



THE GLOBAL WARMING STANDSTILL

Dr David Whitehouse

Foreword by Lord Turnbull

The Global Warming Policy Foundation

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'First they ignore you, then they laugh at you,
then they fight you, then you win.'

--Mahatma Gandhi

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Dr David Whitehouse

David Whitehouse is the Science Editor of the Global Warming Policy Foundation. He has a doctorate in astrophysics and was successively *BBC Science Correspondent* and Science Editor *BBC News Online*. He is the author of a number of books on solar system astronomy and the history of astronomy.

Lord Turnbull

Andrew Turnbull was Permanent Secretary, Environment Department 1994-1998; Permanent Secretary to the Treasury 1998-2002; Cabinet Secretary and Head of the Home Civil Service 2002-2005. He is a crossbench member of the House of Lords.

Foreword

Dr David Whitehouse is a man who deserves to be listened to. Trained as an astrophysicist at Jodrell Bank, he has consistently followed an approach of examining observations rather than projections of large scale computer models, which are too often cited as “evidence”. He looks dispassionately at the data, trying to establish what message it tells us, rather than using it to confirm a pre-held view. He was the *BBC's* Science Correspondent and then Science Editor of *BBC News Online* and in 2002, while working for the *BBC*, he won the prize for European Internet Journalist of the Year, making him one of a very few *BBC* journalists to have won an international honour.

Dr Whitehouse was not the first to spot that a period of standstill in global temperatures was emerging – he generously awards the accolade for that to Professor Bob Carter – but he was the first and for many years the only science journalist to write about this inconvenient fact. For several years he faced scorn from others, being called ‘wrong, completely wrong’. He was pushed aside, being replaced at the *BBC* by other science correspondents with vastly inferior scientific and journalistic credentials. Incredibly, he was not invited to the *BBC's* infamous climate seminar of ‘the leading scientific experts’, presumably because his views did not conform with the dominant preconceptions of those present, mainly representatives of green NGOs or environmental lobbyists.

But gradually the evidence accumulated, until even the Met Office, a congenitally warmist organisation, was eventually forced to concede that there has been a standstill for over a decade, which might continue for some years yet. Despite the temperature data staring them in their face, *BBC* journalists still refer to it as ‘an apparent standstill’.

What are the implications of this development?

First, it destroys the claim that there is a scientific consensus about the future trajectory of climate change and that nobody with serious scientific credentials believes otherwise.

Secondly, it does not provide a new orthodoxy to replace the IPCC/Met Office/Stern view that we face a rate of increase of global mean temperature during the next century of about 0.3°C per decade (with an uncertainty range of 0.2-0.5°C per decade). What it does do is to undermine the certainty, even arrogance, with which that view has been asserted; and it undermines the pseudo-urgency that has been generated about the calls for near complete unilateral decarbonisation in the next 40 years.

Thirdly, it leads one to question whether climate sensitivity, i.e. the often asserted link between CO₂ and temperature, which claims that doubling of CO₂ concentrations equals an increase of 3°C, is as robust as claimed.

Fourthly, it strengthens the case for examining what other forces are at work. The more robustly the 0.3°C trend is asserted (with there being no deceleration of CO₂ emissions), the more importance one has to attach to other forces which have offset the anthropogenically driven temperature rise. Dr Whitehouse points out in his conclusions that it is implausible that the offsetting factors have grown in strength exactly equivalent to turn a predicted trend of 0.3°C per decade into a temperature standstill. If these others

factors, e.g. the sun, the oceans and clouds, etc. are that strong, we can no longer regard CO₂ as the be-all-and-end-all, but should begin to try to understand these natural forces much better before drawing firm conclusions and policy responses.

Dr Whitehouse is to be congratulated on several counts. He has sustained the scientific tradition of skepticism and challenge which, sadly, some senior figures in our scientific establishment have failed to do; he has demonstrated the worth of sustained and objective analysis of the data; and he has punctured the over-confidence in the orthodox narrative of why our climate is changing.

Lord Turnbull

March 2013

Executive Summary

In retrospect, nobody predicted that in the age of global warming the annual average global temperature would remain unchanged for so long. It began as a tentative observation but has become one of the most important investigations in climate science, and one of the major talking points for others interested in the debate about what is happening to our planet, and what we should do about it.

The standstill observation was first made in 2006; the global annual average temperature had not increased for the previous five years, even though many climate scientists, and the media, were talking about an ever-warming planet powered by strong anthropogenic global warming. The initial debate was couched in cautious scientific terms but, because it ran counter to popular opinion, many dismissed it and questioned the motives of those pointing out these observational facts. But to the amazement of many, and the obvious annoyance of some, as the years passed all the major global temperature datasets showed no warming throughout the first decade of the 21st century and beyond. As this report shows, as the statistical significance of the standstill increased, the debate about its potential importance grew among many branches of science, even though many prominent scientists and institutions, and almost all of the media, were steadfastly looking the other way.

With hindsight, it is also clear that some scientists got carried away by the intense ENSO of 1998, presuming future temperature changes would be relatively simple and strongly upward. Today, when faced with the fact of no global temperature change in the past decade or so, some suggest that the very strong ENSO of 1998 has influenced the statistics of subsequent years, giving the impression of a standstill or slight decline. As this report demonstrates, this is not the case; the standstill is independent of what happened in 1998.

It is incontrovertible that the global annual average temperature of the past decade, and in some datasets the past 15 years, has not increased. Year-on-year fluctuations, and any trend over this period, are within errors of measurement. The only justifiable statistical description of the global temperature during this period is a constant. Technically, this standstill can be seen in the datasets produced by NOAA, NASA, the BEST consortium, HadCRUT3, and especially, its successor HadCRUT4. This standstill has occurred as atmospheric CO₂ has increased from 370 parts per million (ppm) to 390 ppm, providing an increasing forcing factor that will raise global temperatures.

Some argue that the duration of the standstill is too short to be meaningful. Thirty years is taken to be the baseline for observing climate changes and fifteen years is too short. This report argues that 15 years is not an insignificant period; what has happened to make temperatures remain constant requires an explanation. The period contains important information and should not be dismissed as having no climatic importance. The recent warming period began about 1980 after four decades of globally stable temperatures thus the years of constant temperature are about equal to years when temperatures increased. This is not a trivial observation.

Global warming was never expected to be smooth. There were bound to be global and regional variations in the rate of warming. For 20 years the Intergovernmental Panel on Climate Change (IPCC) has stuck to its estimate that, on average, the rate of global warming should be 0.2 degree Celsius (°C) per decade. In the 1980s and the first half of the 1990s, 0.2°C per decade was the observed trend, but in the late 1990s and all subsequent years the trend has been zero. This report suggests that the IPCC should revise its estimate in light of observations.

Calculations based on ensembles of climate models suggest prolonged standstills of about ten years can occur once every eight decades. Standstills of 15 years are much more difficult to explain. This report shows, that if we have not passed it already, we are on the threshold of global observations becoming incompatible with the consensus theory of climate change.

Seeking an explanation for the standstill has focused many minds on the nature of so-called decadal variability, the study of which is in its infancy. Solar-induced variations, as well as those from oceanic and atmospheric pressure cycles, and natural variations in the stratosphere, are under consideration. This report demonstrates that such variations are eroding the amount of warming that requires an anthropogenic cause.

The global temperature standstill also provides lessons for the media and the way it has covered global warming. It is evident from this report that some journalists have shown too much zeal in wishing to demolish the scientific case for the standstill, and not enough journalistic inquisitiveness in investigating it. To their surprise the standstill has not gone away, as they expected. Some have uncritically accepted one side of the debate as to its existence, and looked the other way when a different view was presented, making the unwarranted assumption that the standstill is only advocated by 'sceptics'. Often journalists have been years behind the scientific debate about this issue. This report shows that they need to pay more attention to the science of global warming and not just its squabbles.

This report demonstrates that the global temperature standstill is a real phenomenon that cannot be dismissed as a minor statistical aberration. The standstill's explanation will add vital new information to our understanding of how our planet is responding to enhanced levels of greenhouse gases. At the very least it should lead to an appreciation of the nuances of climate change. It also provides a focus for reflecting about how debate and policy adapt to the emergence of this unexpected and unexplained observational fact.

The global temperature standstill shows that climate models are diverging from observations. It is primarily by observations that the truth will be revealed.

Introduction

1. One of the most important and widely discussed outcomes of the IPCC's reports in 1990, 1995, 2001¹ and in 2007² were the estimates that, in the future, the world would warm at a rate of 0.2°C per decade on average due to greenhouse gas forcing. Since those predictions were made, it has become clear that the world has not been warming at that rate, leading to the question of whether the lack of warming seen in the past 16 years is just a temporary departure from the stated average rate of warming, or whether it is indicative of something else.

2. This report is a brief history of this 'standstill'. It covers scientific publications, media reports, personal recollections and analysis, to show how a simple observation was at first ridiculed, then dismissed, and then accepted as a scientific fact, taking its place as one of the key findings of recent climate science.

3. Global temperatures had long intrigued me since, as a science journalist, I had covered science conferences in the late-1980s and the 1990s. I recall talking to Sir John Houghton, who was then chair of the IPCC and Chief Executive of the UK Meteorological Office, asking him in 1989 if there was evidence the world had become warmer in recent years. He replied that it probably had but that the global temperature had not yet risen above the 'noise', so he could not say for sure. A couple of years later he told me the situation had changed and there was indeed evidence that the world was warming.

2006: Eight Years Flat

Dangerous Idea

4. The first time the idea reached the public's attention that global temperature had not risen in the past decade was an article published in *The Daily Telegraph*³ in 2006 by Bob Carter of James Cook University in Australia. Carter talked of an eight-year period, 1998–2006, during which there had been no increase in global temperatures according to the HadCRUT3⁴ data from the University of East Anglia's Climatic Research Unit. It was a sensible article, arguing from the standpoint of real-world data and counter to the oversimplistic descriptions by the media about an ever-warming world. Carter argued that the problem was not climate change per se, but the sophisticated brainwashing that 'had been inflicted on the public, bureaucrats and politicians alike' to expect that there would always be a year-on-year increase in global temperature.

1 http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspmp-projections-of.html

2 http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspmp-projections-of.html

3 <http://www.telegraph.co.uk/comment/personal-view/3624242/There-IS-a-problem-with-global-warming...-it-stopped-in-1998.html>

4 <http://www.cru.uea.ac.uk/cru/data/temperature/HadCRUT3vgl.txt>

5. Carter advised caution, and a stepping back from the climate change frenzy that was gripping the government and the media:

The British Government urgently needs to recast the sources from which it draws its climate advice. The alarmism of its public advisers, and the often eco-fundamentalist policy initiatives that bubble up from the depths of the Civil Service, have all long since been detached from science reality.

6. The article caused an outcry. Professor Carter was accused⁵ of writing articles that conflicted with mainstream scientific opinion on climate change. Such ridicule, as is often the case, missed the point that the global temperature data had taken what was, at first sight, a surprising turn. Describing it this way was not denying global warming. Nonetheless, it contrasted so starkly with the statements being made by science advisors, science academies and the media that the very idea⁶ was called dangerous.⁷

2007: 'Wrong, Completely Wrong'

IPCC

7. The IPCC's Fourth Assessment Report (AR4) was issued in 2007. Regarding estimates of future global warming, it concluded⁸ (see Figure 1):

For the next two decades, a warming of about 0.2°C per decade is projected for a range of Special Report Emission Scenarios [SRES]. Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected.

8. Hardly anything was said in the report about fluctuations from the 0.2°C per decade figure due to natural variability, other than the rise would not be steady. The IPCC said it believed it had a good estimate⁹ of year-to-year variability in temperature records because of climate model simulations with solar and volcanic forcing compared to solar, volcanic and greenhouse gas forcing.

9. The 2007 estimate was broadly similar to estimates that the IPCC had made in the 1990s.¹⁰ The IPCC predictions from 1990 projected a probable rise of the global mean temperature of 0.3° per decade and at least 0.2°C per decade.

5 http://en.wikipedia.org/wiki/Robert_M._Carter

6 <http://www.desmogblog.com/bob-carters-climate-myopia>

7 <http://scienceblogs.com/deltoid/2007/04/10/bob-carter-claims-its-not-warm/>

8 http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmssp-projections-of.html

9 http://www.ipcc.ch/publications_and_data/ar4/wg1/en/figure-9-5.html

10 http://www.ipcc.ch/publications_and_data/publications_ipcc_90_92_assessments_far.shtml#.T6pzi-1X6-I

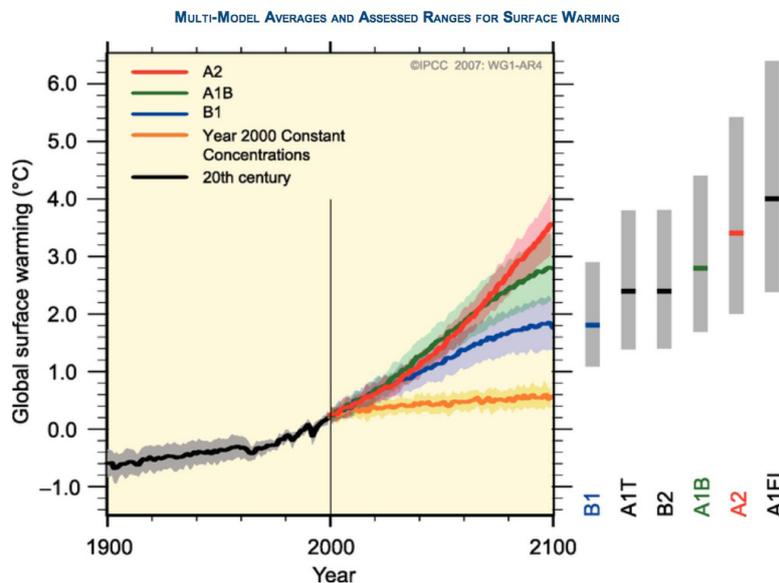


Figure SPM.5. Solid lines are multi-model global averages of surface warming (relative to 1980–1999) for the scenarios A2, A1B and B1, shown as continuations of the 20th century simulations. Shading denotes the ± 1 standard deviation range of individual model annual averages. The orange line is for the experiment where concentrations were held constant at year 2000 values. The grey bars at right indicate the best estimate (solid line within each bar) and the likely range assessed for the six SRES marker scenarios. The assessment of the best estimate and likely ranges in the grey bars includes the AOGCMs in the left part of the figure, as well as results from a hierarchy of independent models and observational constraints. (Figures 10.4 and 10.29)

Figure 1. IPCC 2007 forecast of future temperature rise under various emission scenarios. Note the real data ends in 2000.

10. Considering uncertainties, the IPCC said:

Under the IPCC Business-as-Usual (Scenario A) emissions of greenhouse gases, a rate of increase of global-mean temperature during the next century of about 0.3°C per decade (with an uncertainty range of 0.2°C to 0.5°C per decade); this is greater than that seen over the past 10,000 years. This will result in a likely increase in global-mean temperature of about 1°C above the present value by 2025 and 3°C before the end of the next century. The rise will not be steady because of the influence of other factors...

11. This statement is rather misleading. A rise of 0.3°C per decade would be very unusual, but lower figures would not be, and would be consistent with the warming that occurred between 1910 and 1940, which was due to natural factors alone.

12. In 1995, the IPCC had said:¹¹

For the mid-range IPCC emission scenario, IS92a, assuming the “best estimate” value of climate sensitivity and including the effects of future increases in aerosol, models project an increase in global mean surface air temperature relative to 1990 of about 2°C by 2100. This estimate is approximately one-third lower than the “best estimate” in 1990. This is due primarily to lower emission scenarios (particularly for CO₂ and the CFCs), the inclusion of the cooling effect of sulphate aerosols, and improvements in the treatment of the carbon cycle.

11 <http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>

13. The 0.2°C per decade projection has been used consistently by the IPCC since 1995 despite the considerable increase in understanding of climate science, and the sophistication of climate models seen in recent years.

'The Climate Will Continue To Warm'

14. Writing in the journal *Science* in the summer of 2007, *Smith et al. (2007)*¹² used the UK Met Office's then newly developed DePreSys¹³ (Decadal Prediction System), which was designed to make global temperature predictions on decadal timescales, taking into account ocean cycles, El Niños and fluctuations in the thermohaline circulation. The authors said that although the climate is expected to warm over the next century, over the next decade natural climatic variations could dominate (see Figure 2).

15. *Smith et al. (2007)* said their hindcast modeling, starting in June 1995, correctly predicted an initial cooling. They also predicted that half of the years after 2009 would be records (none have been so far), and that 2014 would be 0.3°C (+/-0.21°C) warmer than 2004. 'The climate will continue to warm', they said. In contrast to the dismissal of the idea put forward by Carter, here was a scientific explanation, or one at least demonstrated in climate models, that there could be relatively little warming in the context of a general upward trend, even though its specific predictions now seem to be wide of the mark.

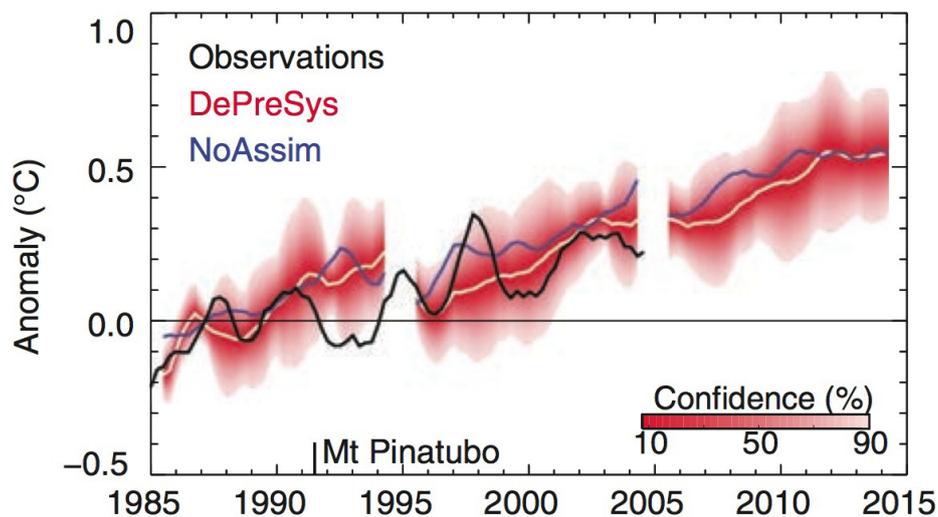


Figure 2. From *Smith et al. (2007)*. NB. CI stands for confidence interval.

