

Updates to HadCRUT global temperature dataset

19 March 2012 - The global temperature dataset compiled by the Met Office and the University of East Anglia's Climatic Research Unit has been updated.



Compiled from temperature observations obtained over land and sea, HadCRUT is used as a basis for a global temperature record going back to 1850.

The latest version of the dataset, called HadCRUT4, includes newly available data - notably adding much more information from the sparsely observed northern higher latitude region.

Differences in the way sea surface temperature observations have been collected have been taken account of and the new version also provides much more detail on uncertainty.

Colin Morice, Climate Monitoring Research Scientist at the Met Office said: "The new study brings together our latest and most comprehensive databases of land and marine temperature observations, along with recent advances in our understanding of how measurements were made at sea. These have been combined to give us a clearer picture of what the historical data can tell us about global climate change over the past 161 years.

"Updates have resulted in some changes to individual years in the nominal global mean temperature record, but have not changed the overall warming signal of about 0.75 °C since 1900."

One of the key reasons for slight changes to mean temperature for later years in HadCRUT4 is the inclusion of much more data from the Arctic, an area which is warming faster than other parts of the world.

Phil Jones, Director of the Climatic Research Unit, said: "HadCRUT is underpinned by observations and we've previously been clear it may not be fully capturing changes in the Arctic because we have had so little data from the area.

"For the latest version we have included observations from more than 400 stations across the Arctic, Russia and Canada. This has led to better representation of what's going on in the large geographical region."

Another change relates to dealing with the different ways sea-surface temperatures have been measured. This has had an effect on some years further back in the record, particularly in the mid 20th century.

Peter Stott, Head of Climate Monitoring and Attribution at the Met Office, said: "An example of this is the rapid changes in the kinds of measurements we see in the digital archives around the Second World War. Some sea surface temperature observations were taken from buckets hauled on board ships and others were made in the engine rooms.

"Research has shown readings from buckets were generally cooler so when the database changes from one source to another you see artificial jumps in the raw data. We've quantified these effects and corrected for them providing a clearer view of the evolution of global temperatures."

Annual global mean temperature record under HadCRUT3 and HadCRUT4

Rank**HadCRUT3****Anomaly (°C)****HadCRUT4****Anomaly (°C)****Uncertainty (HadCRUT4) (°C)**

| | | | | | |
|----|------|------|------|------|------|
| 1 | 1998 | 0.52 | 2010 | 0.53 | 0.10 |
| 2 | 2010 | 0.50 | 2005 | 0.53 | 0.10 |
| 3 | 2005 | 0.47 | 1998 | 0.52 | 0.09 |
| 4 | 2003 | 0.46 | 2003 | 0.49 | 0.10 |
| 5 | 2002 | 0.46 | 2006 | 0.49 | 0.09 |
| 6 | 2009 | 0.44 | 2009 | 0.49 | 0.10 |
| 7 | 2004 | 0.43 | 2002 | 0.49 | 0.09 |
| 8 | 2006 | 0.43 | 2007 | 0.48 | 0.09 |
| 9 | 2007 | 0.40 | 2004 | 0.44 | 0.09 |
| 10 | 2001 | 0.40 | 2001 | 0.43 | 0.09 |

*Anomalies are presented as temperature difference (degrees C) from the 1961 - 1990 average.



 [Peter Stott explains the changes to the HadCRUT dataset \(video transcript\) \(PDF, 120 kB\)](#)

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Updates to HadCRUT4 global temperature dataset

Peter Stott – Head of Climate Monitoring and Attribution

So HadCRUT is the global dataset that's compiled by the Met Office Hadley Centre in conjunction with the climatic research unit in the University of East Anglia. This takes in more than 5,000 weather stations from around the world and combines it with temperatures of the sea surface as measured from ships and from drifting buoys. We do this in order that we can understand what is happening in terms of the year to year variations of the global temperatures and also whether there are any long term trends in global temperatures over the last 200 years.

How and why has it changed?

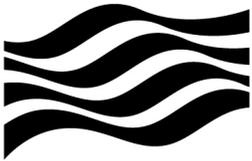
HadCRUT has changed, we have a new version and this is because in the older version, HadCRUT3, we realised that we had sparse coverage over the high latitude regions of the earth and also that there were many different ways in which sea surface temperatures have been measured over the years from taking the temperature of the water on buckets on ships to measuring the engine room intakes to more latterly measuring the temperatures from drifting buoys. In the new global temperature dataset, HadCRUT4 we've taken a much more comprehensive analysis, we have many more data in the Arctic regions and we've also made a new analysis of the sea surface temperatures which we've taken account of the many different ways in which sea surface temperatures are being measured to produce a much more comprehensive record.

What is the effect of these changes?

You can see what effect these changes have had on the record here. So this is the HadCRUT4 global temperature record going from 1850 to the present day and in red here we can see in the solid line our new best estimate of the global temperatures with our uncertainties is the band around it. If you compare with HadCRUT3, which is our previous record, you can see here this is shown in blue and you can see here that the main differences have occurred here, in the middle part of the twentieth century and then more recently in the more recent years.

Can you tell us a bit more about the key changes?

The main differences between the two occur in two places. In the middle part of the twentieth century here and in more recent years. If we look at the changes in the middle part of the century where you can see that HadCRUT4 in red is generally a bit warmer than HadCRUT3. This is because of our new analysis of the different ways in which our sea surface temperatures have been measured in time. The most important issue here is related to the particular drop off in temperatures seen at the end of the second world war in the HadCRUT3 temperatures. This was associated with the fact that following the war there were many more British ships measuring using the method of hauling in buckets over the sides of ships and this leads to cooler temperatures because of evaporative cooling of the temperatures in the bucket. These are cooler temperatures than would be measured by drifting buoys or by the engine room intakes in ships.



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So in this new analysis we have taken account of that and that means that the temperatures globally are slightly warmer than the middle part of the twentieth century. If we look at more recent years, what we have now been able to get are new data for the Russian region and the Arctic region. Now this is a region of the Earth that is relatively poorly observed, we have relatively few weather stations so with these new stations we are better able to measure what is happening at the higher latitudes of the Earth. In fact the high latitudes in the northern hemisphere are warming more rapidly than the global average and while this has resulted in our new HadCRUT4 global temperatures, as you can see the temperatures are slightly warmer than they were in HadCRUT3. But overall the message in the longer terms from both of these records means the same and as you can see that there's been an overall warming of about three quarters of a degree since nineteen hundred.