2014: The hottest year on record

11:22 AM Saturday Jan 17, 2015
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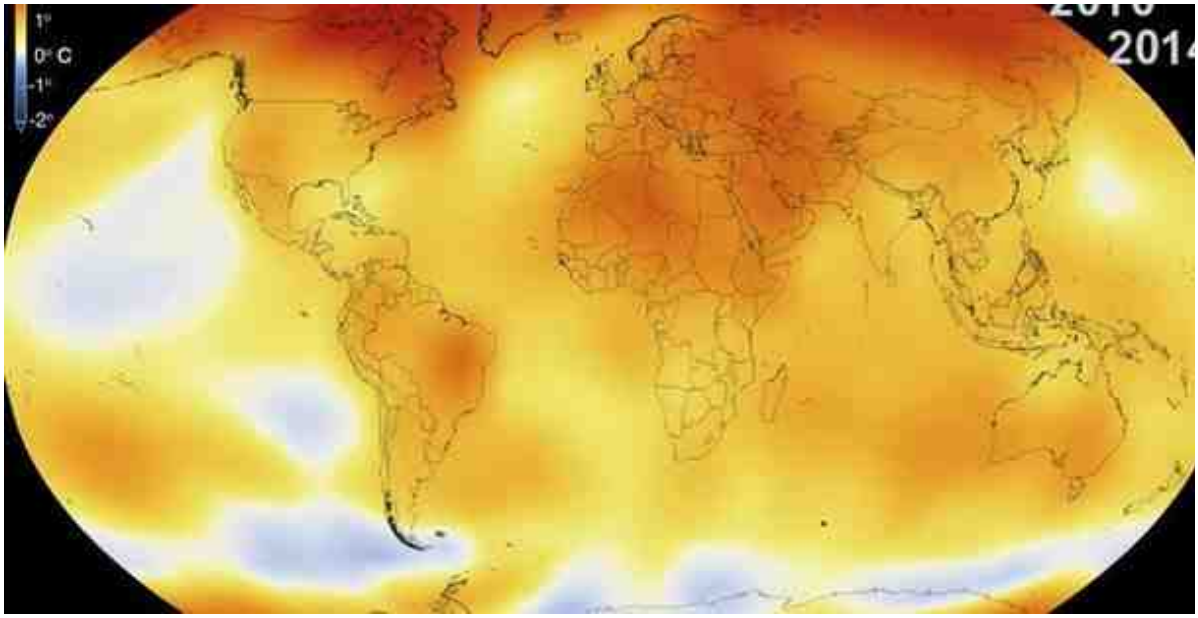

Last year was the Earth's warmest since 1880. With the exception of 1998, the 10 hottest years on record have occurred since 2010. Photo / still via Youtube

Global temperatures last year were the highest since records began in 1880, US scientists claim.

Temperatures across the world averaged 0.8°C (1.4°F) above 20th century averages - making 2014 the warmest year in records dating back 134 years.

The Met Office has already announced that 2014 was the hottest year for the UK in records dating back to 1910.

In an independent analysis of the raw data, released today, Noaa (National Oceanic and Atmospheric Administration) scientists also found 2014 to be the warmest on record.

Nasa scientists claim their analysis of surface temperature measurements suggests the long-term warming of the planet.

John Grunsfeld, associate administrator for the Science Mission Directorate at Nasa headquarters in Washington, said: 'The observed long-term warming trend and the ranking of 2014 as the warmest year on record reinforces the importance for Nasa to study Earth as a complete system, and particularly to understand the role and impacts of human activity.'

Since 1880, Earth's average surface temperature has warmed by about 0.8°C (1.4°F) over the 20th century average, which Nasa's scientists said is a trend that's largely driven by the increase in carbon dioxide, and other human emissions into the planet's atmosphere.

The majority of that warming has occurred in the past three decades, they claim.

Gavin Schmidt, Director of Nasa's Goddard Institute of Space Studies (GISS) in New York, said: 'This is the latest in a series of warm years, in a series of warm decades.
'While the ranking of individual years can be affected by chaotic weather patterns, the long-term trends are attributable to drivers of climate change that right now are dominated by human emissions of greenhouse gases.

Despite 2014 temperatures continuing the planet's long-term warming trend, scientists still expect to see year-to-year fluctuations in average global temperature caused by events such as El Niño or La Niña.

These phenomena warm or cool the tropical Pacific and are thought to have played a role in the flattening of the long-term warming trend over the past 15 years.

However, 2014's record warmth occurred during an El Niño-neutral year.