12 <http://www.sciencemag.org/content/317/5839/796.abstract>

13 <http://www.metoffice.gov.uk/research/modelling-systems/unified-model/climate-models/depresys>

16. *ABC Australia*¹⁴ picked the story up:

A study forecasts that global warming will set in with a vengeance after 2009, with at least half of the following five years expected to be hotter than 1998, which was the warmest year on record.

The proof of a model is, of course, comparing it to what nature actually does. According to *Smith et al.* (2007), the three years, 2012, 2013 and 2014, will all break global temperature records.

New Statesman

17. About the same time, late 2007, I was looking at the various global temperature databases and came to the conclusion that, when the errors of measurement were taken into account, I could not see any global warming since 2001. My view, similar to Carter's, was at odds with what the media were reporting at the time. I contacted the *New Statesman*, a magazine for which I had written, and asked them if they wanted an article about this seemingly surprising turn of events. They were enthusiastic. The editor told me they did not have a print edition out until the New Year so would I mind if it went on their website. It went straight online with no edits.

18. My article¹⁵ said nothing other than 'Here is the temperature data and is it not interesting, indeed surprising to some, that it has not gone up in recent years'. I made no mention of climate change theories, doing nothing other than presenting the observational facts, with perhaps a little bit of journalistic rhetoric. It immediately received a great many hits, becoming by far the most read article on the *New Statesman's* website. The comments' section took off, heading into unprecedented numbers for this normally relatively subdued place on the Internet. By far the majority of the comments were complimentary, though there were some that definitely were not. A short while later I was told my article 'caused quite a stir in the office.'

14 <http://www.abc.net.au/news/2007-08-10/scientists-predict-surge-in-global-warming-after/635996>

15 <http://www.newstatesman.com/scitech/2007/12/global-warming-temperature>

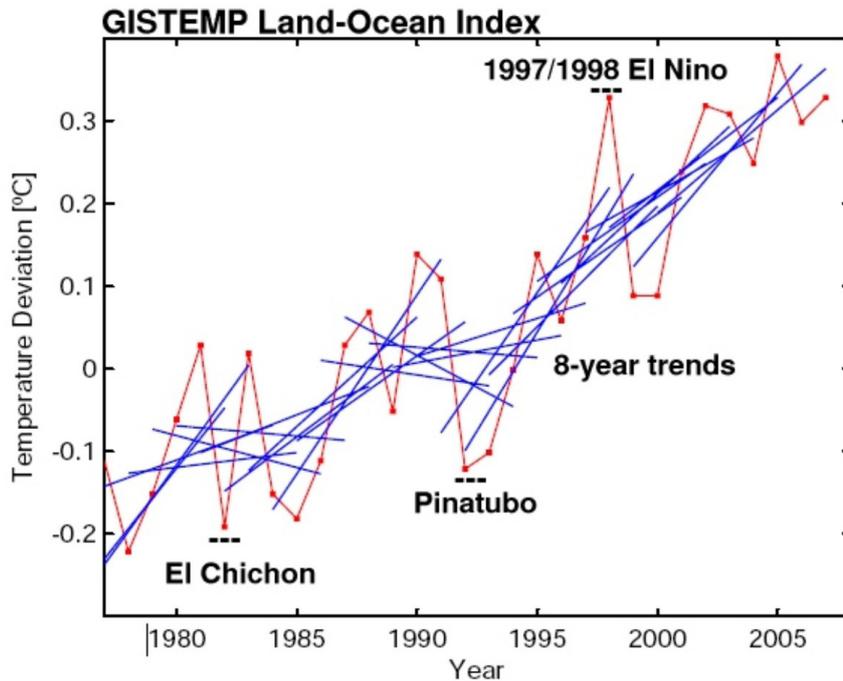


Figure 3. *Real Climate's* trendlines.

19. The *Real Climate*¹⁶ website posted a rebuttal based on a series of trendlines of 8-year duration through the temperature data of the past 30 years using the NASAGISS database. The length of the trendline was chosen to show it oscillating wildly up and down, with sequentially positive and negative gradients (see Figure 3). To them this proved that any talk of a standstill in global temperature was nonsense. It was, of course, not a good way to investigate a time series, especially when all that the trend lines were doing was following the noise. There were no error bars either. I was not impressed.

20. Shortly afterwards an article¹⁷ by the *New Statesman's* Environment Correspondent, Mark Lynas appeared. He said I was 'wrong, completely wrong', and was 'deliberately, or otherwise, misleading the public'.

21. Lynas wrote:

So, a mistaken article reached a flawed conclusion. Intentionally or not, readers were misled, and the good name of the *New Statesman* has been used over the internet by climate contrarians to support their entrenched positions. This is regrettable. Good journalism should never exclude legitimate voices from a debate of public interest, but it also needs to distinguish between carefully-checked fact and distorted misrepresentations in complex and divisive areas like this.

Alongside were *Real Climate's* trendlines presented as the definitive word on the matter.

¹⁶ <http://www.realclimate.org/index.php/archives/2008/01/uncertainty-noise-and-the-art-of-model-data-comparison/>

¹⁷ <http://www.newstatesman.com/environment/2008/01/global-warming-lynas-climate>

22. Lynas was not the only one who was enraged. Bob Ward, of the insurance company, Risk Management Solutions, who had been a prominent critic of what he saw as sceptical positions when he was leading the media communications team for the Royal Society, wrote to Phil Jones of the Climatic Research Unit at the University of East Anglia, in an email made public in the Climategate II release.

Dear Phil, I was wondering whether you have seen the article by David Whitehouse in the latest edition of 'New Statesman'? It would be great if somebody could respond to the article. I would be happy to do so if somebody can supply me with the ammunition. Any thoughts? Best wishes, Bob Ward.

23. Jones replied:

Bob, Quickly re-reading this it sounds as though I'm getting at you. I'm not - just at the idiots who continue to spout this nonsense. It isn't an issue with climatologists. All understand. If I tried to publish this I would be told by my peers it was obvious and banal. I will try and hide it in a paper at some point. I could put it on the CRU web site. I'll see how I feel after the Christmas Pud.

I would have thought that this writer would have know better! I keep on seeing people saying this same stupid thing. I'm not adept enough (totally inept) with excel to do this now as no-one who knows how to is here.

What you have to do is to take the numbers in column C (the years) and then those in D (the anomalies for each year), plot them and then work out the linear trend. The slope is upwards. I had someone do this in early 2006, and the trend was upwards then. It will be now. Trend won't be statistically significant, but the trend is up.

This is a linear trend - least squares. This is how statisticians work out trends. They don't just look at the series. The simpler way is to just look at the data. The warmest year is 1998 with 0.526. All years since 2001 have been above 0.4. The only year before 2001 that was above this level was 1998. So 2nd to 8th warmest years are 2001-2007.

The reason 1998 was the warmest year was that it resulted from the largest El Niño event of the 20th century in 1997/8. We've not had anything resembling a major El Niño event since - they have all been minor.

Using regression, it is possible to take the El Niño event into account (with a regression based on the Southern Oscillation Index). This accounts for about 0.15°C of 1998's warmth. Without that 1998 would have been at about 0.38.

There is a lot of variability from year-to-year in global temperatures - even more in ones like CET. No-one should expect each year to be warmer than the previous. The 2000s will be warmer than the 1990s though. This is another way of pointing out what's wrong with their poor argument. The last comment about CET is wrong. 2007 will be among the top 10 warmest CET years - it will likely be 2nd or 3rd. Cheers Phil.

24. When I read this email, many years after my *New Statesman* article, I was initially amazed that a scientist would say, 'Trend won't be statistically significant, but the trend is up'. On the Internet it is often stated that a trend that is statistically not significant is

not the same as no warming. I profoundly disagree. A cautious, rigorous, and unbiased scientist should be aware of what the data show and the conclusions that can be safely drawn from it. One cannot say that the statistics show no significance, and then attribute significance to them.

25. Ward continued:

Dear Phil, Thanks for responding so comprehensively. I have plotted the data before, and as you observe, the trend is up but the result isn't statistically significant, which I think makes it open to attack. I think the problem is that NOAA made the following statement in its report on the 2006 data:

"However, uncertainties in the global calculations due largely to gaps in data coverage make 2006 statistically indistinguishable from 2005 and several other recent warm years as shown by the error bars on the global time series."

I'm not sure how to argue against this point - it appears to imply that there is no statistically significant trend in the global temperature record over the past few years.

26. The Climategate emails show that several scientists at the UK Met Office, as well as their Press Office, considered a reply¹⁸ following Ward's involvement. However, neither Jones, the UK Met Office nor Ward could assemble a rebuttal.¹⁹

27. Jones said in 2007 that the lack of observed warming was not an issue with climatologists. A short time later it certainly was. The fact that the world had not warmed for many years had been noticed by many climate scientists who were searching for an explanation.

2008: Flavour Of The Month

Natural Variability

28. In 2008 Lord Lawson published his book *An Appeal To Reason*,²⁰ in which he pointed out that global average annual temperatures had not increased this century despite greenhouse gas concentrations in the atmosphere having risen steadily. In a *Newsnight* debate²¹ following the book's publication, Lawson and Chris Rapley, then director of the Science Museum, were interviewed by Jeremy Paxman. When pressed about Lawson's point about no warming this century, Rapley replied that it was 'factually true', but that natural variability in the system could account for it, adding that the underlying trend of the last 30 years followed exactly the predictions of man-made global warming.

18 <http://bishophill.squarespace.com/blog/2011/11/23/the-scientific-firmament.html>

19 <http://di2.nu/foia/foia2011/mail/5127.txt>

20 http://www.ducknet.co.uk/general/title.php?titleissue_id=480&search_term=lawson&search_sections=1

21 <http://www.youtube.com/watch?v=74E2D6oNSHc>

29. Natural variability was regarded by many as the explanation for the temperature hiatus but no one could agree on what kind of natural variability. An interesting paper published by *Keenlyside et al.* (2008)²² looked at the cooling influence of oceanic temperature cycles, suggesting that:

....global surface temperature may not increase over the next decade, as natural climate variations in the North Atlantic and tropical Pacific temporarily offset the projected anthropogenic warming [see Figure 4].

30. Many strident climate scientists and activists were furious that Keenlyside's paper ever got published, believing that a prediction of perhaps two decades of cooling or little temperature increase gave the wrong message, and was a distraction from the urgency of action. *Real Climate*²³ was disparaging, and even offered a bet against Keenlyside's predictions: 'Global cooling appears to be the "flavor of the month"', said *Real Climate*.

First, a rather misguided media discussion erupted on whether global warming had stopped, based on the observed temperatures of the past 8 years or so. Now, an entirely new discussion is capturing the imagination, based on a group of scientists from Germany predicting a pause in global warming last week in the journal *Nature* (*Keenlyside et al.* 2008).

31. *Keenlyside et al.* (2008) makes two forecasts for global temperature. The first about the time interval 2000-2010, the second the interval 2005-2015. For these two 10-year averages, the authors say:

...the initialised prediction indicates a slight cooling relative to 1994-2004 conditions.

Keenlyside, perhaps knowing that his paper would provoke much comment, issued a press release, asking 'Will Global Warming Take A Short Break?'²⁴

22 <http://www.nature.com/nature/journal/v453/n7191/abs/nature06921.html>

23 <http://www.realclimate.org/index.php?p=563>

24 http://www.geomar.de/fileadmin/content/service/Presse/Pressemitteilungen/2008/pm_2008_06_decadal_nature_final-e.pdf

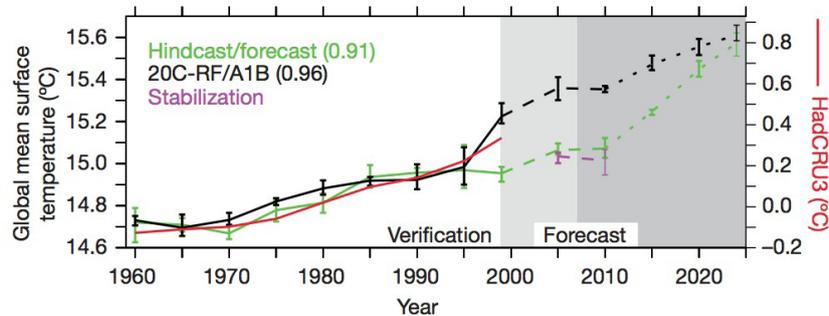


Figure 4 | Hindcast/forecast decadal variations in global mean temperature, as compared with observations and standard climate model projections. Model projections are twentieth century-RF followed by A1B scenario simulations ('20C-RF/A1B'); 'Stabilization' forecasts assume greenhouse gas concentrations fixed at year 2000 levels. Each point represents a ten-year centred mean; vertical bars indicate ensemble spread; verification and forecast periods are indicated (dark shading begins 2008, indicating the start of the true forecast period). Three additional decadal means (joined by a dotted line) show the evolution of the initialized and uninitialized 2005 predictions extended till 2030. Correlation of both hindcasts and climate model projections with observations are given in brackets. Correlation of the twentieth century-RF simulation with observations is greater than that of the hindcasts, but only marginally at the 5% significance level. Observed global mean temperature anomalies are from HadCRU3²⁸.

Figure 4. From *Keenlyside* (2008).

32. By this time, early 2008, the lack of warming seen in global temperatures was being regularly commented upon in the scientific literature. For example, a paper²⁵ by Judith Lean of the U.S. Naval Research Laboratory and David Rind of the Goddard Institute of Space Science said:

The few tenths Kelvin warming during the November 1997 'super' El Niño elevated the global surface temperature beyond that in subsequent years, even as greenhouse gas concentrations increased, fueling debate about the reality of anthropogenic global warming.

33. In March, the "*Watts Up With That?*" website²⁶ discussed the fact that all of the global temperature databases showed no warming in the previous decade. A few days later Richard Lindzen of the Massachusetts Institute of Technology (MIT) pointed out²⁷ that statistically speaking there had been no warming since 1995 (see Figure 5). It sparked considerable criticism and ridicule on the Internet, mostly by commentators and activists.

25 http://pubs.giss.nasa.gov/docs/2008/2008_Lean_Rind.pdf

26 <http://wattsupwiththat.com/2008/03/08/3-of-4-global-metrics-show-nearly-flat-temperature-anomaly-in-the-last-decade/>

27 <http://wattsupwiththat.com/2008/03/11/a-note-from-richard-lindzen-on-statistically-significant-warming/>

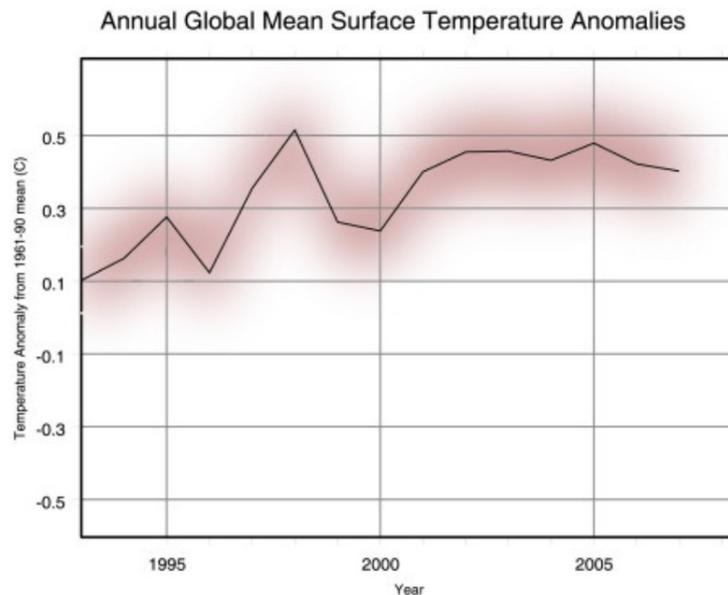


Figure 5. Richard Lindzen's graph.

34. In 2009, the U.S. National Oceanic and Atmospheric Association (NOAA) released a state of the climate report for 2008.²⁸ In this report *Knight et al.* (2009) asked, 'Do global temperature trends over the last decade falsify climate predictions?'. *Knight et al.* (2009) then stated:

Observations indicate that global temperature rise has slowed in the last decade. The least squares trend for January 1999 to December 2008 calculated from the HadCRUT3 dataset is $+0.07 \pm 0.07^\circ\text{C}$ per decade - much less than the 0.18°C per decade recorded between 1979 and 2005 and the 0.2°C per decade expected in the next decade (IPCC; *Solomon et al.* 2007). This is despite a steady increase in radiative forcing as a result of human activities and has led some to question climate predictions of substantial twenty-first century warming.

They added:

The trend after removing ENSO [El Niño Southern Oscillation] (the 'ENSO-adjusted' trend) is $0.00 \pm 0.05^\circ\text{C}$ per decade, implying much greater disagreement with anticipated global temperature rise.

²⁸ <http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/climate-assessment-2008-lo-rez.pdf>

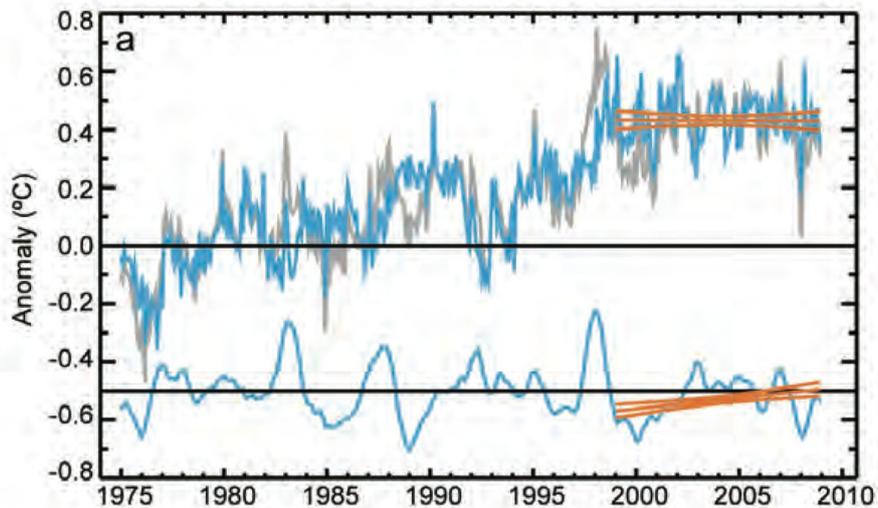


Figure 6. From *Knight et al.* (2008).

