for. In any case, they don't add more than few percent to the DOE emissions figures.

55 upload.wikimedia.org/wikipedia/commons/6/6e/Bundesarchiv_Bild_183-1990-0509-018%2C_Umweltbelastung_in_Lauchhammer.jpg

56 BBC interview February 2010: news.bbc.co.uk/2/hi/8511670.stm.

57 The establishment's anti-scientific attitude that its theory triumphs over data was famously on display in the Climategate email where Kevin Trenberth, who believed (in 2008) that global warming was still occurring but was bemoaning that no one could find it using actual real-world measurements, said

"The fact is that we can't account for the lack of warming at the moment, and it is a travesty that we can't." www.wired.com/threatlevel/2009/11/climate-hack

58 commons.wikimedia.org/wiki/File:Norsemen_Landing_in_Iceland.jpg
 59 Thereby disqualifying themselves as scientists.
 60 See Figures 18 and 20.
 61 epw.senate.gov/hearing_statements.cfm?id=266543
 62 So he can say “See, I used a wide variety of temperature proxies and they all contributed to the
 63 result”, while still getting the hockey-stick shape he wanted.
 64 Bristlecone pines live in dry regions and are very susceptible to CO₂ fertilization and the CO₂
 65 drought resistance effect. They respond strongly to higher CO₂ levels in the air, humidity levels,
 66 and to sunshine—but not to temperature. [Here](#), and [www.spiked-](http://www.spiked-online.com/index.php/debates/copenhagen_article/9056)
 67 online.com/index.php/debates/copenhagen_article/9056.
 68 See endnote 44, “Tree rings make poor proxies”.
 69 www.galaxy.gmu.edu/stats/faculty/wegman.html
 70 www.probeinternational.org/old_drupal/UrbanNewSite/WegmanReport%5B3%5D.pdf, pages 4 -5
 71 Scientists say “incomplete” as a polite way of saying “rubbish” or something earthier.
 72 There are other, minor hockey sticks, similar graphs produced by climate-establishment scientists.
 73 The next most prominent is by Briffa, who refused to divulge his tree ring data for nine years (real
 74 scientists share their data). When finally revealed, his data showed that his hockey stick was based
 75 just on 10 trees in the Yamal peninsula of northern Russia, and relied almost entirely on one freak
 76 tree for the blade of the hockey stick—perhaps that special tree found a source of manure and had
 77 a growth spurt? [joannenova.com.au/2009/09/breaking-news-cherry-picking-of-historic-](http://joannenova.com.au/2009/09/breaking-news-cherry-picking-of-historic-proportions)
 78 [proportions](http://joannenova.com.au/2009/12/fraudulent-hockey-sticks-and-hidden-data), joannenova.com.au/2009/12/fraudulent-hockey-sticks-and-hidden-data
 79 For more on the hockey stick shenanigans, for the more forensically inclined, see
 80 climateaudit.org/2007/11/06/the-wegman-and-north-reports-for-newbies
 81 Here is a very readable and comprehensive rubbing that covers the main points:
 82 wattsupwiththat.com/2010/10/11/an-open-letter-to-dr-michael-mann/#more-26235
 83 Intergovernmental Panel on Climate Change, www.ipcc.ch.
 84 Climatic Research Unit, www.cru.uea.ac.uk
 85 Goddard Institute for Space Studies (part of NASA), www.giss.nasa.gov
 86 National Oceanic and Atmospheric Administration, www.noaa.gov/climate.html
 87 www.guardian.co.uk/environment/2010/jan/24/china-climate-change-adviser
 88 Translation at libertygibbert.wordpress.com/rare-scribbling/locusts/low-carbon-plot. Popular
 89 skeptic article with choice quotes: [blogs.telegraph.co.uk/news/jamesdelingpole/100050359/what-](http://blogs.telegraph.co.uk/news/jamesdelingpole/100050359/what-the-chinese-really-think-of-man-made-global-warming)
 90 the-chinese-really-think-of-man-made-global-warming
 91 From a review at libertygibbert.wordpress.com/2010/08/11/the-dragons-dissent/#more-773
 92 [Here](#), and en.rian.ru/analysis/20080103/94768732.html
 93 www.hindu.com/2008/07/10/stories/2008071055521000.htm
 94 A recent book by five Russian scientists, *Climate Change in Eurasian Arctic Shelf Seas*, says man is
 95 not the main cause of change in the Arctic: [wattsupwiththat.com/2010/10/16/arctic-ice-](http://wattsupwiththat.com/2010/10/16/arctic-ice-rebound%C2%A0predicted)
 96 rebound%C2%A0predicted.
 97 Page 15, section 1.4, pmindia.nic.in/Pg01-52.pdf
 98 [www.telegraph.co.uk/earth/environment/climatechange/7157590/India-forms-new-climate-](http://www.telegraph.co.uk/earth/environment/climatechange/7157590/India-forms-new-climate-change-body.html)
 99 change-body.html
 100 news.sciencemag.org/scienceinsider/2010/09/veil-lifted-on-french-academy-de.html,
 101 [thegwpf.org/opinion-pros-a-cons/1600-vincent-courtillot-the-climate-debate-at-the-french-](http://thegwpf.org/opinion-pros-a-cons/1600-vincent-courtillot-the-climate-debate-at-the-french-academy-of-science.html)
 102 academy-of-science.html
 103 The evidence to which they refer are simulations of climate models, which are merely calculations
 104 and are not (empirical) evidence (in particular, the models may be missing some vital ingredients).
 105 royalsociety.org/climate-change-summary-of-science, [Daily Mail article](#), [article in The Australian](#)
 106 But not Chinese, Russian, or Indian climate scientists—see above.
 107 For example, physicist Dr Will Happer, director of energy research at the U.S. Department of Energy
 108 for two years. www.sepp.org/Archive/contro/controversies/happer.html
 109 *The scientific process has become distorted. One side of a theory receives billions, but the other side*
 110 *is so poorly funded that auditing of that research is left as a community service project for people*
 111 *with expert skills, a thick skin and a passionate interest.* [joannenova.com.au/2009/07/climate-](http://joannenova.com.au/2009/07/climate-money)
 112 money
 113 Auditing is left to unpaid volunteers. [joannenova.com.au/2009/07/climate-money-auditing-is-left-](http://joannenova.com.au/2009/07/climate-money-auditing-is-left-to-unpaid-volunteers)
 114 to-unpaid-volunteers
 115 Richard Lindzen wrote a paper about the corruption in climate science, and names some names:
 116 arxiv.org/ftp/arxiv/papers/0809/0809.3762.pdf