Noaa analysis found that regional differences in temperature are more strongly affected by weather dynamics than the global average.

For example, in the US last year, parts of the Midwest and East Coast were unusually cool, while Alaska and three western states -California, Arizona and Nevada - experienced their warmest year on record.

Nasa's analysis incorporated surface temperature measurements from 6,300 weather stations including from Antarctic research stations and sea surface temperatures from ship and buoy-based operations.

Scientists analysed the raw data using an algorithm that takes into account the varied spacing of temperature stations around the globe and urban heating effects that could skew the calculation. The result is an estimate of the global average temperature difference from a baseline period of 1951 to 1980.

While Noaa researchers used much of the same raw temperature data, they used a different baseline period and their own method to estimate global temperatures, but came to the same worrying conclusion.
Bob Ward, policy director of the Grantham Research Institute at the London School of Economics, said: 'The new global temperature record announced today completely exposes the myth that global warming has stopped.

'There is mounting evidence all around the world that the Earth is warming and the climate is changing in response to rising levels of greenhouse gases in the atmosphere.

'No politician can afford to ignore this overwhelming scientific evidence or claim that global warming is a hoax.'

The average temperature across Britain in 2014 was 9.9°C (49.8°F), some 1.1°C (2°F) above the long term average of 8.8°C (47.8°F), making it warmer than the previous record year of 2006.

The Met Office said the weather record of one individual year cannot be attributed to man-made

global warming.

But it also points out that climate change makes warm years more likely than not.

- The Daily Mail

3 December 2014 Last updated at 15:02
Article written by David Shukman Science editor

World on course for warmest year

This year is in the running to be the hottest globally and for the UK since records began, early estimates show.

In the first 10 months of 2014, global average air temperature was about 0.57 Celsius above the long-term average.

And the first eleven months in the UK have produced an average temperature 1.6C above the long-term.

A separate study by the UK Met Office says the observed temperatures would be highly unlikely without the influence of greenhouse gases produced by humans.

The global figures come in estimates from the UN's World Meteorological Organisation (WMO).

If this year's current global trend continues for the next two months, the previous record years of 1998, 2005 and 2010 will be overtaken by a narrow margin.

The Secretary-General of the WMO, Michel Jarraud, said the preliminary data for 2014 was "consistent with what we expect from a changing climate."

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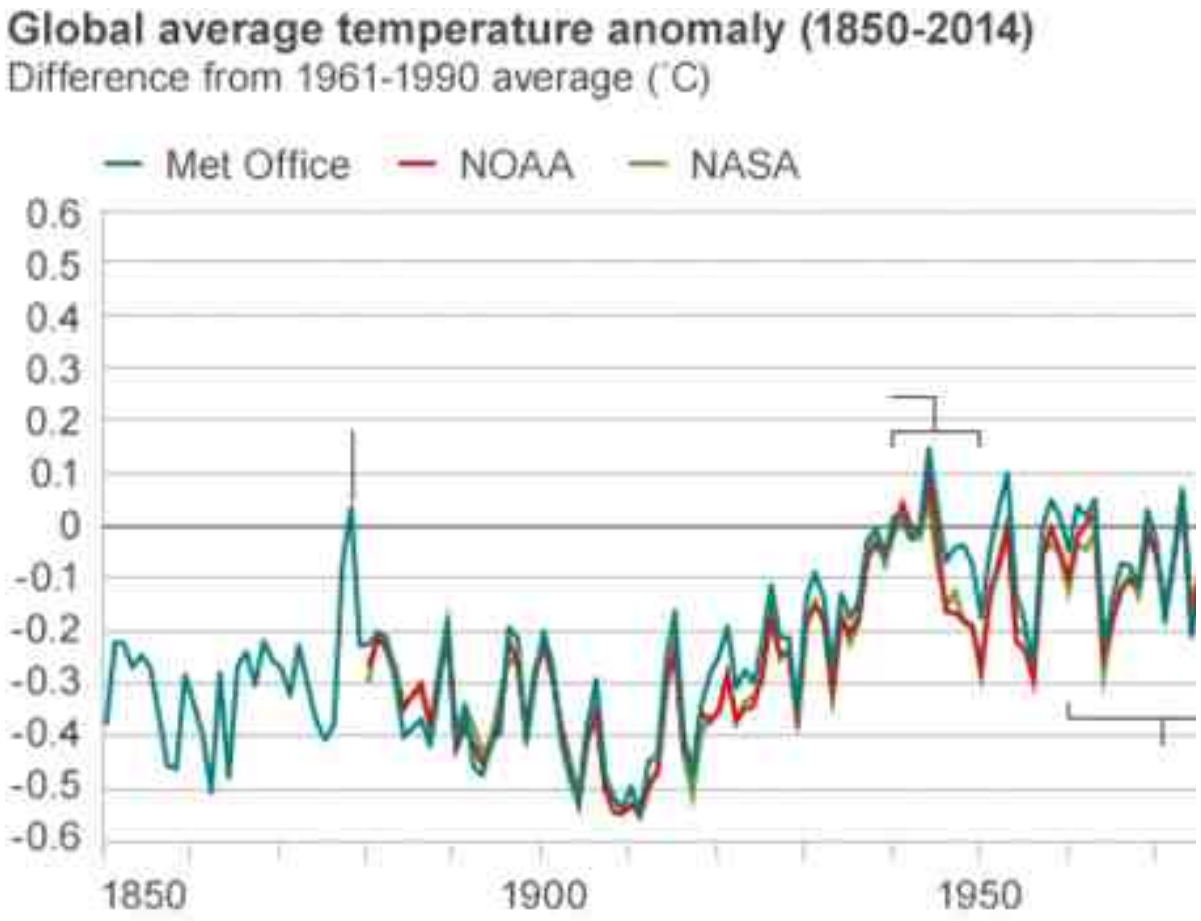