35. *Knight et al.* (2008) reported that a series of climate simulations had been performed that were able to account for decade-long standstills in global temperature, but not for periods as long as 16 years (see Figure 6):

Near-zero and even negative trends are common for intervals of a decade or less in the simulations, due to the model's internal climate variability. The simulations rule out²⁹ (at the 95% level) zero trends for intervals of 15 years or more, suggesting that an observed absence of warming of this duration is needed to create a discrepancy with the expected present-day warming rate.

36. Decade-long standstills occurred in about one in eight decades, and fifteen-year standstills, never. There is, however, a significant technical problem with this argument. The 'pauses' in these climate models are the result of unspecified chaotic variations inherent in nonlinear dynamics (this is what is meant by 'internal variability'). The mapping of the climate models' pauses onto the actual climate makes the tacit assumption that the models replicate the chaotic variations of the climate system, as well as the long-term secular trends.

²⁹ http://www.metoffice.gov.uk/media/pdf/j/j/global_temperatures_09.pdf

2009: The Bottom Line

'15 years before we get worried'

37. The fact that there had been a standstill in global temperatures since at least 2001 was becoming commonly accepted, and discussion, in public and private, turned to its duration, or rather how long the standstill would have to continue in order for the climate models that link rising carbon dioxide concentrations to increasing global temperatures to be questioned.

38. In May of 2009, Mike Lockwood of the University of Reading sent an email³⁰ to Phil Jones of the University of East Anglia's Climatic Research Unit in which he said:

Hi Phil, Yes, I thought it would have been done - but just wanted to check. I came to the same conclusion in that I estimated that we'd need 10 more years of decline from now on before it was really significant.

Phil Jones replied:

Bottom line: the no upward trend has to continue for a total of 15 years before we get worried.

Countering Anthropogenic Warming

39. *Lean and Rind* (2009)³¹ continued to explore aspects of the Earth's changing global temperature in a series of impressive papers. They attempted to explain the recent lack of warming by isolating and analysing the various factors that produced decadal changes in the temperature record: El Niño, volcanic aerosols, solar irradiance and anthropogenic global warming (AGW). In their preamble they state:

...global surface temperatures warmed little, if at all, from 2002 to 2008, even as greenhouse gas concentrations have increased, causing some to question the reality of anthropogenic global warming.

They continued:

According to our prediction, which is anchored in the reality of observed changes in the recent past, warming from 2009 to 2014 will exceed that due to anthropogenic influences alone but global temperatures will increase only slightly from 2014 to 2019, and some regions may even cool.

40. They came to the conclusion that, between 2009 and 2014, global temperatures will rise quickly by 0.15°C. Then, in the period 2014-2019, there will be only a 0.03°C increase (see Figure 7). They believe this will be chiefly because of the effect of solar irradiance

30 <http://di2.nu/foia/foia2011/mail/4199.txt>

31 <http://www.environmentportal.in/files/Earth%20surface%20temperature.pdf>

changes over the solar cycle. *Lean and Rind (2009)* see the 2014-2019 period as being similar to the 2002-2008 temperature standstill, which they say has been caused by a decline in solar irradiance counteracting AGW. They concluded:

....as a result of declining solar activity in the subsequent five years, average temperature in 2019 is only 0.03-0.01°C warmer than in 2014. This lack of overall warming is analogous to the period from 2002 to 2008 when decreasing solar irradiance also countered much of the anthropogenic warming.

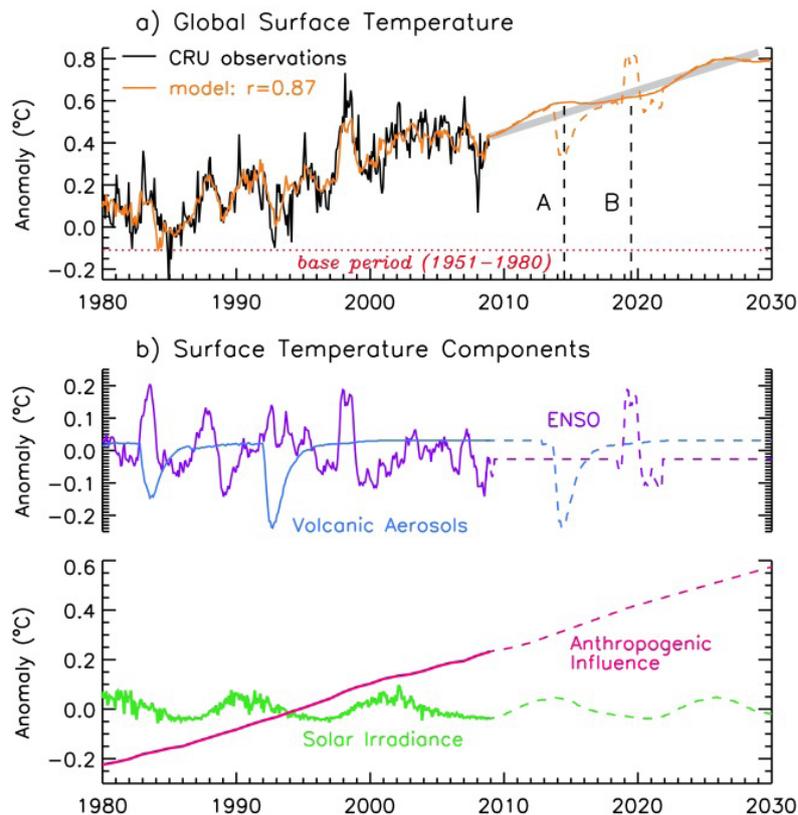


Figure 1. (a) Observed monthly mean global temperatures (black) and an empirical model (orange) that combines four different influences. (b) Individual contributions of these influences, namely ENSO (purple), volcanic aerosols (blue), solar irradiance (green) and anthropogenic effects (red). Together the four influences explain 76% (r^2) of the variance in the global temperature observations. Future scenarios are shown as dashed lines. The vertical black dashed lines in Figure 1a denote 2014 (A) and 2019 (B), at which times corresponding spatial temperature patterns are shown in Figures 3 and 4.

Figure 7. From *Lean and Rind (2009)*.

41. Global temperature data is now available to mid-2012. It suggests the prediction by *Lean and Rind* (2009), that there will be strong warming between 2009 and 2014, is unlikely to occur.

42. *Lean and Rind* (2009) estimate that 76% of the temperature variability observed in recent decades is natural. However, looking at the observed range of natural variants, and their uncertainties, one could make a case that the AGW component, which has only possibly shown itself between 1980 and 1998, is not a required part of the dataset. Indeed, if one did not have in the back of one's mind the rising CO₂ concentration and the physics of the greenhouse effect, one could make out a good case for reproducing the post-1980 temperature dataset with natural climatic variations and a very modest anthropogenic component.

43. Elsewhere it was also being suggested that there could be several decades of no warming, and even slight cooling, and that it would not damage the AGW hypothesis. This was proposed by Easterling and Wehner (2009), who said that the future is likely to produce periods of up to a decade or two of no surface temperature rise or even slight cooling in the presence of a longer-term warming. Easterling and Wehner (2009) however see warming as anthropogenic and standstills as natural fluctuations and use a limited climate model.³² The 0.2°C per decade trend would eventually establish itself because the decadal fluctuations would subsequently average out around the upward trend. This poses a scientific quandary. If there was something wrong with the assumptions about the magnitude of the impact of increasing CO₂ concentrations on global temperatures, at what point do we take such misgivings seriously given that it, and the AGW hypothesis, predict the same set of observables for decades?

44. The solar connection referred to by *Lean and Rind* (2009) should have caused some of the more strident commentators to reflect. Many papers have been published dismissing the sun as a significant factor in anthropogenic global warming (AGW). Their gist is that solar effects dominated up to 1950, but recently have been swamped by AGW. Despite this, the solar effect has been postulated to be able to hold AGW in check for well over a decade - forcing a temperature standstill of duration comparable to the recent post-1980 warming spell!

Two Decades Of Cooler Temperatures

45. This quandary was demonstrated when, in September 2009, Fred Pearce wrote a column for *New Scientist*³³ claiming that Mojib Latif of the Leibniz Institute of Marine Studies (a co-author on the Keenlyside paper) predicted up to two decades of cooling:

We could be about to enter one or even two decades of cooler temperatures, according to one of the world's top climate modelers.

Latif's presentation was along the same lines as the Keenlyside paper. It involved decadal-scale climate predictions and the significant challenges that remain before we can make

³² <http://onlinelibrary.wiley.com/doi/10.1029/2009GL037810/abstract>

³³ <http://www.newscientist.com/article/mg20327254.000-world-will-cool-for-the-next-decade.html>

useful ones.

46. Latif said that the media incorrectly believes that global warming is monotonic. Significant natural variability is superimposed³⁴ on the long-term man-made warming trend, he pointed out:

Although the press might expect for us to set a new temperature record every year (like the Met Office's 2007 prediction), the existence of natural variability means that we could in theory have to wait as long as 17 years before setting a new temperature record.

Fred Pearce wrote:

Many now agree that the short-term prognosis for climate change is less certain than once thought.

Whatever Happened To Global Warming?

47. In October 2009, Paul Hudson, a regional weather presenter for the *BBC*, asked: 'Whatever happened to global warming?'. In his article³⁵ he, unusually for the *BBC*, gave voice to all shades of opinion. Hudson's introductory paragraph was strikingly similar to what I had written two years earlier in the *New Statesman*.

48. Hudson wrote:

The title of this may be a surprise. So might the fact that the warmest year recorded globally was not last year, or 2007, but 1998. For the last decade we have not observed any increase in global temperatures. What's more, climate models did not forecast it [the warming standstill] even though man-made carbon dioxide, the gas thought to be responsible for warming our planet, has continued to rise. So what on earth is going on?

49. In 2009, with only two more annual data points added to the global temperature datasets after my *New Statesman* article, the landscape had changed. There was now a spate of scientific papers attempting to predict what the earth's temperature might be in the coming decades, and also seeking to explain the current global temperature standstill.

50. The uncertainties and the various conflicting predictions about future climate trends were available for all to see, and should have been fare for robust, questioning journalism. One report was an example that journalists can wander too far from straight reporting and become compromised in the shifting sands of spin. This can be done with what the reporter says, or neglects to say. The result is a misleading message presented to an increasingly confused public.

34 <http://www.realclimate.org/index.php/archives/2008/05/what-the-ipcc-models-really-say/>

35 <http://www.bbc.co.uk/blogs/paulhudson/2009/10/whatever-happened-to-global-wa.shtml>

'The Temperature Rise Appeared To Have Stalled In The Last Decade Or So'

51. In November 2009, prompted by the UK Met Office issuing its annual conclusions about the current year's global temperature (which it does every year - before the year is completed -, as input into the climate conferences that take place about that time each year), Roger Harrabin³⁶, the *BBC's* Environment Analyst, wrote an article with the title: 'This year "in top five warmest"'. Harrabin said:

Climate sceptics had pointed out that the temperature rise appeared to have stalled in the last decade or so.

52. It is not just 'climate sceptics' who have pointed out that the temperature rise appears to have stalled in the last decade or so, as I have already shown. The statement was therefore misleading and revealed the article's slant. Harrabin added that the standstill was caused in part by the 'Pacific La Niña current, which cools the Earth'. In reality, the temperature hiatus had been happening since 2001 and La Niñas are much shorter-term features. What is more, the temperature standstill occurred during the influence of more than one warming El Niño event, but this was not mentioned in Harrabin's article. 2009 was, in fact, average within this warm decade. The headline could just as well have read 'Temperature standstill continues' and that 2009 was nothing special.

'If It's That Warm, How Come It's So Damned Cold?'

53. As 2009 drew to a close, a NASA press release stated:

NASA researcher finds last decade was warmest on record, 2009 was one of warmest years.

The statement was correct, but it is worth looking in detail at what followed because of the scientific data used, as well because of the way it was portrayed. The NASA researcher referred to was Jim Hansen of the Goddard Spaceflight Center. The press release was based on a report³⁷ Hansen had written earlier, entitled 'If It's That Warm, How Come It's So Damned Cold?'. The press release said:

A new analysis of global surface temperatures by NASA scientists finds the past year was tied for the second warmest since 1880. In the Southern Hemisphere, 2009 was the warmest year on record.

54. As is often the case, one has to take claims like this with reservation. Hansen's was not a new analysis and everyone already knew that the previous decade had been the warmest of the instrumental record. However, the press release proceeded to dilute its headline with some facts, adding:

The past year was a small fraction of a degree cooler than 2005, the warmest on record, putting 2009 in a virtual tie with a cluster of other years - 1998, 2002, 2003, 2006, and 2007 - for the second warmest on record.

³⁶ <http://news.bbc.co.uk/1/hi/8377128.stm>

³⁷ http://www.columbia.edu/~jeh1/mailings/2010/20100115_Temperature2009.pdf

Scientifically, this makes the claim that 2009 was the second warmest year specious.

55. Hansen is quoted as saying:

There is always interest in the annual temperature numbers and a given year's ranking, but the ranking often misses the point...there's substantial year-to-year variability of global temperature caused by the tropical El Niño-La Niña cycle. When we average temperature over five or ten years to minimize that variability, we find global warming is continuing unabated.

56. Gavin Schmidt, also of NASA's Goddard Spaceflight Center, is quoted in the same press release saying:

The difference between the second and sixth warmest years is trivial because the known uncertainty in the temperature measurement is larger than some of the differences between the warmest years.

This states the obvious and once more contradicts the press release's take-home message. The press release continues:

January 2000 to December 2009 was the warmest decade on record. Looking back to 1880, when modern scientific instrumentation became available to monitor temperatures precisely, a clear warming trend is present, although there was a leveling off between the 1940s and 1970s. In the past three decades, the GISS surface temperature record shows an upward trend of about 0.36°F (0.2°C) per decade. In total, average global temperatures have increased by about 1.5°F (0.8°C) since 1880.

57. It is, in my view, misleading to mix the overall warming seen since the Victorian era with the warming seen since 1980 without any qualification. They are highly likely to be due to different causes, and one does not support or confirm the other.

'The Global Temperature Was Lower Than In 1998, As Expected'

58. Jim Hansen said:

Frequently heard fallacies are that "global warming stopped in 1998" or "the world has been getting cooler over the past decade". These statements appear to be wishful thinking - it would be nice if true, but that is not what the data show. True, the 1998 global temperature jumped far above the previous warmest year in the instrumental record, largely because 1998 was affected by the strongest El Niño of the century. Thus for the following several years the global temperature was lower than in 1998, as expected.

59. Hansen continued:

However, the 5-year and 11-year running mean global temperatures have continued to increase at nearly the same rate as in the past three decades. There is a slight downward tick at the end of the record, but even that may disappear if 2010 is a warm

year. Indeed, given the continued growth of greenhouse gases and the underlying global warming trend there is a high likelihood, I would say greater than 50 percent, that 2010 will be the warmest year in the period of instrumental data.

60. 2010 was indeed the warmest, according to the NASA GISS³⁸ global temperature database, although by only one hundredth of a degree. This is well below the 0.1°C error margin and therefore statistically meaningless.

'The Fact Is We Can't Account For The Lack Of Warming'

61. One of the most (in)famous Climategate emails revealed in late-2009 was written by Kevin Trenberth of the U.S. National Center for Atmospheric Research who wrote:³⁹

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.

It has been taken as an admission that scientists cannot explain why the world has not warmed in the past decade. Trenberth denied⁴⁰ that was his intention, saying that he was referring to the inadequate state of global observations, such as the sparsely sampled deep ocean.

62. Trenberth said:

In my case, one cherry-picked email quote has gone viral and at last check it was featured in over 107,000 items (in Google). Here is the quote:

"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."

It is amazing to see this particular quote lambasted so often. It stems from a paper⁴¹ I published this year bemoaning our inability to effectively monitor the energy flows associated with short-term climate variability. It is quite clear from the paper that I was not questioning the link between anthropogenic greenhouse gas emissions and warming, or even suggesting that recent temperatures are unusual in the context of short-term natural variability.

63. Trenberth's explanation is curious. In his paper he admits that there has been no warming in the past decade or so:

The global mean temperature in 2008 was the lowest since about 2000. Given that there is continual heating of the planet, referred to as radiative forcing, by accelerating increases of carbon dioxide and other greenhouses due to human activities, why is the temperature not continuing to go up?

38 http://data.giss.nasa.gov/gistemp/taledata_v3/GLB.Ts+dSST.txt

39 <http://foia2011.org/index.php?id=6347>

40 <http://www.cgd.ucar.edu/staff/trenberth/emails/>

41 <http://www.cgd.ucar.edu/staff/trenberth/trenberth.papers/EnergyDiagnostics09final2.pdf>

He then asked why this might be so:

In particular, what are the physical processes? From an energy standpoint, there should be an explanation that accounts for where the radiative forcing has gone. Was it compensated for temporarily by changes in clouds or aerosols, or other changes in atmospheric circulation that allowed more radiation to escape to space?

64. He concluded thus:

A climate information system that firstly determines what is taking place and then establishes why is better able to provide a sound basis for predictions and which can answer important questions such as 'Has global warming really slowed or not?'. Decisions are being made that depend on improved information about how and why our climate system is varying and changing, and the implications.

65. In effect, this entire paper can be summarised as indicating that the world has not warmed since 1998, and that scientists cannot explain it: an identical standpoint to the email he famously dismissed!

2010: The Significant Stratosphere

'Packs A Wallop From One Decade To The Next'

66. Few would disagree with the statement that we are at the beginning of climate science and not at the end of it. That is why predictions made some time ago, without the benefit of recent discoveries, must today be looked at with more circumspection than when they were made. An example of this concerns the effect of varying water vapour in the stratosphere.

67. In early 2010, scientists writing in the journal *Science*⁴² suggested that they might have overlooked a major cause of global warming and cooling operating over the past few decades (see Figure 8). Water vapour in the stratosphere was, it seemed, far more influential on global temperatures than previously thought. Increases in stratospheric water vapour levels tend to cool the stratosphere but warm the troposphere, while the opposite is true for stratospheric water vapour decreases. Previous studies suggested that variations in stratospheric water vapour might contribute significantly to climate change, but there was debate about the magnitude of the influence.

68. Lead author Susan Solomon, of NOAA, said:

Current climate models do a remarkable job on water vapour near the surface. But this is different – it's a thin wedge of the upper atmosphere that packs a wallop from one decade to the next in a way we didn't expect.