- ⁹¹ www.nasa.gov/vision/earth/lookingatearth/simpson_bio.html
- ⁹² pielkeclimatesci.wordpress.com/2008/02/27/trmm-tropical-rainfall-measuring-mission-data-set-potential-in-climate-controversy-by-joanne-simpson-private-citizen
- ⁹³ Some in the establishment would say there is evidence: They assume that all the warming since 1700 is due to rising CO₂ levels (except for a small increase in the sun's light output). We know the amount of extra CO₂ over that period (link 1), how much extra direct warming that causes (link 2), and how much extra warming actually occurred (Figure 17)—so we can calculate the required effect of the feedbacks (link 3) to make that happen, which turns out to be threefold amplification. But this just replaces the threefold amplification assumption with the assumption that only rising CO₂ levels caused the warming. It's still, at base, just an assumption without evidence—because there is (and can be) no evidence that there were no other forces that could have caused the global warming.
- The climate establishment also argues, in other contexts, that there are no other forces that could have caused the warming by saying their climate models can only explain the observed warming if CO₂ is the only cause of the warming. This logic is circular, because the climate models are only calibrated with threefold amplification based on the assumption that there were no other causes for the recent global warming trend. Talk about having your cake and eating it too. The press apparently isn't inquisitive enough to notice this trick. When critics outside the climate establishment point it out, the climate establishment just denigrates them and then announces in their most reassuring voice that they are the authorities and it's all ok. What a bunch of charlatans! Finally, notice from Figure 19 that human CO₂ emissions could not have caused the half of the global warming before 1850, so their assumption about no other causes is obviously wrong. So no evidence—just a logical trick that is sufficient to fool most of the audience.
- They also on occasion offer up other historical instances as evidence for the threefold feedbacks amplification, but they are all very flimsy. The threefold amplification is really just based on the warming starting around 1700, which is the only instance for which we have decent numbers.
- ⁹⁴ When skeptic scientists say “there is no evidence” for man-made global warming, they are generally referring to the lack of evidence for these amplifying feedbacks.
- ⁹⁵ Water vapor is water in its gaseous form. When water vapor becomes liquid water again it forms droplets of water in the air, that is, clouds.
- ⁹⁶ The humid air is the lower troposphere, the bottom part of the atmosphere (up to about 12 km at the tropics, dropping to about 6 km near the poles). It is the bit with water vapor in it.
- ⁹⁷ Amplifying feedback increases the effect of an initial cause. Also called “positive” feedback.
- ⁹⁸ Moderating (or dampening) feedback decreases the effect of an initial cause. Also called “negative” feedback. Note that negative feedback does not reverse the initial effect; it just reduces it to less than it would have been in the absence of the negative feedback.
- ⁹⁹ That is, the moist lower troposphere is warmer than the dry upper troposphere.
- ¹⁰⁰ The volume of humid air is expanding, pushing up into the drier air on top, thereby converting a space or height of dry cool air into moist warm air. That is, the volume that was occupied by the bottom of the upper troposphere becomes occupied by the (top of) the lower troposphere. This volume is basically the “hotspot” in the atmospheric warming diagrams below (it is a bit diffuse, and things move around in the air, so it is more spread out than you might expect from the simple description above).
- ¹⁰¹ A similar “prediction” in IPCC Assessment Report 4, 2007, Chapter 9 (www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter9.pdf), Figure 9.1, in Section 9.2.2.1 on page 675. There are many such published predictions; they all feature a prominent hotspot about 12 km up in the tropics.
- ¹⁰² For each latitude and height, the results at different longitudes are averaged into a single number or point in the diagram.
- ¹⁰³ Figure 25 covers the period 1958 to 1979, but since there was no net warming from 1958 to 1977 (see Figure 18) so it essentially covers the period of warming from 1977 to 1999.
- ¹⁰⁴ Picture and general information on radiosondes at www.ncdc.noaa.gov/oa/climate/igra/index.php. Numbers and locations of radiosondes from the “Acknowledgements” section at ara.lmd.polytechnique.fr/index.php?page=arsa. Although at least 15,000 radiosondes were released each month, up to 90% were rejected for various reasons, which still leaves a veritable wall of data from over 1,500 radiosondes per month.
- ¹⁰⁵ And they didn't publish the radiosonde observations in the next IPCC Assessment Report, in 2007.
- ¹⁰⁶ Later supported and extended by two independent observations, one on clouds (Spencer, 2008 and 2010) and the other on radiation leaving the earth (Lindzen and Choi, 2009 and 2010). In both cases

