July was Earth's hottest month on record

By Kendall Trammell, CNN

Updated 2011 GMT (0411 HKT) August 15, 2019

(CNN) Earth faced unprecedented heat in July, its hottest month on record, according to the National Oceanic and Atmospheric Administration.

July's temperature across land and ocean surfaces worldwide was 1.71 degrees Fahrenheit above the 20th-century average of 60.4. It was the highest for July since records began in 1880, besting the record set in 2016 by 0.05 degrees. Some of the significant temperature differences were seen across Alaska, central Europe, northern and southwestern parts of Asia, and parts of Africa and Australia. Temperatures were at least 2.7 degrees Fahrenheit above the average.

Nine of the 10 warmest Julys have occurred since 2005, with the past five years being the five warmest on record. A contributing factor: July is typically the world's warmest month of the year. However, temperatures in parts of Scandinavia and western and eastern Russia were at least 2.7 degrees below average last month.

Sea ice set a record low

July's record high temperatures affected the Arctic's sea ice rates, as well.

The sea ice extent set a record low for July, appearing 19.8% below average, beating the record of July 2012, according to an analysis by the National Snow and Ice Data Center using data from NOAA and NASA. Last month’s Antarctic sea ice extent was also the smallest for July in the 41-year record.

July confirmed as hottest month recorded

By Isabelle Gerretsen, CNN

Updated 1849 GMT (0249 HKT) August 5, 2019

The July record comes after a period of extremely hot weather around the world which has triggered mass melting of Greenland's ice sheet.
Story highlights

July 2019 has replaced July 2016 as the hottest month on record, with meteorologists saying that global temperatures marginally exceeded the previous record.

The European Union’s Copernicus Climate Change Programme, which analyzes temperature data from around the planet, said that July was around 0.56 °C warmer than the global average temperature between 1981-2010.

That’s slightly hotter than July 2016, when the world was in the throes of one of the strongest El Niño events on record. El Niño events are characterized by warming of the ocean waters in the Pacific Ocean and have a pronounced warming effect on the Earth’s average temperature.

Though there was a weak El Niño in place during the first part of 2019, it is transitioning to a more neutral phase, making the extreme July temperatures even more alarming.

Photos: The effects of climate change on the world
Florida – A flooded street in Miami Beach in September 2015. The flood was caused by a combination of seasonal high tides and what many believe is a rise in sea levels due to climate change. Miami Beach has already built miles of seawalls and has embarked on a five-year, $400 million stormwater pump program to keep the ocean waters from inundating the city.

Jean-Noël Thépaut, head of the Copernicus program, said: "While July is usually the warmest month of the year for the globe, according to our data it also was the warmest month recorded globally by a very small margin."

"With continued greenhouse gas emissions and the resulting impact on global temperatures, records will continue to be broken in the future," he added.

According to Copernicus, 2015 through 2018 have been the four warmest years on record. April, May and July this year all ranked among the warmest on record for those months, and this June was the hottest ever.

Freja Vamborg, a senior scientist at Copernicus, told CNN last week that the data suggested we are on track for the second-hottest year ever, after 2016.

The temperature record was close to 1.2 degrees Celsius above pre-industrial levels.

This means we are rapidly approaching the crucial threshold of 1.5 degrees, which will precipitate the risk of extreme weather events and food shortages for hundreds of millions of people.

The UN Intergovernmental Panel on Climate Change warned last year that we have until 2030 to avoid such catastrophic levels of global warming and called on governments to meet their obligations under the landmark 2015 Paris Agreement.
Almost 200 countries and the European Union have pledged to keep the global temperature below 2 degrees Celsius as part of the Paris Agreement.

Petteri Taalas, secretary-general of the World Meteorological Organization, said last week that this July has “rewritten climate history, with dozens of new temperature records at the local, national and global level.”

Photos: In pictures: Water crisis and heatwave in India
Civic workers remove dead fish floating at a partially dried up lake in Ambattur, Chennai, India, Tuesday, June 18.