42 <http://www.sciencemag.org/content/327/5970/1219.abstract>

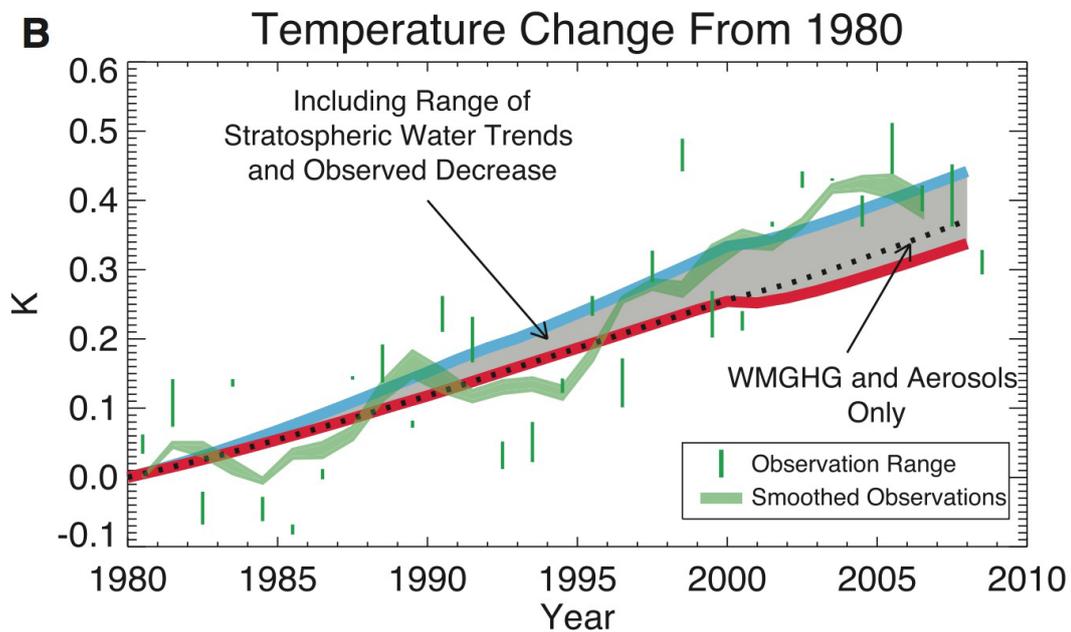


Figure 8. From Solomon *et al.* (2010).

69. Solomon continued:

The trend in global surface temperatures has been nearly flat since the late 1990s despite continuing increases in the forcing due to the sum of the well-mixed greenhouse gases (CO_2 , CH_4 , halocarbons, and N_2O), raising questions regarding the understanding of forced climate change, its drivers, the parameters that define natural internal variability, and how fully these terms are represented in climate models.

70. I disagree with one statement made later in the paper.

Over the past century, global average surface temperatures have warmed by about 0.75°C . Much of the warming occurred in the last half century.

That is not borne out by the facts. At least half of the warming took place prior to 1940.

71. Solomon *et al.* (2010) suggested that the recent rise in global temperatures between 1980 and the late 1990s was exaggerated by the greenhouse effect but was fundamentally caused by a temporary increase in water vapour in the stratosphere, and that the post-2001 standstill has been caused to a certain degree by a decline in stratospheric water vapour content.

72. The abstract of Solomon *et al.* (2010) stated:

Stratospheric water vapor concentrations decreased by about 10% after the year 2000. Here we show that this acted to slow the rate of increase in global surface temperature over 2000-2009 by about 25% compared to that which would have occurred due only to carbon dioxide and other greenhouse gases. More limited data suggest that

stratospheric water vapor probably increased between 1980 and 2000, which would have enhanced the decadal rate of surface warming during the 1990s by about 30% as compared to estimates neglecting this change. These findings show that stratospheric water vapor is an important driver of decadal global surface climate change.

'No Upward Trend, Just A Plateau'

73. In February 2010, at the height of the Climategate furore, Roger Harrabin of the *BBC* made contact with Phil Jones of the Climatic Research Unit, who had written many emails he would later describe before politicians as 'bad'. Jones agreed to answer a few questions⁴³ put to him by Harrabin.

Harrabin: Do you agree that from 1995 to the present there has been no statistically significant global warming?

Jones: We live in the warmest decade, no one doubts that (though possibly not as warm as it was 1000, 2000 and 3000 years ago), and this explains why the world's warmest years are clustered during that period. Look at the order of the warmest years, however, and you will see they are jumbled up and sit well within each other's errors of measurement. There is no upward trend, just a plateau.

74. Jones' conclusions had been reached before by many others; they should have been no surprise to anyone who had looked at the data, or recent scientific publications.

75. Early-year temperature data indicated that 2010 might be relatively warm. The first half of the year gave high monthly global temperatures. Subsequently *The Times*⁴⁴ asked if 2010 was heading for a record. *The Times* talked of a 'NASA analysis showing record global warming undermines the skeptics'.

76. A closer look at the information on which *The Times* based its headline shows that a combination of selective memory and scientific spin play a large role in arriving at it. The conclusion was based on a paper⁴⁵ released to the media by Hansen before it had been peer-reviewed, and he admitted that some of the newsworthy comments it contained may not make it past the referees.

77. Hansen claimed that, according to his NASA GISS database, the year from April 2009 to April 2010 has a temperature anomaly of 0.65°C (based on a 1951-1980 average), making it the warmest year since modern records began. It was fractionally warmer than 2005, he said, although an important point to be made is that, statistically speaking, taking into account the error of measurement and the scatter of previous datapoints, it is not a significant increase. He said:

We conclude that there has been no reduction in the global warming trend of 0.15-0.2°C per decade that began in the late 1970s.

43 <http://news.bbc.co.uk/1/hi/8511670.stm>

44 <http://www.timesplus.co.uk/tto/news/?login=false&url=http%3A%2F%2Fwww.thetimes.co.uk%2Fto%2Fenvironment%2F>

45 http://pubs.giss.nasa.gov/docs/2010/2010_Hansen_et_al.pdf

78. This shows a selective use of the data, choosing a trendline that joins a datapoint in the late 1970s with the most recent one. One could have taken a datapoint a decade earlier and tied it to the same point in the late 1970s, and deduced an even greater rise in temperature per decade. It is cherry-picking.

79. In *The Times* article, Vicky Pope of the UK Met Office added:

The Met Office continues to predict that 2010 is more likely than not to be the warmest calendar year on record, beating the 1998 record.

Importantly, Pope added that 2010 could be the hottest year on record due to the current El Niño (it was not, according to the Hadley Centre). Had it escaped journalistic notice that El Niños are natural?

'The Science Was Never In Doubt'

80. The July 2010 issue⁴⁶ of the Bulletin of the American Meteorological Society was particularly interesting. One of the items included in the 'State of the Climate for 2009'⁴⁷ was a report by NOAA. It drew together the available scientific data pertinent to our ever-changing planet. *The Independent* newspaper reported it was based on 50 climatic indicators. *The Guardian* said 11. The Met Office, in its press release, stated it was based on 10 key climatic indicators. The NOAA report itself quoted 37. To be fair, there are different ways of grouping environmental indicators.

81. Responding to the various press releases issued about the report, written by NOAA, the media said it was a clear example of accelerated global warming that showed no signs of leveling off. The media reports tied it to the Climategate scandal, saying that despite all the fuss the science was never in doubt.

82. Peter Stott of the UK Met Office was widely quoted in the media, saying that despite variations between individual years, the evidence was unequivocal that the world had warmed during the past 150 years. This was a safe thing to say as it was something that almost no one would take issue with. No scientist of whatever viewpoint disputes the fact that we live in a warm decade, or that the global temperature has risen since the Victorian age, and the Little Ice Age before that. The key point is what is natural and what is human-influenced. It is unscientific and misleading to use natural variability to bolster the range of human-influenced variability, and then to pass it off to the public as the same thing.

83. The NOAA report discussed whether 2009 was warmer than the previous years and, after a brief consideration of 0.1°C differences, concluded that it probably was. However, at the end of that particular section it states the statistically obvious fact that should have been stated right at the start of that particular section:

...the uncertainties in deriving the global mean surface temperature imply that 2009 is statistically indistinguishable from the other high ranking years.

⁴⁶ <http://www.ncdc.noaa.gov/bams-state-of-the-climate/2009.php>

⁴⁷ <http://www.aoml.noaa.gov/hrd/Landsea/bams-91-7-stateoftheclimate.pdf>

One commentator said:

This confirms that while all of this [Climategate] was going on, the earth was continuing to warm. It shows that Climategate was a distraction, because it took the focus off what the science actually says.

84. As 2010 progressed, the possibility that it might be a record year in terms of temperature increased month on month. But one crucial factor was usually missing, or had been glossed over.

85. In the media it had been mentioned that the first half of 2010 had also seen a strong El Niño effect, but in none of the 571 news reports collated in *Google News* was El Niño given as an explanation, despite the fact that it markedly increased the global temperature. Neither was there mention of the Pacific Decadal Oscillation, which went positive, thereby also contributing to global warming. The El Niño raised 2010's temperature slightly, though not statistically significantly, above the other recent years. This is evident if you use a running mean of El Niño duration over the temperature data, as some did. The impression was given that 2010's slight extra warming was entirely anthropogenic.

86. As 2010 drew to a close, the contradiction at the heart of climate science was becoming apparent to many. On the one hand there were claims that computer models could reproduce the climate of the past 50 years. On the other were statements saying that we do not understand, or have not yet even identified, crucial factors affecting climate change. It was as if the past truly were a different country, and could be explained using climate models inadequate for predicting the future. There was no consensus over what would happen to global temperature over the next decade.

87. One of the major themes in trying to understand the post-2001 global temperature hiatus has been the importance of decadal climate cycles. Decadal cycles are poorly understood; because our measurements of the climate system only stretch back a few decades in most cases, our observational database is inadequate to recognise them all, let alone quantify them.

88. It is clear that the oceans are the main reservoir of heat in the climate system; their uptake and release of heat over multiple timescales provide the climate system with its 'memory', an area in which we have very limited understanding. Computer simulations of the Atlantic Meridional Overturning Circulation and the Pacific Decadal Oscillation are poor. Indeed, fundamental processes involved in ocean-atmospheric interaction are not understood, and new findings often contradict current theories.

89. In November, Vicky Pope of the UK Met Office gave a radio interview⁴⁸ in which she said the warming standstill of a decade could be represented in computer models. But in reality, few were taking about a decade-long standstill. It was lengthening into a duration that the Met Office's models could not explain.

48 http://news.bbc.co.uk/today/hi/today/newsid_9231000/9231192.stm

2011: 'We have not seen that in the land data'

State Of The Climate

90. In 2011 the UK Met Office issued a report called 'Evidence: The State of the Climate'⁴⁹, which offered explanations for the recent lack of warming (see Figure 9). It stated:

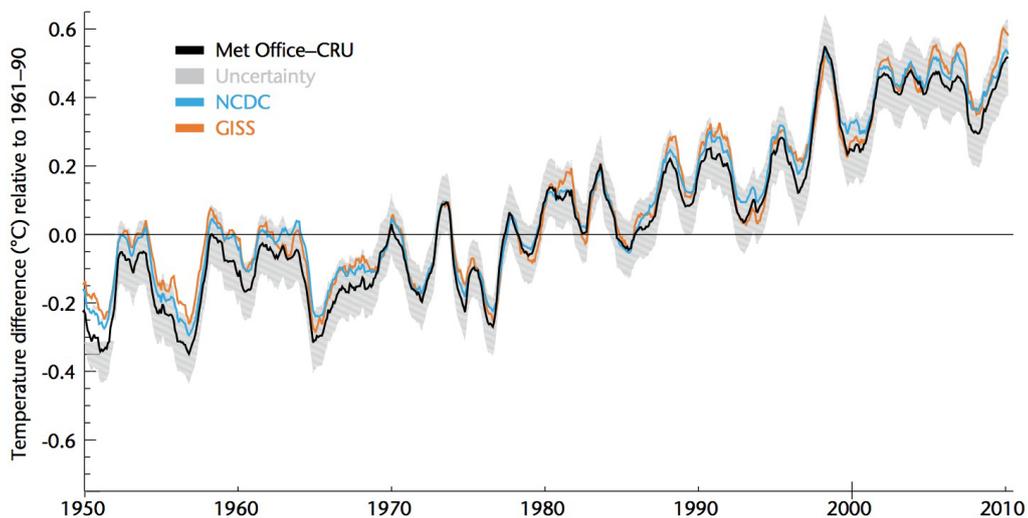
Met Office findings that the world is warming are in line with independent analyses of decadal temperatures conducted by NOAA's National Climatic Data Center and NASA's Goddard Institute for Space Studies.

91. It also stated:

The temperature rise is inexorable - despite short-term variations.

Since the late 1970s the long-term rate of surface warming has been about 0.16°C per decade. However, the observed rate of warming has decreased slightly in the last 10 years to 0.05-0.13°C per decade, depending on whether you use the Met Office observational dataset, that of NASA's Goddard Institute for Space Studies or NOAA's.

The recent decrease in rate of temperature rise has been independently observed in both land and sea-surface temperature records.



12-month running mean of global average temperatures from three datasets. HadCRUT3 (black and grey area) produced by the Met Office-CRU; NCDC (blue) produced by the National Climate Data Center; and GISS (orange) produced by the Goddard Institute for Space Studies at NASA. The grey shaded area shows the approximate 95% confidence range for the HadCRUT3 data. The true global average is expected to lie outside this range around 5% of the time.

Figure 9. From UK Met Office 'State of the Climate'.

49 <http://www.metoffice.gov.uk/media/pdf/m/6/evidence.pdf>

92. The UK Met Office said that it believed the standstill is probably partly caused by the low solar activity of the past decade coupled with the influence of stratospheric water vapour variations.

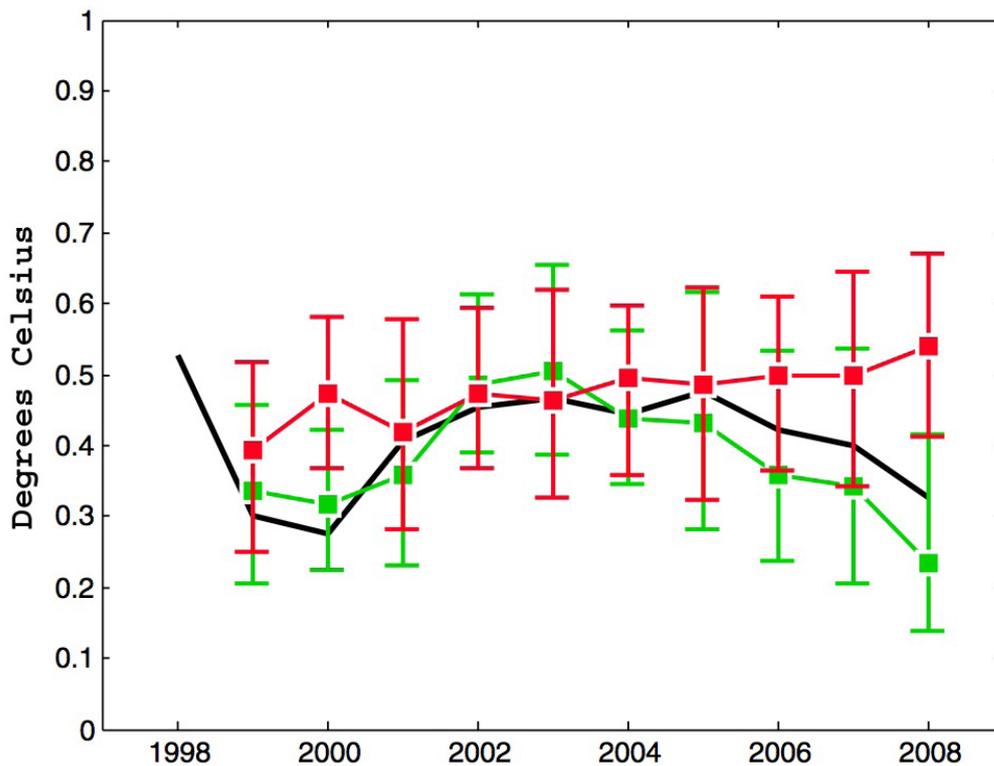


Fig. 3. Observed temperature (black line), the out-of-sample forecast for global surface temperature driven by anthropogenic changes in radiative forcing (red line) and the out-of-sample forecast for global surface temperature driven by natural variables (solar insolation, SOI, and volcanic sulfates) (green line). Error bars represent 95% confidence intervals (see *SI Appendix*).

Figure 10. From Kaufmann et al. (2011).

Blaming China

93. The authors of the PNAS paper⁵⁰ 'Reconciling anthropogenic climate change with observed temperature 1998–2008' (Kaufmann et al. 2011) took the standstill as established (see Figure 10). They blamed China's increasing coal consumption for the temperature hiatus through adding particles that reflect sunlight and cool the Earth into the atmosphere. The effect of aerosols and their interplay with other agents of combustion is a major uncertainty in climate models. However, despite China's coal burning, data indicate that in the past decade the amount of aerosols in the atmosphere has not increased.

⁵⁰ <http://wattsupwiththat.files.wordpress.com/2011/07/pnas-201102467.pdf>

94. *Kaufmann et al.* (2011) sought to explain the temperature standstill between 1998 and 2008. They said that the global temperature had increased since then. This is misleading. There was an El Niño in 2010 (natural cyclic warming) but even that did not raise temperatures above 1998 levels. In fact the standstill has continued to the present day.

95. Looking at tropospheric data, which also shows the recent temperature standstill, Ben Santer of the U.S. Lawrence Livermore National Laboratory published a paper⁵¹ that concluded:

Because of the pronounced effect of interannual noise on decadal trends, a multi-model ensemble of anthropogenically-forced simulations displays many 10-year periods with little warming. A single decade of observational TLT data is therefore inadequate for identifying a slowly evolving anthropogenic warming signal. Our results show that temperature records of at least 17 years in length are required for identifying human effects on global-mean tropospheric temperature.

96. Recall that in February 2010, Phil Jones had said there had been no statistically significant global warming between 1995 and 2009. After only one more year's data became available (and had been for five months), Jones looked again at his statistics, using the HadCRUT3 data, and reached a different conclusion.

Significant, Not Significant.

97. What a difference a year makes. According to a report by the *BBC's* Environment Correspondent Richard Black, warming between 1995 and 2010 was now significant.⁵² Another year, according to the report, had 'pushed the trend past the threshold usually used to assess whether trends are real'. Data from 2010, it seemed - for there were no references to methodology - had pushed the significance of warming beyond the 95% confidence level. 'The trend over the period 1995-2009 was significant at the 90% level, but wasn't significant at the standard 95% level that people use', Phil Jones told *BBC News*. Adding just 6.66 percent more data (16 as opposed to 15 years) had, paraphrasing Jones' own words, achieved statistical significance in scientific terms, which is much more likely for longer periods, and much less likely for shorter periods.