the total feedbacks were observed to moderate the direct warming by roughly halving it, which suggests that the climate establishment are exaggerating future temperature changes by a factor of about six (that is, if they say 3°C (5.4°F) hotter by the end of the century it will be about 0.5°C (0.9°F) warmer).

¹⁰⁷ It wasn't like the media or politicians were asking them hard questions about the discrepancy in Figure 27. And it's not like they wanted to jeopardize their newfound popularity and funding.

¹⁰⁸ https://publicaffairs.llnl.gov/news/news_releases/2008/NR-08-10-05-article.pdf

¹⁰⁹ joannenova.com.au/2010/07/sherwood-2008-where-you-can-find-a-hot-spot-at-zero-degrees

¹¹⁰ www.ccrcc.unsw.edu.au/staff/profiles/sherwood/bio.html

¹¹¹ www.foxnews.com/politics/2010/09/16/white-house-global-warming-global-climate-disruption

¹¹² Given that, in 2010, it seems a pretty safe bet that we humans are not going to cut back on our CO₂ emissions much any time soon.

¹¹³ On shorter time scales of tens of years they are not well correlated (for example see joannenova.com.au/2009/05/shock-global-temperatures-driven-by-us-postal-charges). Nor on longer time scales of millions of years:

www.geocraft.com/WVFossils/PageMill/Images/image277.gif.

¹¹⁴ Or a third factor is causing both.

¹¹⁵ The explanation is obvious to any chemist. The oceans contain dissolved CO₂, so as the oceans warm/cool they release/pull-in CO₂. So if the planet warms for some reason, air temperatures go up first (because it takes much less heat to warm the atmosphere than the oceans), then after a few hundred years the oceans warm enough to release significant amounts of CO₂, thereby raising the CO₂ level in the atmosphere.

Some claim that the CO₂ released by the oceans then amplifies the initial warming. Theoretically it does, but the effect is so small we can find no evidence for it in the ice core records. Some claim to have found such evidence, but they have mistaken aliasing artifacts in the data for evidence of amplification (process their data using different sampling and their "evidence" disappears, which wouldn't be the case if the evidence was real).

¹¹⁶ Caillon 2003, www.sciencemag.org/cgi/content/abstract/299/5613/1728

¹¹⁷ www.fastcompany.com/magazine/117/features-gore.html, <http://www.dailyfinance.com/story/al-gore-the-worlds-first-carbon-billionaire/19220501>