The July record comes after a period of extremely hot weather around the world. Intense heat waves have swept Europe this summer, breaking temperature records in at least a dozen countries. Scientists have warned that the world should expect more scorching heat waves and extreme weather due to climate change.

Europe wasn’t the only region baking in July. Anchorage, Alaska, recorded its hottest month ever, and extreme heat helped facilitate "unprecedented" wildfires in the Arctic and triggered mass melting of Greenland’s ice sheet.

"This is not science fiction. It is the reality of climate change. It is happening now, and it will worsen in the future without urgent climate action. Time is running out to rein in dangerous temperature increases with multiple impacts on our planet," Taalas stressed.
Europe’s heat wave is about to bake the Arctic

Concerns grow regarding sea ice and Greenland’s ice sheet.

On Friday, more temperature records are falling in Europe as the historic heat wave that brought the hottest weather ever recorded in Paris, London, the United Kingdom, Belgium, the Netherlands and Germany shifts northward. In a few days, the weather system responsible for the heat wave will stretch all the way across the top of the globe.

It’s what this system, characterized by a strong area of high pressure aloft — often referred to as a heat dome — will do to the Arctic that has some scientists increasingly concerned.

Norway, Sweden and Finland will experience unusually high temperatures through the weekend, as a potentially record strong area of high pressure in the mid-levels of the atmosphere sets up over the region, blocking any cold fronts or other storm systems from moving into the area, like a traffic light in the sky.

Temperatures in parts of Scandinavia will reach into the 90s or higher, on the heels of an intense heat wave in 2018 that led to an outbreak of damaging wildfires.

Bergen, Norway, already set an all-time record high Friday with a temperature of 91 degrees
(32.8 Celsius).

Accelerating Arctic ice melt

So far this year, Arctic sea ice extent has hovered at record lows during the melt season. Weather patterns favorable for increased melt have predominated in this region, and an unusually mild summer has also increased melting of the Greenland ice sheet. Unlike with sea ice melt, runoff from the Greenland ice sheet increases sea levels, since it adds new water to the oceans.

If the entire ice sheet were to melt, it would raise global average sea levels by 23 feet.

Ruth Mottram, a researcher with the Danish Meteorological Institute, tells The Washington Post that as the high-pressure area, also referred to as a “blocking ridge,” sets up over Greenland, it could promote a widespread and significant melt event like the one in 2012. During that summer, nearly all of the ice sheet experienced melting, including the highest elevations that rarely exceed 32 degrees.

“Assuming this comes off (and it seems likely) we would expect a very large melt event over the ice sheet,” Mottram said via email. “This was a very similar situation to 2012 where melt reached all the way up to Summit station. As you have probably seen the Arctic sea ice is already at record low for the time of year so clearly we may be looking at a situation where both Arctic sea ice and Greenland ice sheet have record losses even over and above 2012 — though we won’t know for sure until after the event.”
What happens next to the extreme #europeheatwave? Actually, the atmospheric flow will transport the heat towards #Greenland, resulting in high temperatures, consequently enhanced melting and a negative #SMB (surface mass balance) next week. Make sure to watch the @PolarPortal! pic.twitter.com/e4kvMVVNIo

— Martin Stendel (@MartinStendel) July 26, 2019

Zack Labe, a climate researcher at the University of California at Irvine who focuses on Arctic climate change, says the upcoming Arctic heat wave could have major ramifications and may push sea ice to another record low at the end of the melt season.

“This appears to be a very significant event for the Arctic,” he says.

“A massive upper-level ridge will position itself across the North Atlantic and eventually Greenland in the next few days. This negative North Atlantic Oscillation-like pattern will be associated with well above average temperatures in Greenland. In fact, simulations from the MARv3.9 model suggest this may be the largest surface melt event of the summer,” Labe said, referring to a computer model projection of surface ice melt in Greenland.

"Whether or not we set a new record low this year, the timing and extent of open water on the Pacific side of the Arctic has been unprecedented in our satellite record. This is already having significant impacts to coastal communities in Alaska and marine ecosystems,” Labe said.

Elsewhere in the Arctic, this summer has been similarly extreme.