98. At the time it was likely, given the La Niña experienced in 2010/11, that when 2011 data was added to the calculations, even by Jones' own methods the trend would once again fall below significance. Indeed, this is what happened. Adding a small amount of data to a dataset and getting a different result is a warning sign to any scientist. Specialist journalists should know this.

99. Black's report also stated that Jones' 2010 comment about no warming was still seen on blogs critical of the idea of man-made climate change. True. But it is also seen on blogs and in research papers supporting the idea that mankind is overwhelmingly responsible for recent climate change. It is also seen on blogs that debate the exact mix of human and natural contributions to climate change.

⁵¹ <http://www.agu.org/pubs/crossref/2011/2011JD016263.shtml>

⁵² <http://www.bbc.co.uk/news/science-environment-13719510>

100. The *BBC* article says that Jones' 2010 comment was quoted 'erroneously' as a demonstration that the Earth's surface temperature was not rising. This is wrong. Jones' answer did include some statistical caveats but his answer was, in essence, that it had not warmed. When the *BBC* article appeared, I wrote that I looked forward to another *BBC News* item, dated mid-January 2012, based on data to the end of 2011, the headline of which should be 'Global Warming since 1995 "now not significant (again)". It did not happen.

101. Following the *BBC* article and the flimsy evidence it presented, the *Carbon Brief*⁵³ website was swift to proclaim some kind of victory by expanding the conclusions in the *BBC* article. This website says it 'fact checks' climate stories in the media. If only it had lived up to that promise. The idea that global warming had stopped 'can finally be laid to rest'; it proclaimed a short while after the *BBC* story was posted. It then took Jones' conclusion of a warming trend being statistically significant between 1995 and 2010, and could not wait to say it discredited statements by the Global Warming Policy Foundation (GWPF) that there was no increase in the past ten years. In doing so, *Carbon Brief* demonstrated its inability to tell apples from oranges and its desire to cherry-pick data, and revealed a desire to criticise the GWPF using concocted arguments.

'Adjusted Data'

102. In December a paper⁵⁴ written by Grant Foster and Stefan Rahmstorf set out to remove the effect of three large natural influences on global temperature variability. In so doing they maintained that they had proven Phil Jones wrong about his earlier assertion of no statistical warming between 1995 and 2009. The influences they tried to remove were El Niño and volcanic and solar effects in order to find the 'real global warming signal'.

103. Foster and Rahmstorf are both well known commentators on climate change who are not recognised for their flexible or generous approach to the various shades of opinion expressed on climate change to which they do not adhere. Much of this research is reproduced on a website run by the anonymous Tamino, who does have a tendency to draw straight lines through everything, even when inappropriate.

104. Foster and Rahmstorf addressed the post-2001 data problem by examining data from five global temperature datasets over the period 1979-2010. They drew a straight line between the (arbitrary) start of their data selection and its end. Imposing linearity obliterates most information in the temperature data, reducing it to two parameters only. I do not think that information in the real world data, which opposes the straight line assumption, should be discarded in favour of what the authors believe the data should show.

105. The authors made the contentious statement that removing the effects of El Niño and volcanic and solar influences reveals the real global warming signal (see Figure 11). I disagree. Other factors, stratospheric and oceanic, are significant, and anyone who has been paying attention to recent developments must realise that the solar equation is

53 <http://www.carbonbrief.org/blog/2011/06/global-warming-since-1995-statistically-significant>

54 <http://iopscience.iop.org/1748-9326/6/4/044022/>

rather more complex than just consideration of the Total Solar Irradiance. Also, I think that traces of El Niños and La Niñas still remain in their 'adjusted' data.

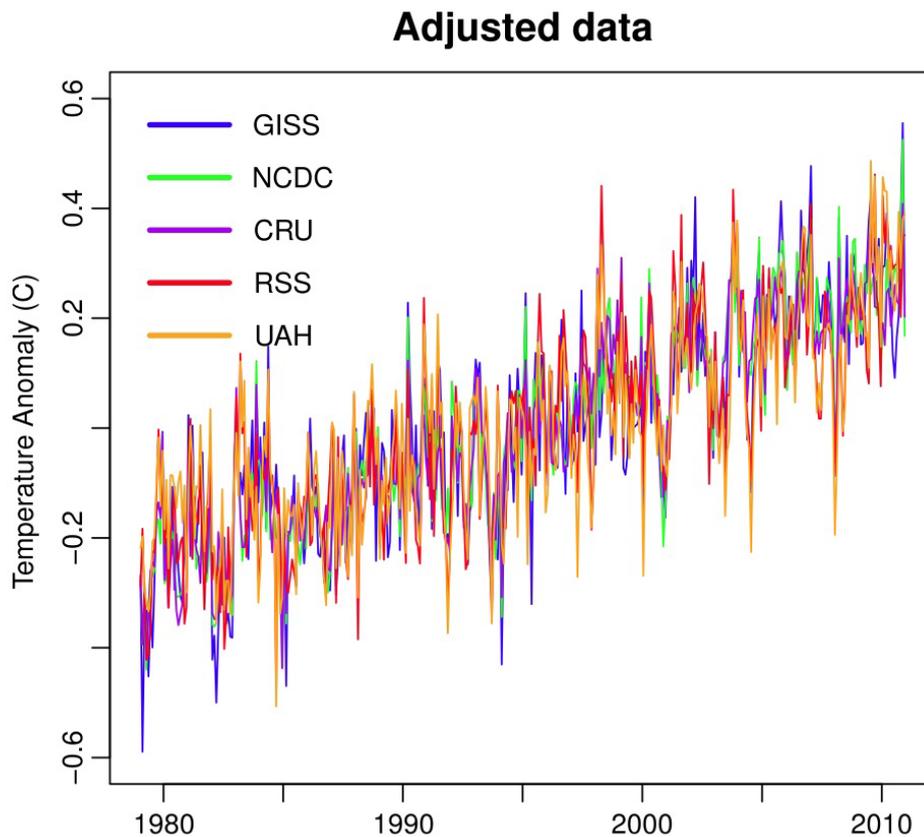


Figure 11. From *Foster and Rahmstorf* (2011).

106. About the same time, *Science* magazine published a paper⁵⁵ by Susan Solomon and colleagues, which concluded that aerosols in the upper atmosphere, unaccounted for in earlier estimations, had, over the previous 10 years or so, acted to offset about 0.07°C of warming that would have otherwise occurred (see Figure 12). Potential candidates responsible for the stratospheric injections of such aerosols included not-so-large volcanic eruptions and particulates from coal burning that somehow get lofted into the upper atmosphere. In summary, we had suggestions that the lack of warming seen over the previous decade or so was due to declining stratospheric ozone, aerosols in the upper atmosphere, pollution in the lower atmosphere and declining solar activity, not forgetting oceanic cycles! Given this, the authors suggested that we should not be so hard on the climate models for failing to anticipate the lack of warming over the past 10-15 years.

107. What the paper really said is that the amount of global warming that should have occurred over the previous 10-15 years (if the climate models were correct) was about 25% greater than the model-expected warming from the combination of increases in

55 <http://www.sciencemag.org/content/early/2011/07/20/science.1206027>

greenhouse gases and lower atmospheric pollution alone, meaning that the observed warming during this same time - statistically zero - is even harder to explain and makes the models look even worse. But, of course, that is not how the results were spun to the press. The paper sparked a round of media coverage proclaiming that we now knew part of the reason why the earth's average temperature had risen so little during the previous 10-15 years despite rapidly rising atmospheric levels of greenhouse gases.

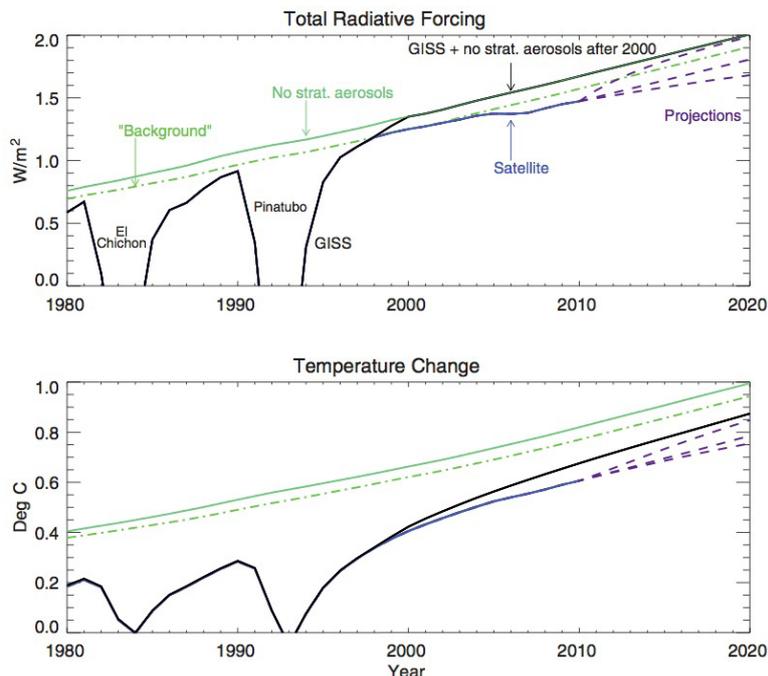


Fig. 4. Radiative forcing for six stratospheric aerosol forcing scenarios (**top**, also see Fig. 3) and the resulting change in global average temperature since preindustrial times as calculated by the Bern earth system model of intermediate complexity (**bottom**). Scenarios include: no stratospheric aerosol forcing (solid blue/green line); only background aerosol forcing with no volcanoes (dash-dotted green line); stratospheric aerosol forcing from GISS optical depths transitioning to no stratospheric aerosol forcing after 2000 (black line); forcing from GISS until 1998, then assuming forcing inferred from the global satellite optical depths (black followed by blue lines); this curve then splits into three future projections (dashed purple lines) as described for Fig. 3.

Figure 12. From *Solomon et al.* (2011).

'There Will Be No Spin, Whatever We Find'

108. The long-awaited Berkeley Earth Surface Temperature Project (BEST) released its preliminary findings in October 2011, although not in a research journal but to the scientific community and the general public.⁵⁶

109. BEST had been established to resolve criticism of the records of global temperature increase based on surface measurements over the past 150 or so years. Its director, Richard Muller, told *The Guardian*:

...we are bringing the spirit of science back to a subject that has become too

⁵⁶ <http://www.guardian.co.uk/science/2011/feb/27/can-these-scientists-end-climate-change-war>

argumentative and too contentious...we are an independent, non-political, non-partisan group. We will gather the data, do the analysis, present the results and make all of it available. There will be no spin, whatever we find. We are doing this because it is the most important project in the world today. Nothing else comes close.

Their conclusion⁵⁷ was not surprising - the world had become warmer in recent decades - or at least the land has. This was consistent with the other global temperature datasets. A press release issued by the project said 'Global Warming is real'. As if anyone seriously doubted it!

110. Of the 39,000 or so weather stations BEST used, covering 29% of the planet, all on land, about a third showed no warming over the 60-year period under consideration; indeed they showed cooling. Another way to look at the data would be that only a third of weather stations (the difference between the warmers and the coolers) contribute to the final conclusion. To my mind, that is a very different stance from saying that two-thirds of temperature stations show warming.

111. The findings of the BEST Project are important because they emphasise the growing realisation that science has underplayed the unknowns and uncertainties in the attribution of the causes of recent climate change. The data compiled, and the analysis undertaken, by BEST is unambiguous evidence that many aspects of global warming are poorly understood.

112. The researchers found a strong correlation between North Atlantic temperature cycles lasting decades, and the global land surface temperature. They admit that the influence in recent decades of oceanic temperature cycles has been unappreciated and may explain most, if not all, of the global warming that has taken place, stating the possibility that the 'human component of global warming may be somewhat overestimated'.

113. Contrary to claims being made by the leader of the BEST global temperature initiative, their data confirms, and places on a firmer statistical basis, the global temperature standstill of the past ten years as seen by other groups (see Figure 13). But when asked by the *BBC's Today* programme⁵⁸, Muller said that the global temperature standstill of the past decade was not present in their data:

In our data, which is only on the land we see no evidence of it having slowed down. Now the evidence which shows that it has been stopped is a combination of land and ocean data. The oceans do not heat as much as the land because it absorbs more of the heat and when the data are combined with the land data then the other groups have shown that when it does seem to be leveling off. We have not seen that in the land data.

57 <http://www.berkeleyearth.org/>

58 http://news.bbc.co.uk/today/hi/today/newsid_9621000/9621049.stm

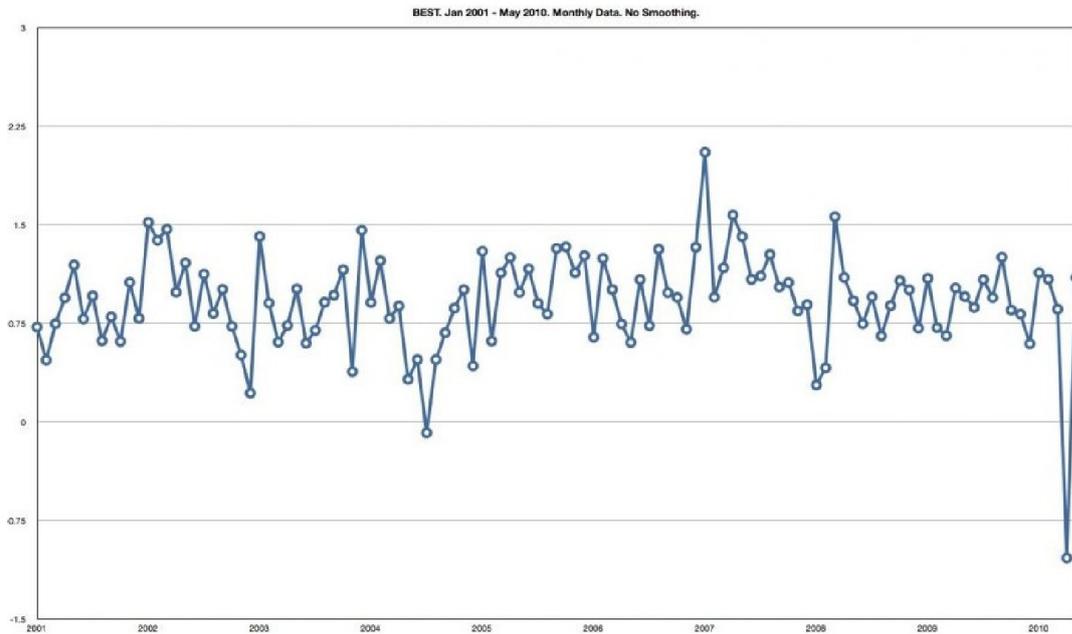


Figure 13. BEST data since 2001. The second last point should be disregarded as it is due to anomalous station sampling.

114. The global temperature standstill of the past decade is obvious in HadCRUT3 data, which is a combination of land and sea surface data. BEST is only land data from nearly 40,000 weather stations. Muller says they 'really get a good coverage of the globe'. The land is expected to have a fast response to the warming of the lower atmosphere caused by greenhouse gas forcing, unlike the oceans with their high thermal capacity and their decadal timescales for heating and cooling.

115. Examining the BEST data for the past decade reveals it to be a statistically robust straight line of zero gradient. Indeed, most of the largest variations can be attributed to ENSO and la Niña effects. It is impossible to reconcile with Muller's statement. Indeed BEST seems to have worked hard to obscure the past decade. They present data with a short x-axis and a stretched y-axis to accentuate the increase. The data is then smoothed using a ten-year average, which is ideally suited to removing the past five years of the past decade and mix the earlier standstill years with years when there was an increase. This is an ideal formula for suppressing the past decade's data.

116. In conclusion, the BEST data confirms that the global temperature standstill of the past decade is well represented in land-only data. That the standstill should be present in land-only data is remarkable. There have been standstills in land temperature before, but the significance of the past decade is that it is in the era of mankind's postulated influence on climate through greenhouse gas forcing. Predictions made many times in the past few years suggest that warming should be the strongest and swiftest in the land data. That BEST confirms the global temperature hiatus and shows that it is apparent in land-only data is significant, and in my view its major scientific finding, so far. That they deny it is

puzzling.

117. In October, an article⁵⁹ appeared that included some revealing comments by leading climate scientists. I reproduce them here to illustrate how attitudes have changed over just a few years and to show how, in the space of a few weeks, the public can be presented with contrasting statements about the recent lack of warming.

118. John Barnes, Mauna Loa Observatory:

If you look at the last decade of global temperature, it's not increasing. There's a lot of scatter to it. But the [climate] models go up. And that has to be explained. Why didn't we warm up?

Susan Solomon, NOAA:

What's really been exciting to me about this last 10-year period is that it has made people think about decadal variability much more carefully than they probably have before. And that's all good. There is no silver bullet. In this case, it's four pieces or five pieces of silver buckshot.

John Daniel, NOAA:

When the record came in 1998, though, scientists faltered. It's a pattern often seen with high temperatures. They cut out too much nuance.

John Daniel, NOAA:

We make a mistake, anytime the temperature goes up, you imply this is due to global warming. If you make a big deal about every time it goes up, it seems like you should make a big deal about every time it goes down.

Ben Santer, Lawrence Livermore National Laboratory:

This no-warming-since-1998 discussion has prompted people to think about the why and try to understand the why. But it's also prompted people to correct these incorrect claims.

119. At the end of 2011, in the NasaGiss summary of 2011, James Hansen, Reto Ruedy, Makiko Sato and Ken Lo, said:

Thus, although the current global warming graphs are suggestive of a slowdown in global warming, this apparent slowdown may largely disappear as a few more years of data are added we conclude that the slowdown of warming is likely to prove illusory, with more rapid warming appearing over the next few years.

120. What might happen to global temperatures is, as those researchers know from experience, difficult to determine. The purpose of my quoting this NASA press release⁶⁰ is its use of words. The slowdown is 'apparent' and will prove 'illusory' if warming

59 <http://www.eenews.net/public/Greenwire/2011/10/25/1>

60 <http://data.giss.nasa.gov/gistemp/2011/>

resumes. The slowdown/standstill is not 'apparent'; it is real. In addition, if warming resumes the standstill will not prove 'illusory', but rather temporary. This is not the way to dispassionately describe scientific data. Later in the report they say that the 5-year (60-month) running mean global temperature hints at a slowdown in the global warming rate during the past few years.