Source: Met Office

Strong El Nino

Weaker El Nino

Philippines volcano

El Nino effect

Cooler years

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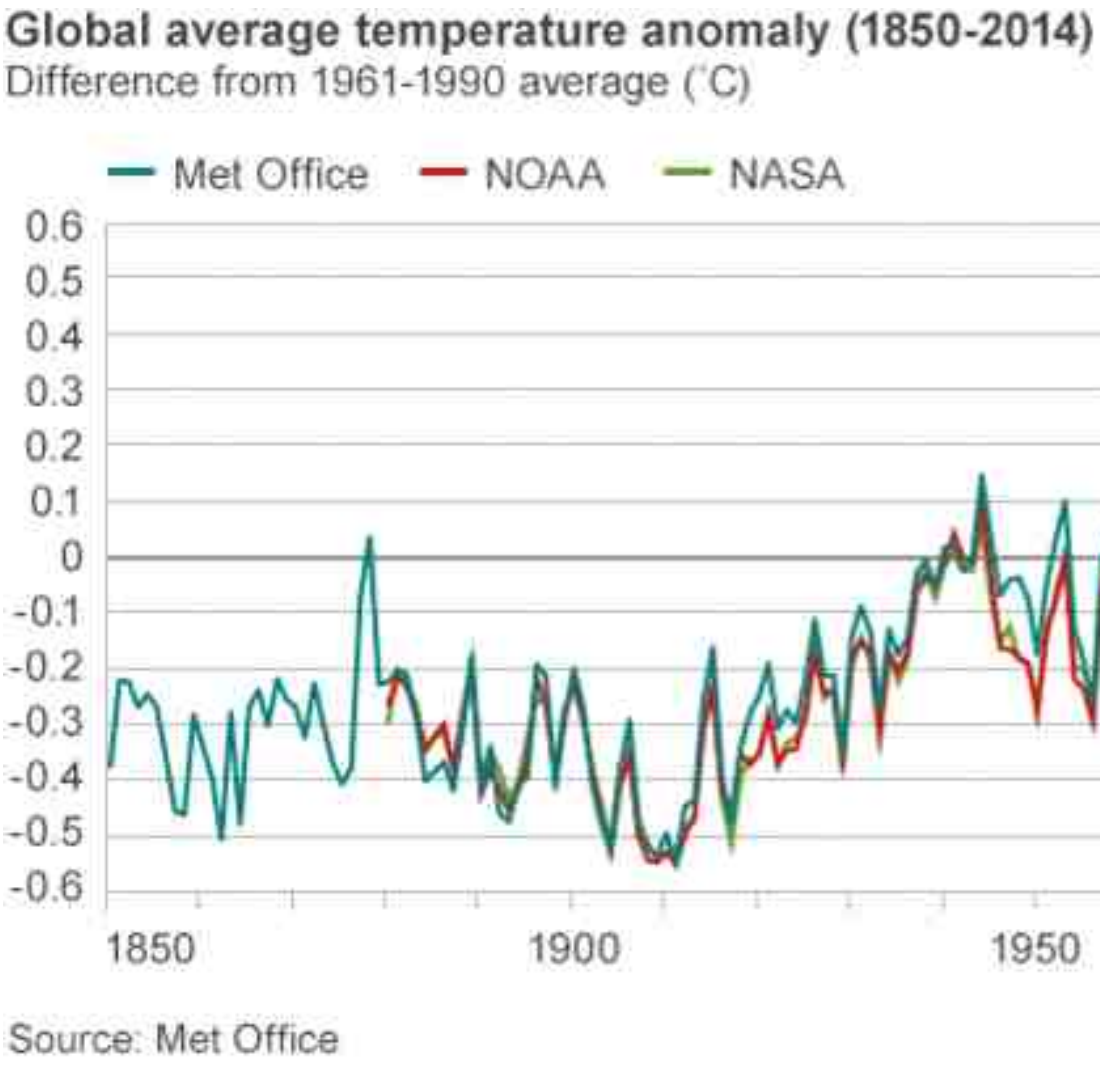

