Late 20th century was warmest in 1,400 years

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A Belarus man cools down in a fountain during a hot summer day in Minsk on July 11, 2010. Earth was cooling until the end of the 19th century and a hundred years later, the planet's surface was on average warmer than at any time in the previous 1,400 years, according to climate records presented on Sunday.

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In a study spanning two millennia published in *Nature Geoscience*,

scientists said a "long-term cooling trend" around the world swung into reverse in the late 19th century.

In the 20th century, the average global temperature was 0.4 degrees Celsius (0.7 degrees Fahrenheit) higher than that of the previous 500 years, with only Antarctica bucking the trend.

From 1971-2000, the planet was warmer than at any other time in nearly 1,400 years.

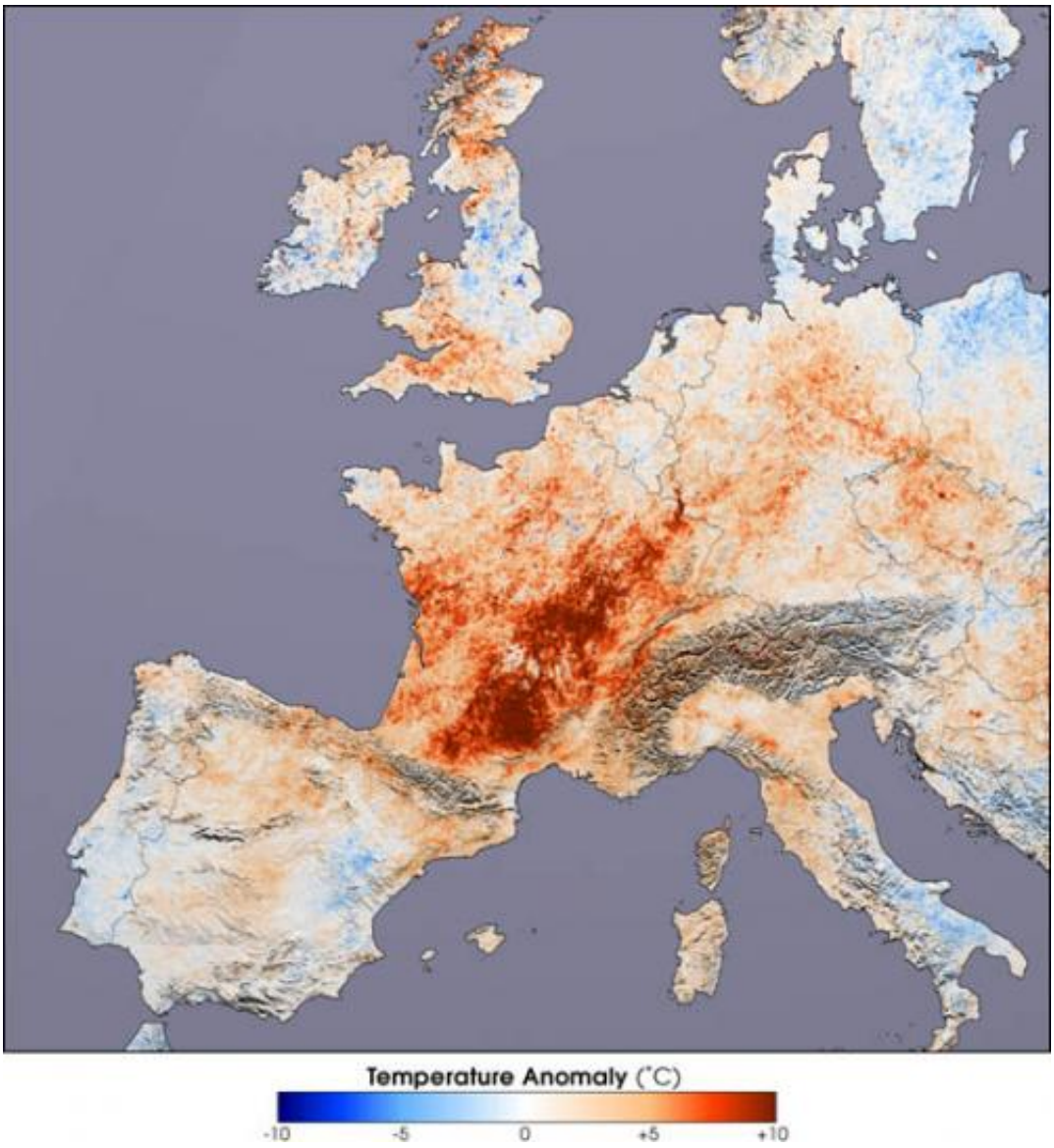
This measure is a global average, and some regions did experience warmer periods than that—but only for a time. Europe, for instance, was probably warmer in the first century AD than at the end of the 20th century.

The investigation is the first attempt to reconstruct temperatures over the last 2,000 years for individual continents.

It seeks to shed light on a fiercely-contested aspect in the global-warming debate.

Sceptics have claimed bouts of cooling or warming before the Industrial Revolution—including two episodes in Europe called the Medieval Warm Period and the Little Ice Age—are proof that climate variations are natural, not man-made.

The new study does not wade into the debate about greenhouse gases, but points to two planetary trends.



During Europe's 2003 heat wave, July temperatures in France were as much as 18 degrees F hotter than in 2001. Credit: NASA

The first is a clear, prolonged period of cooling. It may have been caused by a combination of factors, including an increase in volcanic activity, with stratospheric ashes reflecting the sunlight, or a decrease in solar activity or tiny changes in Earth's orbit, both of which would diminish sunlight falling on the planet.

The cooling—between 0.1-0.3 C (0.2-0.6 F) per thousand years, depending on the region—went into reverse towards the end of the 19th century, and was followed by an intensifying period of warming in the 20th, the paper said.

Beneath this global trend over 2,000 years were episodes of continental cooling or warming, some of which were quite long.

And some continents lagged the overall planetary trend, but with the exception of Antarctica, all followed it.

"Distinctive periods, such as the Medieval Warm Period or the Little Ice Age stand out, but do not show a globally uniform pattern on multi-decadal time scales," said Heinz Wanner of the University of Bern in Switzerland, one of 78 researchers from 24 countries who took part in the project.

"There are things that are common to all the regions of the planet—long-term cooling, until the 19th century, followed by warming on all continents, except for Antarctica, where it is less clear, but also strong variations from one region to another," Hugues Goosse, a climatologist at Belgium's Catholic University of Leuven, told AFP.

Previous research into climate change has pointed to a warming spurt in the 20th century and attributed it to the rise of heat-trapping carbon gases emitted by burning coal, oil and gas.

The warming trend shifted up a gear in the middle of the 1970s, in line with record-breaking levels of carbon dioxide (CO_2), according to this past research.

2012 saw the 36th straight year that global temperatures were above average since 1880, when scientifically acceptable records were first

kept, and was the ninth or 10th warmest on record, US scientists said in January.

The temperature reconstruction published on Sunday was coordinated by a scientific initiative called the Past Global Changes (PAGES) 2K Network.

It brings together weather data as well as telltales of temperature variation from tree rings, pollen, corals, lake and marine sediments, ice cores and stalagmites garnered at 511 locations across seven continental-scale regions.

Climate records for Africa, though, were sparse, the researchers cautioned.

More information: Paper: DOI: 10.1038/ngeo1797