121. In a press statement released early the following year, the UK Met Office said that their prediction for the global temperature of 2011 was that it would have a temperature anomaly of 0.44°C with a range of 0.28-0.60°C. Once again the Met Office was wrong, as 2011 was 0.1°C cooler. Note that the range of temperatures offered, 0.28-0.60, encompasses every year since 1997, with 0.60 being 0.08 higher than the 1998 temperature record. Considering this, it was hardly a precise prediction.

122. 2011 was the 12th warmest year in their 150 years of global temperature records, with an anomaly of 0.346. Although this discrepancy is within the Met Office's stated margin of error, it is the 11th year out of the last 12 when the Met Office global temperature forecast has been too warm. In all these years, the discrepancy between observed temperatures and the forecast are within the stated margin of error. But all the errors are on the warm side, with none of the forecasts that have been issued in the last 12 years ending up too cold.

123. The Met Office predicted that 2012 would have a temperature anomaly of 0.480, making it the warmest year after the powerful 1998 El Niño year, which had a figure of 0.529. However, if 2012 was 0.48 it would not alter the statistics post 2001. (The global average temperature of 2012 had a temperature anomaly of 0.43 according to HadCRUT4 and 0.40 according to HadCRUT3.)

2012: HadCRUT4

124. In January 2012, the *Mail on Sunday*⁶¹ published a provocative article that, among other things, pointed out that, according to the HadCRUT3 global temperature database, the world had not become warmer in the past 15 years (see Figure 14).

⁶¹ <http://www.dailymail.co.uk/sciencetech/article-2093264/Forget-global-warming--Cycle-25-need-worry-NASA-scientists-right-Thames-freezing-again.html?ito=feeds-newsxml>

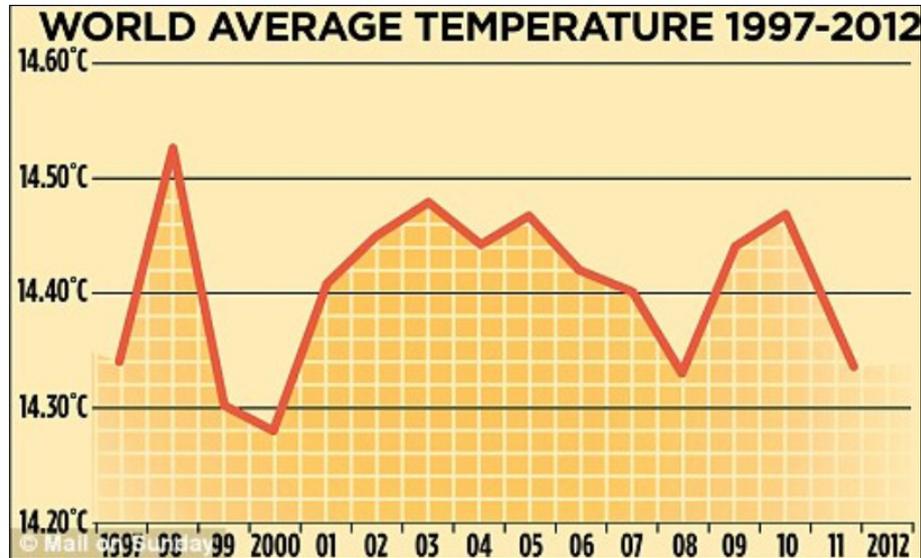


Figure 14. The HadCRUT3 graph published in the *Mail on Sunday*.

Exaggerated Computer Models

125. In February, an opinion piece⁶² was published in *The Wall Street Journal* online edition titled 'No need to panic about global warming'. Authored by sixteen scientists in disciplines including meteorology, physics, engineering, astrophysics, and others, it said:

The lack of warming for more than a decade - indeed, the smaller-than-predicted warming over the 22 years since the U.N.'s Intergovernmental Panel on Climate Change (IPCC) began issuing projections - suggests that computer models have greatly exaggerated how much warming additional CO₂ can cause.

126. Shortly afterwards, a reply⁶³ to *The Wall Street Journal* opinion piece appeared, authored by 38 scientists, predominantly, though not entirely, climate scientists who are prominent in the media, was entitled 'Check with climate scientists for views on climate'. It argued that only the opinion of climate scientists is relevant when discussing climate science. As such it disregarded scientific convention that research papers are written in such a way that those with scientific training and experience are able to follow them and use their skills to debate the treatment of data etc. On a personal note, I would point out that there is nothing especially intellectually challenging about most peer-reviewed climate science literature.

127. The reply stated:

Climate experts know that the long-term warming trend has not abated in the past decade. In fact, it was the warmest decade on record. Observations show unequivocally that our planet is getting hotter. And computer models have recently

62 <http://online.wsj.com/article/SB10001424052970204301404577171531838421366.html>

63 <http://online.wsj.com/article/SB10001424052970204740904577193270727472662.html>

shown that during periods when there is a smaller increase of surface temperatures, warming is occurring elsewhere in the climate system, typically in the deep ocean. Such periods are a relatively common climate phenomenon, are consistent with our physical understanding of how the climate system works, and certainly do not invalidate our understanding of human-induced warming or the models used to simulate that warming.

128. This is, once again, sleight of hand and misleading. The fact that we live in the warmest decade in the instrumental record is not in doubt. The question of the long-term trend being unabated is contentious.

129. Bob Ward, now Policy and Communications Officer for the Grantham Institute at the London School of Economics, took exception⁶⁴ to the *Mail on Sunday* article.

On 29 January 2012, the UK's *Mail on Sunday* newspaper published an amazingly inaccurate article, which began with the extraordinary statement:

"The supposed consensus on man-made global warming is facing an inconvenient challenge after the release of new temperature data showing the planet has not warmed for the past 15 years."

130. Ward continued:

But what 'sceptics' always fail to point out is that, based on their logic, manmade global warming has actually 'stopped' nine times since 1970, in 1972, 1978, 1979, 1980, 1981, 1982, 1995, 1996 and 1997. And they fail to mention that the underlying anthropogenic warming trend is clear and unambiguous when temperature data for the past four decades are taken into account.

131. This is misleading. The longest period of 'standstill' quoted by Ward is just 8 years. His subsequent analysis of the past 40 years of HadCRUT3 data bundled into subsequent 15-year intervals shows what is already known – that the rate of warming in the 1980s and in the past decade was low.

HadCRUT4: Warmer And Flatter

132. In the first part of 2012, the much anticipated update to the HadCRUT3 global temperature database was released over a few weeks, first in truncated form to the media followed by a posting on the Met Office website three weeks afterwards! To compile the new dataset, the researchers looked at 5,583 land stations and took data from 4,842 of them. Much more data is included from the Arctic, the most rapidly warming region of the Earth. Many considered that HadCRUT3 underestimated the global warming trend over the past 15 years or so because it has, by chance it is claimed, sampled the areas of the Earth's land surface that show more cooling, meaning that the data was not representative of the 'real' situation. There is also a somewhat less important effect concerning the change from ocean measurements made by ships and more recent ones made by buoys. Ships tend to be warm-biased.

64 <http://www2.lse.ac.uk/GranthamInstitute/Media/Commentary/2012/February/anthropogenic-global-warming-1997.aspx>

133. The addition of the polar data made HadCRUT4 warmer in the last decade but also flatter (see Figure 15). The new UK Met Office global temperature data confirmed that the world has not warmed for just the past decade but for 15 years. Figure 15 shows the global annual average temperature since 1997. No statistically significant trend can be discerned. The only statistically acceptable conclusion to be drawn from the HadCRUT4 data is that between 1997 and 2011 it remained constant, with a global temperature of $14.44 \pm 0.16^\circ\text{C}$ (2 standard deviations). A technical note: At the time, the HadCRUT4 database had been released from 1997 and 2010. The 2011 datapoint has been estimated from the differences between HadCRUT4 and the two published versions of the previous dataset, HadCRUT3, as observed over the past decade. As the HadCRUT3 data includes 2011, it is possible to estimate HadCRUT4 as lying between the specified error bars.

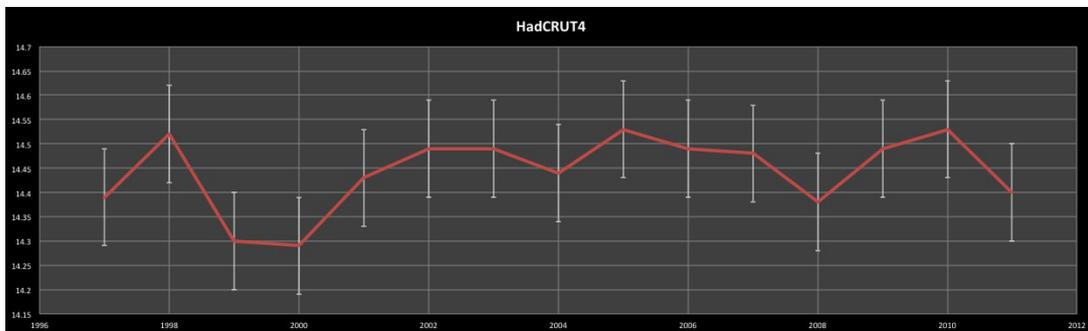


Figure 15. HadCRUT4 data since 1997.

134. The important question is whether 15 years is a sufficient length of time from which to draw climatic conclusions that are usually considered over 30 years, as well as the implications for climate projections. Global warming simulations, some carried out by the UK Met Office and mentioned previously, have been able to reproduce 'standstills' in global warming of a decade or so while still maintaining the long-term 0.2°C per decade average rise. These decadal standstills occur about once every eight decades. However, such climate simulations have not been able to reproduce a 15-year standstill:

Near-zero and even negative trends are common for intervals of a decade or less in the simulations, due to the model's internal climate variability. The simulations rule out (at the 95% level) zero trends for intervals of 15 years or more, suggesting that an observed absence of warming of this duration is needed to create a discrepancy with the expected present-day warming rate (NOAA 2008).

135. Jochem Marotzke, Director of the Max Planck Institute for Meteorology in Hamburg, said in an interview⁶⁵ that the models run on the supercomputers of the Hamburg Climate Research Centre also show such (decade-long about every 80 years) plateau phases:

The physical causes are still unclear, and our simulations show them occurring at other times. Thus the models are not consistent with the current observations.

⁶⁵ <http://notrickszone.com/2012/04/17/max-planck-institute-director-admits-physical-causes-unclear-models-inconsistent-with-observations/>

Not As Quickly As Feared

136. On 23 April 2012, an interview⁶⁶ with James Lovelock appeared on the *MSNBC* website, saying:

James Lovelock, the maverick scientist who became a guru to the environmental movement with his 'Gaia' theory of the Earth as a single organism, has admitted to being 'alarmist' about climate change and says other environmental commentators, such as Al Gore, were too. Lovelock, 92, is writing a new book in which he will say climate change is still happening, but not as quickly as he once feared.

137. The article continued:

The problem is we do not know what the climate is doing. We thought we knew 20 years ago. That led to some alarmist books – mine included – because it looked clear-cut, but it has not happened. The climate is doing its usual tricks. There is nothing much really happening yet. We were supposed to be halfway toward a frying world now. The world has not warmed up very much since the millennium. Twelve years is a reasonable time... it [the temperature] has stayed almost constant, whereas it should have been rising -- carbon dioxide is rising, no question about that.

Reaction to Lovelock's comments was swift.⁶⁷

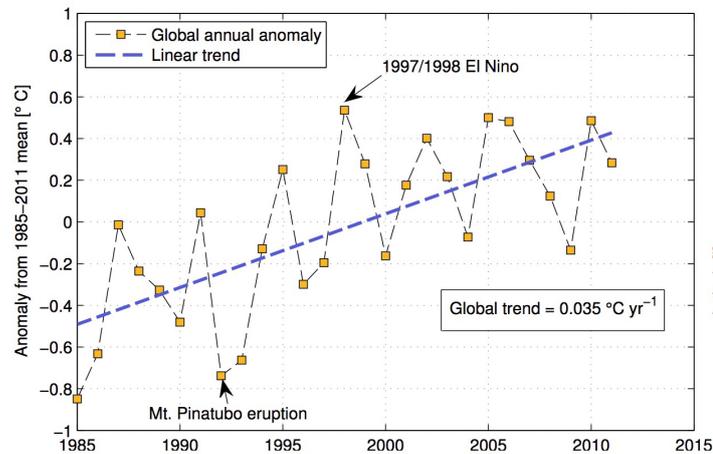
Lakes Show Standstill

138. *Schneider et al.* (2012) in a poster presentation to the 'Taking the temperature of the Earth Conference'⁶⁸ looked at the temperatures of lakes and reservoirs around the world. They said that in situ observations of lake surface temperatures are very rare on a global scale, but infrared imagery from space can be used to infer water surface temperatures of lakes and reservoirs. They provided data for 169 of the largest inland water bodies worldwide using three satellite-borne instruments. Together, these provided daily to near-daily data from 1981 through to the present, allowing them to calculate 25-year trends of nighttime summertime/dry-season surface temperature.

66 http://worldnews.msnbc.msn.com/_news/2012/04/23/11144098-gaia-scientist-james-lovelock-i-was-alarmist-about-climate-change

67 <http://www.theaustralian.com.au/news/world/scientist-cools-on-climate-alarmism/story-e6frg6so-1226338267619>

68 http://www.geos.ed.ac.uk/research/earthtemp/themes/1_in_situ_satellite/



Anomaly time series of the global mean average over all study sites. The anomaly is computed as the difference from the 1985 to 20 mean for each lake. All sites were weighted equally, thus the signal is dominated by the mid-latitudes of the northern hemisphere.

Figure 16. From *Schneider et al.* (2012)

139. They found that the surface temperatures of the water bodies had been 'rapidly warming' (see Figures 16 and 17) with an average rate of $0.35 \pm 0.11^\circ\text{C}$ per decade for the period 1985–2001. Two years ago, *Schneider et al.* published what was then described as the first global survey of lake temperatures.⁶⁹ Then the researchers found a decadal trend of 0.45°C . The researchers said the results provided a critical new independent data source on climate change that indicated lake warming in certain regions was greater than expected based on air temperature data.

140. Their graph of temperature anomaly showed no statistically significant trend post-1997. Hence an alternative description of their findings is that the world's large bodies of water show the well-known standstill of the past decade or so seen in global temperatures. The same is true for upper ocean temperatures, which have plateaued in the previous decade or so.⁷⁰

69 http://www.agu.org/news/press/pr_archives/2010/2010-40.shtml

70 <http://oceans.pmel.noaa.gov>

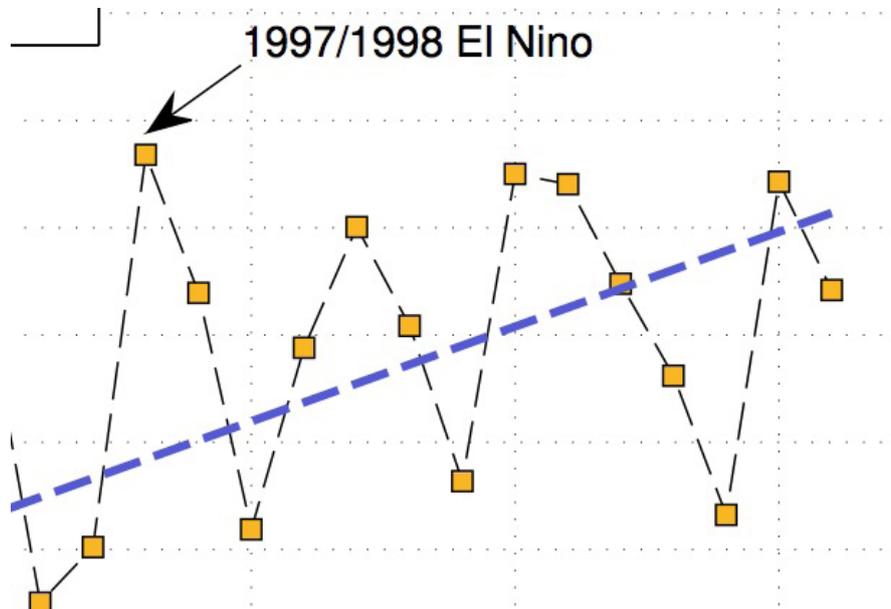


Figure 17. The last 15 years of data from *Schneider et al.* (2012)

Second Best

141. The second series of papers from the BEST consortium⁷¹ analysing global land temperatures were published in July 2012. It included the first analysis of global land temperature 1750–1850. However, the papers suffered from being too ambitious in the face of inconclusive data, and the conclusions reached by Muller in this accompanying article in *The New York Times*⁷² was too far-reaching considering the data and the analysis he presented.

142. Considering only land data, as he did in the original BEST study, Muller extended his analysis back to 1753, concluding that over the past 250 years there has been a 1.5°C increase and one of 0.9°C over the past 50 years. This is a stronger statement than the IPCC makes. It is also considerably larger than combined land-sea data. HadCRUT3 or HadCRUT4 data gives 0.4°C since 1980 and no increase between 1940–1980. However, looking at the errors in Muller’s temperature estimates (which should have been included in *The New York Times* article) we see that the increase in temperature is between 0.1 and 2.9°C.

143. Muller said that the flattening of the temperature of the past decade or so is not statistically significant. In the first analysis he said it was not seen at all in the data! By comparing the temperature curve to that of rising CO₂ he concluded that:

Humans are almost entirely the cause.

⁷¹ <http://berkeleyearth.org>

⁷² <http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html?pagewanted=all&r=0>

This was not a wise statement to arrive at based on curve fitting and lining up two variables. Previous work, based on many more parameters, concluded that anthropogenic CO₂ is an important factor in the past-50 years, but not before. In conclusion, this analysis tells us nothing new about global temperatures post-1850 (although there is some interesting data about changes to the diurnal temperature range in the 20th century) and its claims of attribution due solely to mankind is unsupported. There is some fascinating data about volcanic eruptions and global temperatures prior to 1850.

'Steady Rate Of Warming'

144. In the debate about the significance of the observed global annual average temperature standstill some have argued that it has little climatic significance. Not only is it shorter than the canonical 30 years used as the minimum to deduce climatic effects, it is also unimportant because the underlying decadal rate of warming is close to the IPCC's estimate/prediction of 0.2°C per decade, and because this rate of warming has remained unchanged over the past 30 years. Thus it is maintained that global warming has not stopped even though there may be a pause in the temperature increase, or as the UK Met Office puts it: 'a recent lower rate of warming'. What we have seen in the past 15 years is therefore just variation in the rate of warming and the underlying rate of global warming is as significant today as it has always been.