- ## 1878: Strong El Nino

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In 1878, there was a strong El Nino (where warmer water rises to the surface of the Eastern Pacific Ocean) and this is seen very clearly as a large spike in global temperature. This event was remarkable for an extreme drought in India where it is an estimated more than five million people died. There were droughts in nothern China also associated with this El Nino. The famine caused by the drought in India spurred scientists to begin work on climate patterns, leading eventually to discovery of the El Nino-related “Southern Oscillation” - the idea that the ocean and atmosphere are connected.

- ## 1940s: Weaker El Nino

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The warm early 1940s were affected by a weaker, but protracted, El Nino.

- ## 1991: Mt Pinatubo eruption

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In June 1991 Mt Pinatubo in the Philippines erupted, releasing millions of tons of

sulphur dioxide into the atmosphere. This resulted in a decrease in the temperature worldwide.

- ## 1998: Record-breaking year

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  For a long time. the strong El Nino around 1997/98 meant that 1998 topped the rankings for the world's warmest year. This has since been overtaken.

- ## 1960/70s: Cooler years

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  The cool 1960s and 1970s are likely to have resulted at least partly from man-made air pollution from sulphate particles. Steps taken towards cleaner air resulted in warming.

In comments released with the new figures, he said:

"The provisional information for 2014 means that fourteen of the fifteen warmest years on record have all occurred in the 21st century."

In unusually strong language, Mr Jarraud highlighted the impacts of the weather extremes.

"Record-breaking heat combined with torrential rainfall and floods destroyed livelihoods and ruined lives. What is particularly unusual and alarming this year are the high temperatures of vast areas of the ocean surface, including in the northern hemisphere."

And he asserted that the new figures confirm the key trend in climate change: "There is no standstill in global warming."

This is a reference to the hotly-debated "pause" in global warming which has seen no major increases in temperature since 1998.

A year of extremes

The WMO report highlights a number of record-breaking weather events around the world:

- The UK's last winter in which 12 major Atlantic storms battered the country bringing nearly double the usual rainfall.
- In September, parts of the Balkans received more than double the monthly rainfall and parts of Turkey were hit by four times the average.
- The town of Guelmin in Morocco was swamped by more than a year's rain in just four days.
- Western Japan saw the heaviest August rain since records began.
- Parts of the western United States endured persistent drought (as we reported from Oklahoma last June, as did parts of China and Central and South America.
- Tropical storms, on the other hand, totalled 72 which is less than the average of 89 judged by 1981-2010 figures. The North Atlantic, western North Pacific and northern Indian Ocean were among regions seeing slightly below-average cyclone activity.

The provisional record for 2014 is only slightly higher than for the previous record year of 2010 - one-hundredth of a degree - which was 0.56C above the long0-term average.

However climate scientists point out that all but one of the warmest 15 years have come in this century.

This suggests that although there have been no big jumps in temperature in the past 16 years, the period as a whole is proving to be exceptionally warm.