Smoke from Alaskan wildfires carried north towards Beaufort and Chukchi Sea, #Alaska, #USA, 25 July 2019 Enhanced natural colors #Copernicus #Sentinel-3 Full-size: https://t.co/tPjHRaAxX#RemoteSensing #wildfire #AirQuality pic.twitter.com/wgTAMviKKC

— Pierre Markuse (@Pierre_Markuse) July 26, 2019

Alaska had its warmest June on record, and more than 2 million acres have gone up in flames across the state as a result of a long stretch of above-average temperatures.

Arctic-wide, an unusual spate of wildfires is burning, affecting vast stretches of Siberia, as well. Smoke from these fires is circling the globe, tracked via satellite imagery.

These fires are also emitting greenhouse gases such as carbon dioxide.

Europe heatwave: Paris latest to break record with 42.6C

Paris saw a record high temperature of 42.6C (108.7F) on Thursday, amid a heatwave that broke records across Western Europe.

A red alert was issued in north France. Germany also set a new national temperature record of 41.5C, passing the figure set just a day before.

The UK recorded a record temperature for July of 38.1C, with trains told to run more slowly to stop rails buckling.

Europe heatwave: Records tumble in Belgium, Germany and
Belgium, Germany, and the Netherlands have recorded their highest ever temperatures, in a heatwave searing Western Europe.

The Belgian town of Kleine Brogel hit 39.9°C (102°F), the hottest since 1833.

The southern Dutch city of Eindhoven beat the 75-year-old national record with a new high of 39.3°C.

Germany's weather service said a new record of 40.5°C - just 0.2°C higher - had been set in Geilenkirchen, near the Belgian and Dutch borders.

Amid the sweltering temperatures, a Eurostar train broke down, trapping passengers.

French reports suggested five deaths might have been linked to the heatwave.

The highest temperature recorded in Paris - 40.4°C in 1947 - is expected to be surpassed on Thursday.
Eindhoven.
In Kleine Brogel, the record was broken early in the afternoon at 38.9C but the temperature continued to climb to 39.9C by 17:00 (15:00 GMT).
Belgium has issued a code red weather warning for the whole country.

Skip Twitter post by @Killed_Mufasa

Killed_Mufasa
@Killed_Mufasa

It's so hot outside that the weather folks have ran out of colours so they're just reusing purple :D #hitte #heatwave
A big bridge at the Dutch port of Rotterdam was being sprayed to prevent the metal expanding in the heat. Much of France was also sweltering. La chaîne météo reported that the temperature in several areas had climbed above 40C. Pont-la-Ville in the eastern area of Haute-Marne reached 41.2C while Vassincourt to the north-east reached 40.5C.

**A guide to coping with hot weather**

Last four years are 'world's hottest'

Thursday could see 42C in the French capital. Authorities launched a red alert in the Paris region and 19 other French departments, calling for "absolute vigilance", and comparisons were drawn to a heatwave in August 2003, during which heat contributed to almost 15,000 deaths.

**Record temperatures expected across Europe**

![Temperature map of Europe](image)

In Luxembourg, temperatures were close to 40C and drivers were told to reduce their speeds because of the risk of smog. Spain declared a red alert in its Zaragoza region, which was hit by devastating wildfires last month. The European Commission’s Copernicus Climate Change Service says the risk of wildfires is high in Spain and in Portugal.

In the UK, temperatures are predicted to exceed 35C, and could be the highest ever recorded.

**What preparations are being made?**

To limit the heating of water used to keep its nuclear reactors cool, French energy firm EDF said it would be shutting two reactors at the Golftech nuclear power plant in the southern Tarn-et-Garonne region.

Ice foot baths and extra water points are being made available to cyclists competing in the Tour de France - which is entering its final week - to avoid dehydration.

The French government is outlawing animal transportation "for economic reasons" between 13:00 (11:00 GMT) and 18:00 in areas affected by heat alerts.

**How high have temperatures been already?**

The French weather service has reported temperatures of 42C in areas of the south-west. It is expected the heat will not dip below 20C for the rest of the week.