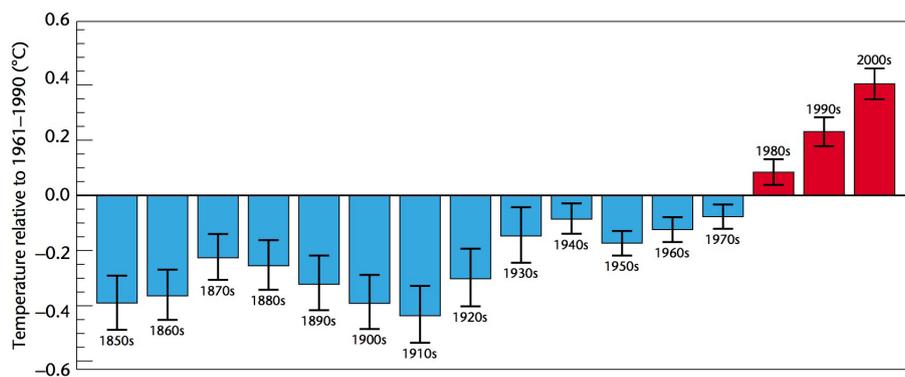


Figure 18. From the Met Office "State of the Climate".

145. The evidence for this is the average global temperature for the past three decades. The UK Met Office in their 'State of the Climate' brochure⁷³ use an oft-repeated graph that shows this underlying increase in warming (see Figure 18). It is obvious there is no pause. It is essentially this data that the head of the UK Met Office, John Hirst, used in a lecture in

73 <http://www.metoffice.gov.uk/media/pdf/m/6/evidence.pdf>

October 2012 at the University of Leeds (see Figure 19).⁷⁴ Global warming is taking place at precisely the rate expected. But there is another way to look at this data.

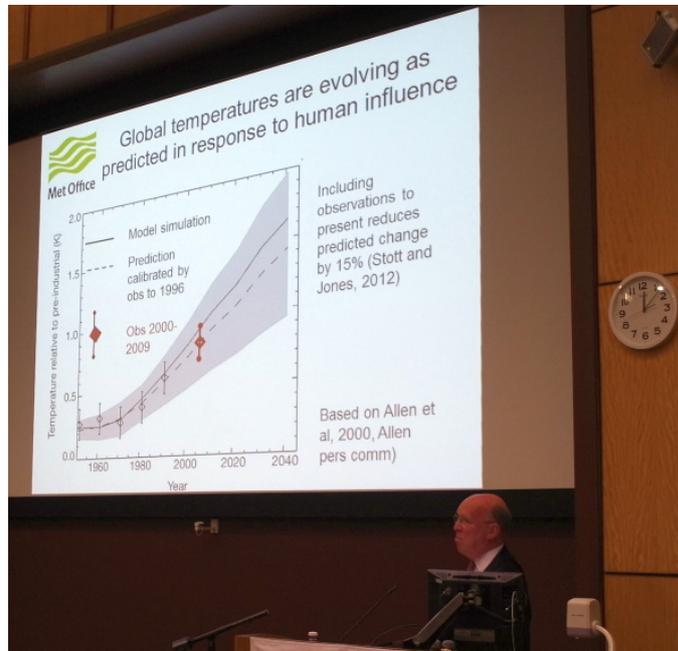


Figure 19. John Hirst and graph showing constant underlying rate of global warming. Courtesy of *Tallblokes Talkshop*.

146. Firstly, the data in the Met Office graph has been cherry-picked through the process of dividing it into decades. The climate knows nothing of a decade, which is a time interval that ultimately comes from the number of fingers we have. Imposing arbitrary points on the data set, like taking the start at 1980 and producing data for the 1980s, 1990s and 2000s, is also cherry-picking and has the disadvantage of throwing away the most recent data. There is a different way to look at this data.

147. Using the last three decades average global temperature but updating the Met Office graph to HadCRUT4 (it used HadCRUT3) one finds a steady increase – the unchanging underlying rate of global warming. However, bearing in mind the imposed constraint in the Met Office approach of decades with arbitrary start and end points, an analysis of the same HadCRUT4 data but this time using all the available data and working backwards in 5-year integrations tells a very different story, as seen in Figure 20. There is now no consistent increase in temperature seen in the data. The mid-point in the Met Office graph is now seen to be the average of the two rather different middle points. What is apparent is that the data show the global temperature has changed between two levels. Each level, of 15 years, is within one standard deviation of its mean, and the two levels are two standard deviations apart. A trendline drawn through the data is clearly unsatisfactory. The data, displayed this way, reveal that, far from showing a steady underlying rate of warming, the global temperature has had two standstills, with, curiously, the 1998 super El Niño delineating them.

⁷⁴ <http://tallbloke.wordpress.com/2012/10/07/met-office-chief-john-hirst-ignoring-hi-own-scientists-promoting-alarmism/>

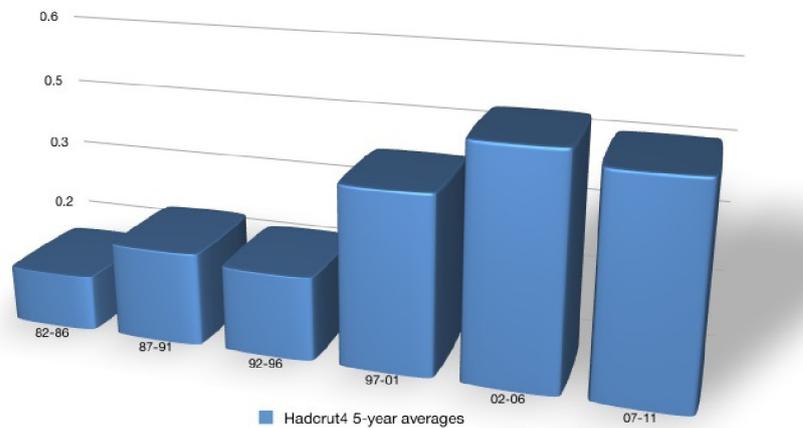


Figure 20. HadCRUT4 5-year averages ending in 2011.

148. These two ways of looking at the HadCRUT4 data (with the cherry-picking considerations) bring out differing aspects of it, but averaging over a decade is giving a misleading impression of what the data actually shows – a well known problem with averaging. The global warming of the past thirty years – the current warm period – does not show an underlying constant rate. Temperature standstills are the norm.

HadCRUT4 Updated

149. The Met Office's new global temperature database, HadCRUT4, was updated in August 2012. Previously it had been complete to 2010. When HadCRUT4 first came out it ended in 2010, the warmest year in the dataset. This was used in trend analysis to imply a recent temperature increase.⁷⁵ When I first looked at HadCRUT4, I was aware that when the 2011 data was included it would almost certainly show a reduction in global temperature, and hence alter the tone of the implications that had been inferred after HadCRUT4's debut. Looking at the differences between HadCRUT4 and HadCRUT3, whose data was up to date, I estimated that HadCRUT4 for 2011 would have an anomaly of 0.400. This attracted some criticism. When updated the HadCRUT4 dataset 2011 had a temperature anomaly of 0.399!

150. The inclusion of the official data for 2011 did not change the statistics of the HadCRUT4 database – in the last decade or so it is warmer and flatter than HadCRUT3. The recent temperature standstill is very evident. There is no statistical case to be made for a global temperature increase in the past 15 years.

151. Some still say this is cherry picking the data. But it is not cherry-picking to look at

⁷⁵ <http://www.metoffice.gov.uk/news/releases/archive/2012/hadcrut-updates>

the temperature of the recent warm spell, post-1980, and note the features evident in the data, such as El Niño, La Niña, volcanic dips and the post-1997 standstill. Perhaps the best way to deduce the length of the recent standstill is to start at the latest data and go back, year-by-year, until the hypothesis of constant temperature is violated. This leads one to 1997. It should also be noted that the length of temperature standstill considered in climate models does not stipulate any particular start and end date. It is the duration, whenever it occurs, that is the important factor.

152. A close inspection of the latest HadCRUT4 data showed some differences from the dataset that was first released in March of 2012. In the initial data set 1998 was the warmest year (though not statistically so) along with 2010 (temperature anomaly of 0.53) closely followed by 2005 at 0.52. In the update 2010 has been increased to 0.540, 2005 to 0.534 and 1998 reduced to 0.523. In fact every year in the top ten warmest years has been adjusted to some degree or other. Compared to HadCRUT3 2010 has increased by 0.07, 2005 by 0.06 and 1998 decreased by 0.006°C. None of these adjustments are, considering the errors of measurement, statistically significant, but they do affect the ranking of years, which is important if the associated errors are not considered, as is often the case in the media. The overall conclusion is that global temperature datasets are fluid and change from month to month, and this must be taken into account in any analysis. It would be nice to have explanations for such changes included with the updated data.

State Of Global Temperatures

153. The UK Met Office, on the 28th November 2012 - in time for the UN climate conference at Doha - issued a 'State of Global Temperatures in 2012' report.⁷⁶ They used three 'leading global temperature datasets' to conclude that the average temperature of 2012 was 0.45 ±0.10°C above the 1961-1990 average (see Table 1). They added that, despite there being no data for December 2012, these error bars meant that 2012 could be between the 4th and the 14th warmest year of the instrumental period, since 1850.

Year	HadCRUT4	NOAA NDCD	NASA GISS	WMO Average
2012	0.44 ±0.10	0.45	0.44	0.45
2011	0.40 ±0.09	0.41	0.44	0.42
2010	0.54 ±0.09	0.53	0.56	0.54
2009	0.49 ±0.09	0.47	0.5	0.48
2008	0.38 ±0.09	0.38	0.37	0.38
2007	0.48 ±0.09	0.46	0.52	0.49
2006	0.49 ±0.09	0.47	0.48	0.48
2005	0.53 ±0.09	0.52	0.55	0.54
2004	0.44 ±0.09	0.45	0.41	0.43
2003	0.50 ±0.09	0.49	0.49	0.49

⁷⁶ <http://www.metoffice.gov.uk/news/releases/archive/2012/global-temperatures-2012>

Year	HadCRUT4	NOAA NDCD	NASA GISS	WMO Average
2002	0.49 ±0.09	0.49	0.5	0.49
2001	0.43 ±0.09	0.42	0.42	0.43
2000	0.29 ±0.09	0.3	0.28	0.29
1999	0.3 ±0.09	0.33	0.26	0.3
1998	0.52 ±0.09	0.5	0.51	0.51
1997	0.39 ±0.09	0.39	0.34	0.37
1996	0.18 ±0.09	0.19	0.23	0.2
1995	0.32 ±0.09	0.32	0.32	0.32
1994	0.2 ±0.09	0.2	0.17	0.19
1993	0.14 ±0.09	0.14	0.07	0.12

Table 1. Recent global temperatures released by the UK Met Office in November 2012.

154. The Met Office then added that, due to a La Niña, 2012 was cooler than the average for the last decade (a statement that is not statistically correct). But what is an obvious standstill to some is to others a not-so-rapid warming, or as the Met Office put it:

Although the first decade of the 21st century was the warmest on record, warming has not been as rapid since 2000 as over the longer period since the 1970s.

155. The Met Office continued:

This variability in global temperatures is not unusual, with several periods lasting a decade or more with little or no warming since the instrumental record began.

We are investigating why the temperature rise at the surface has slowed in recent years, including how ocean heat content changes and the effects of aerosols from atmospheric pollution may have influenced global climate.

156. I beg to differ. Since instrumental temperature records began in about 1850, lengthy standstills, such as the one between 1940 and 1980, are evident. But we are not in that regime. We are supposed to be in the era of anthropogenically-dominated global warming. The IPCC put the transition between natural and anthropogenic influence as 1960-1980. Since the global temperature started to rise about 1980, and continued to 1997, this makes the lack of variability seen in global temperatures since 1997 highly unusual. Indeed, as we have said before, it is the recent warm periods major characteristic.

157. The Met Office continued:

Inter-annual variations of global surface temperature are strongly affected by the warming influences of El Niño and the cooling influences of La Niña in the Pacific Ocean.

These influences are quite small when compared to the total global warming since 1900 of about 0.8°C but nevertheless typically reach about $\pm 0.10^\circ\text{C}$, and can strongly influence individual years. A more pertinent point is that El Niño and La Niña have no effect on the global temperature standstill. Individual years go up and down due to these effects, but there is no statistically significant trend since 1997. In fact looking at the post-1997 data the El Niños and La Niñas seem to be the only statistical cause of variations from year to year. The standstill is El Niño-La Niña independent.

158. In 2011, the Met Office said⁷⁷ that 2011 placing near the top of temperature datasets continued a long-term warming trend in global climate. Taking away 2012's temperature from the recent data does not make much difference, yet at the end of 2011 the Met Office said 'the warming trend continues'. However, after just one more year of data we now have 'temperature rise at the surface has slowed'. If there is evidence that at the end of 2012 it has slowed, then there was also evidence it had slowed at the end of 2011.

Leaked AR5

159. Whatever one's view about the leaking of the draft IPCC Fifth Assessment Report (AR5), it does make fascinating reading, and given the public scrutiny it is now receiving it will be interesting to see what parts of it are changed when the final report is released. The analysis of global combined land and ocean surface temperature in AR5 is inadequate for what the IPCC admits is seen as the prime statistic of global warming. It is highly selective in the references it quotes and in the use of time periods that obscure important aspects of the temperature data. It is poorly drafted, often making a strong assertion and then somewhat later qualifying, if not contradicting, it by admitting its statistical insignificance. This leaves the door open for selective and incomplete quoting.

160. In Chapter 2 the report says that the AR4 report in 2007 said that the rate of change global temperature in the most recent 50 years was double that of the past 100 years. This is not true and is an example of cherry-picking. Why choose the past 100 and the past 50 years? If you go back to the start of the instrumental era of global temperature measurements in about 1880 (the accuracy of the data is not as good as later years but there is no reason to dismiss it, as AR5 does), then of the 0.8–0.9°C warming seen since then, 0.5°C of it, i.e. most, occurred prior to 1940 when anthropogenic effects were minimal (according to the IPCC AR4).

161. AR5 admits that of the warmest years on record the 'top ten or so years are statistically indistinguishable from one another'. This is sloppy. The 'or so' is significant and should be replaced with a more accurate statement. Despite the admitted statistical indistinguishability of the past ten years (at least) AR5 then goes on to say that 2005 and 2010 'effectively' tied as the warmest years! There is no mention of the contribution to global temperature made by the El Niño in those years!

⁷⁷ <http://www.metoffice.gov.uk/news/releases/archive/2011/2011-global-temperature>

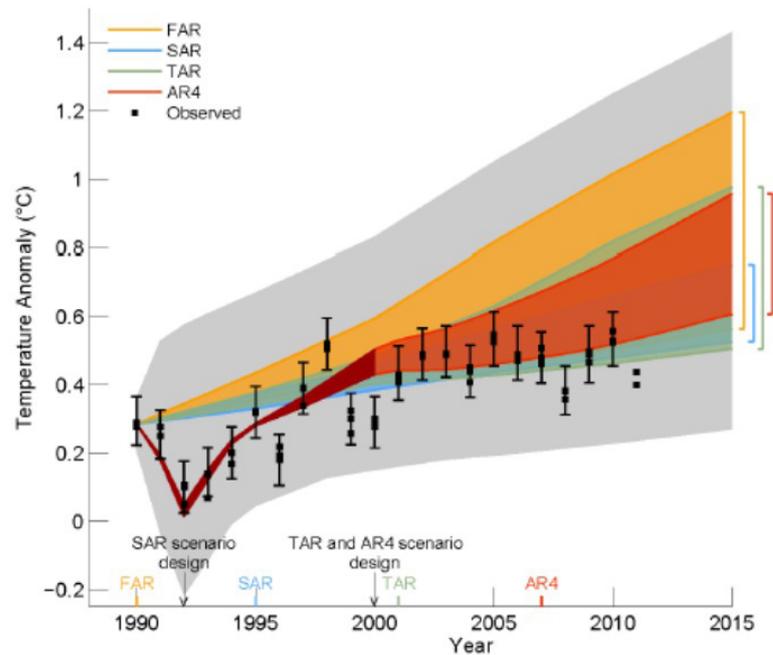


Figure 21. Draft AR5 comparison of data and climate model predictions.

162. It is in its treatment of the recent global temperature standstill that AR5 is at its most uneven handed (see Figure 21). It says that much attention has been focused on the 'apparent flattening in HadCRUT3 trends', and it says that 'similar length phases of no warming exist in all observational records and in climate model simulations'. No, it has not. The IPCC says that the time when anthropogenic influence dominated began between 1960 and 1980. AR5 takes 1979–2011 as a period for analysis when temperatures started rising after a 40-year standstill. The fact that is obvious from the data is that the past 16 years of no global temperature increase is unusual and is not an 'apparent flattening'. It is a total flattening for 16 years (as AR5 confusingly admits later on) representing just over half of the duration of the recent warming spell. Flat periods have existed before but they were in the era when mankind's influence was not significant. The 16-year flatness since mankind has been the prime climatic influence has been the cause of much discussion in the peer-reviewed literature, something that AR5 does not reflect.

163. AR5 goes on to say that with the introduction of HadCRUT4 (and its inclusion of high latitude northern hemisphere data) there is now a warming trend. No, there is not. Look at the HadCRUT4 data and, as the GWPF has demonstrated, it is warmer than HadCRUT3, but it is also flatter for the past 15 years. AR5 also adds a claim that 'all products show a warming trend since 1998'. That this is not the case seems to be something that AR5 concedes a little later in the report when it says that none of the warming trends they quote are statistically significant!

164. Consider AR5's summary:

It is virtually certain that global near surface temperatures have increased. Globally averaged near-surface combined land and ocean temperatures, according to several independent analyses, are consistent in exhibiting warming since 1901, much of which has occurred since 1979.

165. Nobody doubts that the world has warmed since 1901. But why choose 1901, and what warming is natural and what is anthropogenic?

166. AR5 says:

Super-imposed upon the long-term changes are short-term climatic variations, so warming is not monotonic and trend estimates at decadal or shorter timescales tend to be dominated by short-term variations.

Since 1979 we had has about 16 years of warming and 16 years of temperature standstill. Which is the short-term natural variation? The warming or the standstill?

167. AR5 says:

A rise in global average surface temperatures is the best-known indicator of climate change. Although each year and even decade is not always warmer than the last, global surface temperatures have warmed substantially since 1900.