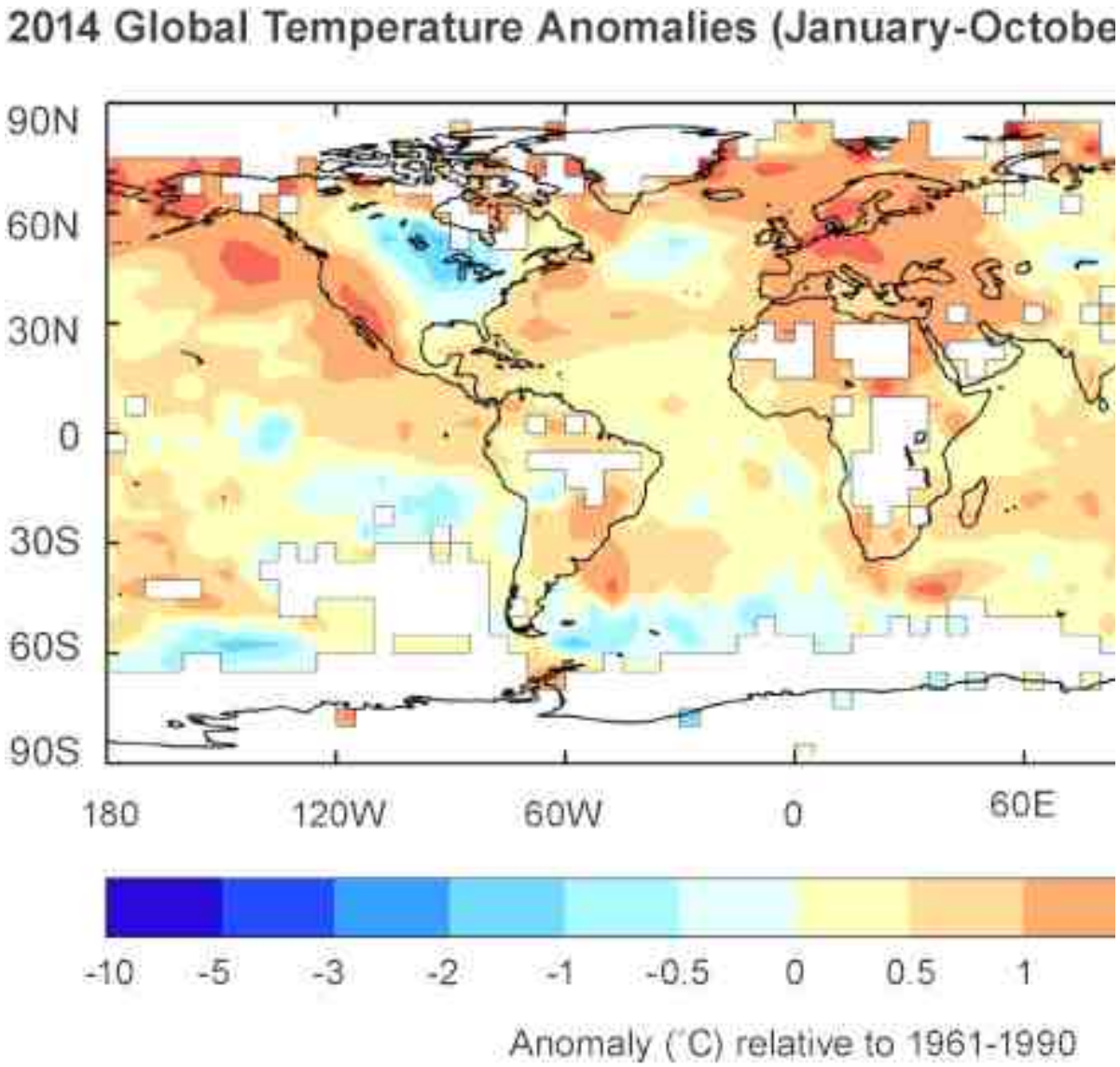
The waters of the eastern Pacific are among those to have warmed significantly - a situation which might normally be expected to trigger so-called El Nino conditions that often boost global warmth. However, puzzlingly for scientists, these have yet to materialize.

So if 2014 does prove to set a new record for global average temperatures, it will have been without the warming contribution of an El Nino.

For the UK, temperatures so far this year suggest the country is on course for a new record -

judged by data stretching back to 1910.

And there may also be a new high in the longer-running Central England Temperature record - which started in 1659.