An intense heatwave swept through areas of Europe last month, making it the hottest June on record. **France set an all-time high-temperature record of 46C**, according to the WMO, and new June highs were set in the Czech Republic, Slovakia, Austria, Andorra, Luxembourg, Poland, and Germany.

**Europe heatwave: French city of Bordeaux hits record temperature**

9 hours ago
The French city of Bordeaux has hit its highest temperature since records began, as Western Europe braces for the second heatwave to hit this summer.

On Tuesday, Meteo France registered 41.2°C (106.1°F) in the south-western city, breaking a 2003 record of 40.7°C. Forecasters predict a record-breaking run across Europe this week, including Belgium, Germany and the Netherlands.

A World Meteorological Organization spokeswoman said the heatwaves bore "the hallmark of climate change".

"As we saw in June they are becoming more frequent, they're starting earlier and they're becoming more intense," Claire Nullis added. "It's not a problem that's going to go away."

How hot could it get?

Much of France has been issued with an orange alert - the second highest level of warning. Meteo France said Paris temperatures might hit new highs on Thursday. The record, set in 1947, stands at 40.4°C.

Comparisons have been drawn to a heatwave France experienced in August 2003, during which heat contributed to almost 15,000 deaths.

The mercury is also expected to climb to 40°C in a string of countries:
- In an unprecedented move, Belgium has issued a code red weather warning for the whole country
- Spain declared a red alert in its Zaragoza region, which was hit by devastating wildfires last month. The European Commission's Copernicus Climate Change Service says the risk of wildfires is high in Spain and in Portugal
- In the Netherlands, the government activated its "national heat plan"
- In the UK, temperatures are predicted to exceed 35°C, and could be the highest ever recorded

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Is climate change to blame?

Linking a single event to global warming is complicated. While extreme weather events like heatwaves occur naturally, experts say these will happen more often because of climate change.

Records going back to the late 19th Century show that the average temperature of the Earth's surface has increased by about one degree since industrialisation.

A climatology institute in Potsdam, Germany, says Europe's five hottest summers since 1500 have all been in the 21st Century. Scientists are concerned that rapid warming linked to use of fossil fuels has serious implications for the stability of the planet's climate.

In Europe, a historic heat wave is shattering records with astonishing ease, may hasten Arctic melt
A historic heat wave is bringing unprecedented temperatures to Western Europe, and is poised to expand northeastward to Scandinavia and into the Arctic by late this weekend. Once above the Arctic Circle, the weather system responsible for this heat wave could accelerate the loss of sea ice, which is already running at a record low for this time of year.

First, residents of Paris, London, Brussels, Amsterdam, Munich, Zurich and other locations are suffering through dangerously high temperatures on Wednesday and Thursday.

Already on Wednesday, all-time national heat records in the Netherlands, Belgium and Germany had fallen, right on the heels of a late June heat wave that broke similar records in France and other countries. The German meteorological agency noted that Wednesday’s national record of 104.9 degrees (40.5 Celsius) may last just a day before being broken on Thursday.

It’s difficult to beat all-time heat records in mid-July, considering this is the hottest time of year. It’s even more unusual to beat these records by a large margin, which is what is occurring now.

For example, Paris is likely to exceed 100 degrees (37.8 Celsius) on Wednesday by a few degrees, and break its all-time high temperature record of 104.7 degrees (40.4 Celsius) by up
to 3 degrees on Thursday, with a forecast high of 108 (42.2 Celsius). The city's all-time high temperature record has stood since 1947.

Multiple all-time records were set elsewhere in France on Tuesday, both for daytime highs and hot nighttime low temperatures.

The U.K. Met Office is predicting that the country's all-time national heat record of 101.3 degrees (38.5 Celsius) will be broken Thursday.

In addition, national heat records in Germany, where the mark to beat is 104.5 degrees (40.3 degrees), could be set this week as well.

Heat of this intensity constitutes a significant public health threat, particularly for vulnerable populations like outdoor workers, the elderly, young children, those with compromised immune systems and anyone lacking the means to cool down. In most of the cities currently affected, people lack air conditioning at home and in many public buildings and transit systems.