Nobody, of whatever 'sceptical' persuasion would disagree with that.

168. The unacknowledged (in AR5) problem of the global temperature standstill of the past 16 years is well shown in its Figure 1.4, which shows the actual global temperature versus projections made by previous IPCC reports. It is obvious that none of the IPCC projections were any good. The inclusion of the 2012 data, which I hope will be in the final report, would make the comparison between real and predicted effects appear even starker.

169. In summary, the global temperature of the past 16 years is a real effect that in any realistic and thorough analysis of the scientific literature should be seen as a significant problem for climate science; indeed, it may currently be *the* biggest problem in climate science. To have it swept under the carpet with a selective use of data and reference material supported by cherry-picked data and timescales is not going to advance its understanding, and is also a disservice to science.

2013: An Apparent Acknowledgement

Hansen On The Standstill

170. In a report on the global temperature to the end of 2012, *Hansen, Sato and Ruedy*

(2013)⁷⁸ acknowledge the existence of a standstill in global temperature lasting a decade. According to *Hansen et al.*, the Nasa Giss database has 2012 as the ninth warmest year on record, although it is statistically indistinguishable from the last 12 years, at least. NOAA says it is the tenth warmest year. The difference is irrelevant.

171. *Hansen et al* discuss the possible contributions to global temperature in the past decade from stochastic variability and climate forcings. Personally, I do not think that the variations are demonstrably stochastic. Very early in the report Hansen makes the statement:

Global temperature thus continues at a high level that is sufficient to cause a substantial increase in the frequency of extreme warm anomalies.

To say that such an assertion is debatable is an understatement.

172. *Hansen et al.* have an explanation as to why the year was only the ninth warmest. They say that much of 2012 was affected by a strong La Niña that kept temperatures down. In fact, less than half of the year was so affected. In addition, the warming El Niños and the cooling La Niñas of the past decade or so are not responsible for the standstill in global temperatures. Rather, they provide quasi-periodic oscillations around a constant mean. Such is the lack of a trend in global temperatures that a moderate El Niño is enough to push an individual year's mean temperature to be a record, although still statistically indistinguishable from previous years.

173. *Hansen et al.* say:

Comparing the global temperature at the time of the most recent three La Niñas (1999-2000, 2008, and 2011-2012), it is apparent that global temperature has continued to rise between recent years of comparable tropical temperature, indeed, at a rate of warming similar to that of the previous three decades. We conclude that background global warming is continuing, consistent with the known planetary energy imbalance, even though it is likely that the slowdown in climate forcing growth rate contributed to the recent apparent standstill in global temperature.

174. I do not think this is a safe conclusion. Considering the last three La Niña's (1999-2000, 2008 and 2011-2012) I think it unwise to use the first one for any comparison. It occurred immediately after the very unusual El Niño of 1998 (said by some to be a once in a century event) and clearly the two subsequent La Niña years must be seen as part of that unusual event. It would be safer not to include 1999-2000 in any La Niña year comparisons. This leaves 2008 with a temperature anomaly of 0.49 and 2010-11 which has 0.66 and 0.54. That is not a great difference, and besides one should not look for trends with just two datapoints. You cannot conclude anything about background warming from this data. In addition there is no similar effect in El Niño years: 2002-2004 is 0.60-0.59, 2006-2007 is 0.59-0.62 and 2009 is 0.59. *Hansen et al.* say that the continual warming since the mid-70s has been associated with greenhouse gases. His attribution of the global temperature standstill between about 1940 and 1980 as being due to a balance between aerosol cooling and greenhouse gas warming is not as well established as they portray it.

⁷⁸ http://www.nasa.gov/pdf/719139main_2012_GISTEMP_summary.pdf

No Increase In Warming Above Current Levels

175. On 24th December 2012, the UK Met Office revised its global temperature predictions as a result of a new version of its climate model and climate simulations using it (see Figure 22). The revision was not picked up until after the Christmas break. It stated that global temperatures up to 2017 will most likely be 0.43°C above the 1971-2000 average, with an error of $\pm 0.15^\circ\text{C}$. In reality this is a forecast of no increase in global temperatures above current levels. The new forecast is a considerable change from forecasts given in the past few years.⁷⁹ An excellent comparison between the new and older forecasts can be found here.⁸⁰

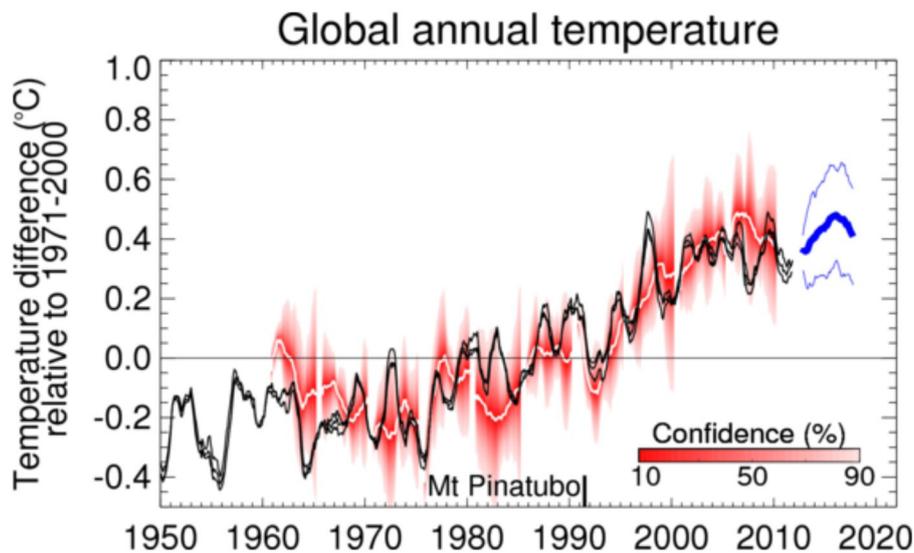


Figure 22. Met Office predictions to 2017

176. In 2007, the Met Office Hadley Centre reported⁸¹ to the UK Government that it had pioneered a new system to predict the climate a decade ahead. It said that the system simulated both the human-driven climate change and the evolution of slow natural variations already locked into the system:

We are now using the system to predict changes out to 2014. By the end of this period, the global average temperature is expected to have risen by around 0.3°C compared to 2004, and half of the years after 2009 are predicted to be hotter than the current record hot year, 1998.

177. Given that we have data for three of the five years of that period and all show no

⁷⁹ <http://web-beta.archive.org/web/20120206093904/http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-fc>

⁸⁰ <http://tallbloke.wordpress.com/2013/01/05/major-change-in-uk-met-office-global-warming-forecast/>

⁸¹ <http://www.metoffice.gov.uk/media/pdf/b/1/informing.pdf>

departure from a constant temperature⁸² when analysed statistically, this is a prediction that will probably be wrong. In any case, it is completely at odds with the new forecast. That the global temperature standstill (observed from 1997 to the present) could continue to at least 2017 would mean a 20-year period of no statistically significant change in global temperatures. Such a period of no increase coming at a time when greenhouse gas forcing is rising will pose fundamental problems for climate models.

2012 In the Top Ten - Just

178. In January 2013, the UK Met Office and the Climatic Research Unit of the University of East Anglia released the data for December in their HadCRUT3 and HadCRUT4 global temperature datasets (see Figure 23). This completed the data for 2012 and allowed it to be placed into context with preceding years. The global temperature standstill continues. 2012 was the tenth warmest year according to HadCRUT3 and the tenth warmest year in HadCRUT4 (only one thousandth of a degree warmer than 2001 – statistically insignificant). 2012 stayed in the top ten warmest years – by a statistical sliver.

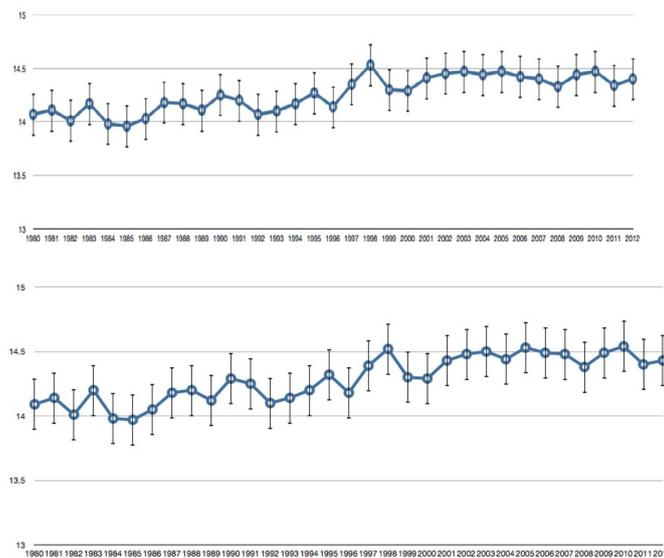


Figure 23. Met Office temperature data as at January 2013. Top, HadCRUT3; bottom HadCRUT4.

179. Statistically there has been no change in the average annual temperature of the globe since 1997, meaning that the standstill is now 16 years. The latest five-year average of HadCRUT3 and HadCRUT4 data shows a decline for the first time.

180. In February 2013, the *Real Climate* website carried out a comparison between climate

82 <http://www.thegwpf.org/2012-temperature-standstill-continues/>

models and recent data (see Figure 24).⁸³ They could not quite bring themselves to state the most obvious fact revealed in the graph they published of models and data, namely that the trend of the data is away from the average of the ensemble of climate models, and that all of the last seven annual data points lie below the climate model average. *Real Climate's* analysis also avoids mentioning the statistical indistinguishability of recent global annual temperatures.

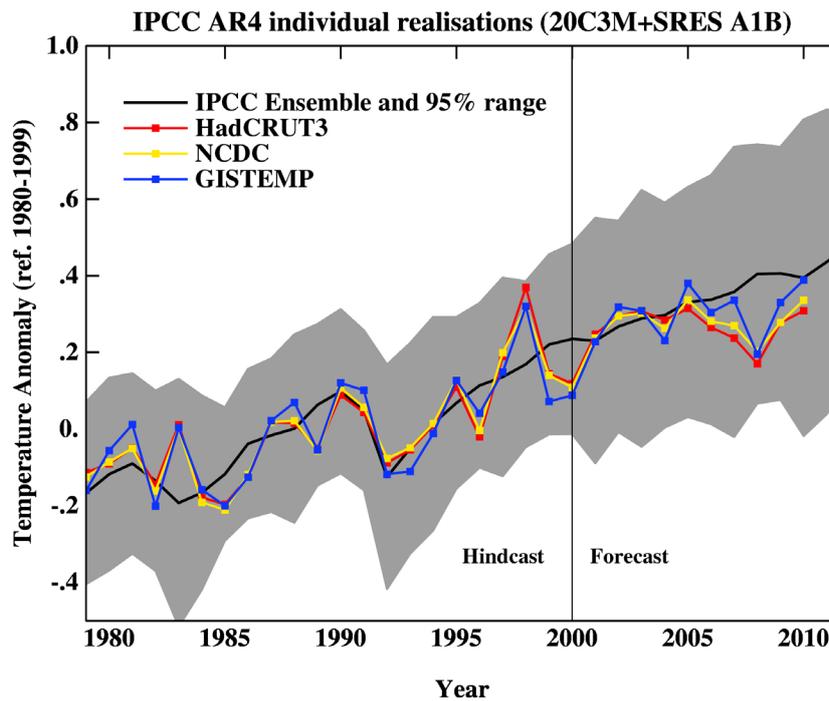


Figure 24. *Real Climate's* model-data comparison.

IPCC Recognises The Standstill

181. In an interview with *The Australian* in February, Rajendra Pachauri, the chair of the IPCC, acknowledged the reality of the post-1997 standstill in global average temperatures.⁸⁴

However, Pachauri's assertion that it will take a temperature standstill of '30-40 years at least' to affect theories of man-made global warming is without a scientific basis. The 16-year standstill already strains climate models, and if it continues for a few more years it will increasingly demonstrate that the climate models on which the IPCC has based its assumptions are inadequate.

83 <http://www.realclimate.org/index.php/archives/2013/02/2012-updates-to-model-observation-comparisons/#more-14579>

84 <http://www.theaustralian.com.au/news/nothing-off-limits-in-climate-debate/story-e6frg6n6-1226583112134>

Conclusions

182. Whether the global temperature standstill of the past 15-16 years continues, or is replaced by warming, as the IPCC predicts, only future data will tell. Meanwhile, the length of the standstill implies that the challenge it offers for models of future climate prediction, and explanations for past warming, cannot be ignored. We are on the cusp of climate model vulnerability.

183. For some, the answer is so-called decadal variations - influences on our climate that warm or cool and that take place over periods longer than a couple of years but which are not long-term trends. It would be fair to say that the study of such variations is still in its infancy, and any use of what has been learned to predict future variations in the Earth's climate is mired in uncertainty.

184. Many are in no doubt about what lies a century or so ahead. The human 'signal' of increased levels of greenhouse gasses causing higher temperatures is written into climate models, so decadal variations are seen as just short-term noise. These variations will eventually be overwhelmed by the incessant AGW climate forcing. Whatever decadal variations are doing, they will eventually, according to the standard hypothesis, be averaged out. This means, for projections of up to a century ahead, one can effectively dismiss decadal variations. In the short-term, however, the influences on the climate will be man-made and decadal, and clearly, as the past ten years have shown, natural decadal variations are far stronger.

185. We have reached the point where the temperature standstill is becoming the major feature of the recent global warming period that began in 1980. Since then, global temperature has remained constant for longer than it has been increasing. Perhaps this should not be surprising, as in the seven decades since 1940, the world has become warmer in only two of them, and in each decade individually the increase in temperature has barely been statistically significant. Only when the warming in the 1980s is added to that of the first half of the 1990s does the recent warming exceed the noise in the system.

186. But what does this 15-year temperature standstill mean? For some it means nothing. Ten to fifteen years is too short a time period to say anything about climate, they would argue, pointing out that at least thirty years is needed to see significant climatic changes. They also point out that this decade is warmer than the 1990s, and that the 1990s were warmer than the 1980s, which is a clear demonstration of the underlying rate of global warming.

187. Thirty years is generally taken as the minimum duration to delineate climate from weather. But there is no particular reason to have chosen 30 years. It could equally have been 25 or 40 years, in which case we would see 15 years of no global warming in a different climate perspective.

188. All agree that the global climate is changing constantly, within certain limits, due to the combination of anthropogenic and natural factors. Frequently the man-made factors are postulated to be responsible for climate change whereas the natural factors are taken

to be agents of climate variability. The additional greenhouse effect caused by mankind's emissions is a unique climatic forcing factor in that it is believed to operate in one direction only, that of increasing the temperature. The key point about the greenhouse effect in this context is that it depends upon one factor - the concentration of greenhouse gasses in the atmosphere.

189. In the past decade, the atmospheric CO₂ levels have increased from 370 ppm to 390 ppm. Using those figures, the IPCC once estimated that the world should have warmed by at least 0.2°C. The world's failure to warm at all means that all the other climatic factors have had a net effect of producing 0.2°C of cooling; therefore these other factors must be at least as important as anthropogenic influences.

190. The counterbalancing climatic factors have not only compensated for the postulated AGW at the end of the decade, they have kept the global annual average temperature constant throughout the past 10-15 years when the AGW effect wants to increase it. The key point that makes this constancy fascinating is that for every value of CO₂ there is an equilibrium temperature although equilibriums are never reached in the climate. In other words, the higher CO₂ concentration at the end of the decade exerts a stronger climate forcing than at the beginning of the decade.

191. This makes what has happened in the past decade all the more remarkable. Because the greenhouse effect wants to force the temperature up, which in the absence of a cooling influence is what would have happened, the fact that the temperature has remained constant indicates that whatever has been cooling the planet has had to increase in strength at precisely the same rate as the CO₂ warming, in order to keep the temperature constant. This means that for about 15 years, the combined effect of all the Earth's climate variability factors have increased in such a way as to exactly compensate for the rise in temperature that the increased CO₂ would have given us. It is not a question of the Earth's decadal climate cycles summing up to produce a constant cooling effect, they must produce a cooling effect that increases in strength at exactly the same rate as the greenhouse effect, so as to keep the Earth's temperature constant.

192. Can it really be the case that, over the past 15 years, the sum total of all the Earth's natural climatic variables, such as changes in solar irradiance, volcanoes, the Pacific Decadal Oscillation, the North Atlantic Oscillation, and the Arctic Oscillation, all of which can change from cooling to warming over decadal timescales, have behaved in such a way as to produce a cooling effect that is the mirror image of the warming postulated by the anthropogenic climate forcings from CO₂ and other greenhouse gases, from the changing water vapour, from tropospheric ozone, and from a clearing aerosol burden? Am I alone in thinking, that in the dynamically changing global climate, this looks like a contrived, indeed scientifically suspicious, situation?

193. Looking at the spread of predictions of the climate models used in the IPCC's AR4, the forecast for average warming is 0.2°C per decade centred on a Gaussian distribution with a standard deviation of about 0.14°C per decade. Thus, if one regards a measure of spread of climate models as a reasonable basis for prediction (even though different models contain different physics; they are not simply 'samples' drawn from a random distribution) there is an 8% probability of getting no increase in a ten-year period and a less than 1% chance of twenty years with no trend. At the moment, the chances of 15 years of no trend

are about 4%. Importantly, the 0.2°C per decade warming predicted by the IPCC has never been met. Rates have always been lower.

194. Jochem Marotzke, director of the Max Plank Institute for Meteorology adds:

We really do not know why this stagnation is taking place at the moment. I hardly know a colleague who would deny that it has not got warmer in recent years.

Quite a turnaround for an idea that was dismissed just a few years ago as 'wrong, completely wrong.'

March 2013

Appendix:

Global Temperature Databases:

HadCRUT3

<http://www.cru.uea.ac.uk/cru/data/temperature/HadCRUT3vgl.txt>

HadCRUT4

http://www.metoffice.gov.uk/hadobs/HadCRUT4/data/time_series/HadCRUT4_annual_ns_avg.txt

NASAGISS

http://data.giss.nasa.gov/gistemp/tabledata_v3/GLB.Ts+dSST.txt

NOAA

ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual.land_ocean.90S.90N.df_1901-2000mean.dat

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For further information about the GWPF or a print copy of this report contact:

The Global Warming Policy Foundation
1 Carlton House Terrace, London SW1Y 5DB
T 020 7930 6856
M 07553 361717
www.thegwpf.org

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