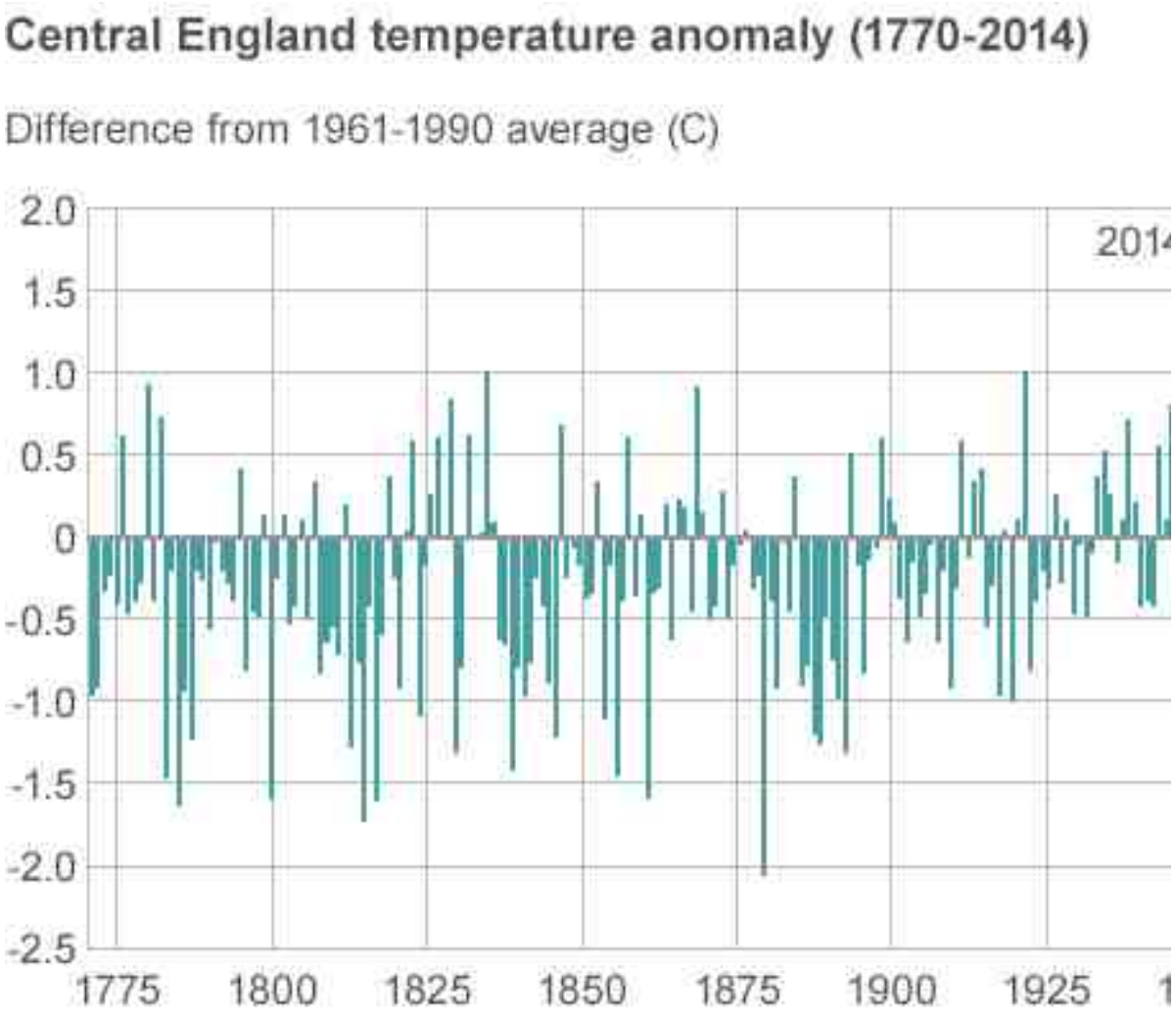


Although no single month in 2014 has set a new record, every month except August has seen above-average temperatures so the whole year so far has been consistently warm.

Meanwhile, the Met Office has studied the extent to which manmade greenhouse gases are behind the warming.

A paper issued to coincide with the WMO figures says that although "one warm year does not necessarily say anything about long-term climate change" new research shows how human influence made record temperatures more likely.

Met Office scientists ran computer models of two versions of the climate - one with data drawn from real conditions and the other with simulations of the atmosphere in which the greenhouse gases had been removed.



Source: Met Office

The results were used to calculate a measure known as a "Frequency of Attributable Risk" (FAR) to describe the likelihood of a human influence in warming.

For the UK, the models show that this year's potential record temperature was made ten times more likely because of the presence of carbon emissions in the atmosphere.

Adam Scaife, a Met Office scientist involved in the research, told the BBC about the results on a global scale:

"It turns out to be very unlikely to have the temperatures we've seen this year in the world where we've artificially removed the anthropogenic carbon dioxide.

"In the world that would have been, it's very unlikely that we'd see the temps we're seeing now."

The WMO's report on the state of the global climate is published every year to coincide with the UN's annual negotiations on climate change, this time under way in Lima in Peru.