All-time record heat for the Netherlands- and should be warmer tomorrow! 🔥 https://t.co/GP2U4AljTF
— Eric Blake 🌡 (@EricBlake12) July 24, 2019

In London, where the record of 100.1 degrees (38.1 Celsius) may be broken on Thursday, the subway system is not air conditioned throughout its network, leading some tube stations to see temperatures skyrocket well above 100 degrees on platforms, and remain stifling aboard trains. The average high in London for this time of year is 74 degrees.

An Omega block

The heat is the result of a massive area of high pressure, also referred to as a heat dome, that is forcing the jet stream to divert around, it like a large detour in the sky. This is drawing hot air northward from the Sahara Desert, and keeping cooler maritime air at bay.

The upper air weather pattern formed by this resembles the shape of the Greek letter Omega, and meteorologists refer to it as an Omega block, since such features can be slow to dislodge.
Eventually, the high pressure area responsible for this heat wave is forecast to slide northeastward and park itself over Scandinavia and migrate north into the Arctic. As it does so, it could set records for the intensity of the high pressure area so far north at this time of year, and is likely to lead to heat records in Sweden, Norway, and Finland.

Right now, Arctic sea ice extent is at the lowest level on record for this time of year. Weather conditions during the Arctic melt season are a crucial factor in determining whether ice extent hits a record low in September or just misses it, as the past few seasons have done.

A heat dome over the Arctic, following unusually mild conditions throughout much of the Arctic Ocean during the melt season so far, could ensure a new and ominous record will be set this year.

**Climate change is likely a key player in this**

All weather is now occurring in an atmosphere that has been substantially altered by human activities, particularly the addition of large quantities of carbon dioxide, methane and other greenhouse gases from burning fossil fuels and land use change. This has caused global average temperatures to increase **by about 1.8 degrees** since around the dawn of the industrial revolution, and in fact, 2019 is on its way to being one of the top 5 hottest years since instrument records began in the late 19th century.
Climate studies have consistently shown that heat waves are becoming more common, severe and longer-lasting as the global average surface temperature warms. In other words, heat waves are now hotter than they used to be, making it easier to set all-time records.

The Met Office, for example, reports that the U.K. is now experiencing “higher maximum temperatures and longer warm spells” than it used to.

“The hottest day of the year for the most recent decade (2008-2017) has increased by 0.8°C above the 1961-1990 average*. Warm spells have also more than doubled in length — increasing from 5.3 days in 1961-90 to over 13 days in the most recent decade (2008-2017). South East England has seen some of the most significant changes, with warm spells increasing from around six days in length (during 1961-1990) to over 18 days per year on average during the most recent decade,” the Met Office stated in a research report.

A different study published earlier this year found a record-breaking summer heat wave in Japan during 2018 “could not have happened without human-induced global warming.” And a recent rapid attribution analysis, which has not yet been published in a peer-reviewed science journal, showed that the early summer heat wave in Europe was made at least five times more likely to occur in the current climate than if human-caused warming had not occurred.

July on course to be hottest month ever, say climate scientists

If global trends continue for another fortnight, it will beat previous two-year-old record

Jonathan Watts
Tourists leave the Acropolis on 4 July in Athens, Greece, after it closed because of high temperatures. Photograph: Milos Bicanski/Getty Images

Record temperatures across much of the world over the past two weeks could make July the hottest month ever measured on Earth, according to climate scientists.

The past fortnight has seen freak heat in the Canadian Arctic, crippling droughts in Chennai and Harare and forest fires that forced thousands of holidaymakers to abandon campsites in southern France and prompted the air force in Indonesia to fly cloud-busting missions in the hope of inducing rain.

If the trends of the first half of this month continue, it will beat the previous record from July 2017 by about 0.025°C, according to calculations by Karsten Haustein, a climate scientist at the University of Oxford, and others.

This follows the warmest-ever June, which was confirmed this week by data from the US space agency Nasa, following Europe’s Copernicus satellite monitoring system.

**Last month was the hottest June on record**

Combined global land-surface air and sea-surface water temperature deviations from June 1951-80 average

In response to the new numbers, Michael Mann, the director of the Earth System Science Center at Pennsylvania State University, tweeted: “This is significant. But stay tuned for July numbers. July is the warmest month of the year globally. If this July turns out to be the warmest July (it has a good shot at it), it will be the warmest month we have measured on Earth.”

The scientists stressed that this outcome is uncertain because conditions could change in the second half of the month, but it underscores a broader pattern of steadily rising temperatures caused by increasing emissions of carbon dioxide from power plants, deforestation, cars, planes and other sources.

Mann estimated the chance of a new record this month at about 50%. In the longer term, he said records would continually be broken. “We have shown in recent work that the record warm streaks we’ve seen in recent years cannot be explained without accounting for human-caused planetary warming. Those warm streaks are certain to not only continue but to worsen if we continue to burn fossil
fuels and warm the planet.”

Nine of the 10 hottest years on record have occurred since 2000, according to the US National Oceanic and Atmospheric Administration. Data from the first six months of this year indicates this year has a 99.9% chance of entering the top five, according to Gavin Schmidt.

“It is clear that 2019 is shaping up to be a top-five year – but depending on what happens it could be second, third or fourth warmest. The warmest year was 2016, which started with a big El Niño, which we didn’t have this year, so a record year is not particularly likely,” he said.

Quick guide
How global heating is causing more extreme weather

Of the many recent temperature anomalies, perhaps the most remarkable was in the Canadian Arctic community of Alert, Nunavut, which hit a record 21°C on 14 July, although temperatures at this time of year are usually just a few degrees above freezing.

Last month, France shattered its previous heat record during a heatwave across much of Europe that was made at least five times – and possibly hundreds of times – more likely by human-driven climate disruption, according to scientists.

Political leaders have failed to halt the rise in emissions that is behind global heating. On Tuesday, the UK environment secretary, Michael Gove, warned that time was running out to prevent a breakdown of the climate and natural life support systems. “These twin challenges of biodiversity and climate change are massive and urgent and interrelated. The action taken so far hasn’t been sufficient, but late as it may be, there is still time,” he warned. “The scale of action required may be daunting, but the need to act is imperative.”

The UK has avoided most of the extreme heat seen in Europe in elsewhere in recent weeks. The average temperature in the first two weeks of July was 15.1°C, which equals the July average, though Mark McCarthy, the head of the Met Office’s National Climate Information Centre, said there might be a modest rise because the second half of the month is usually marginally warmer than the first.

Concerns about rising temperatures and their impact on health are growing. On Tuesday, the Red Cross launched a new Heatwave Guide to help urban planners and city authorities reduce the risks, which are particularly great for the elderly, very young children, pregnant women and people who are socially isolated.

“Heatwaves are one of the deadliest natural hazards facing humanity and the threat they pose will only become more serious and more widespread as the climate crisis continues,” said Francesco Rocca, the president of the International Federation of Red Cross and Red Crescent Societies.

Previous heatwaves have killed tens of thousands of people, including 2,500 in India in 2015 and 70,000 in Europe in 2003, according to the Red Cross.

As the crisis escalates...

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Earth now warming faster than it has in 1900 years, new data shows

Deborah Netburn
The climate change situation is only worsening. It’s not just humans who track long-term trends in the weather. The history of our planet’s climate is recorded by nature herself - written in tree rings and arctic ices, corals and deep ocean sediments.

Each of these records tell only a small piece of the Earth’s climate story, but together they form a sprawling and complex novel of the past, helping scientists better understand how and why certain trends emerged, and foreshadowing what we might expect the Earth’s climate to look like in the future.

In 2017 an international consortium known as PAGES (Past Global Changes) published its largest database yet of climate temperature records, stretching from the present day back 2000 years, by the start of the Common Era.

The data points were recorded by trees, ice, lake and ocean sediment, and mineral deposits in caves, as well as by humans. They come from 648 locations across the globe, including all the continents and major ocean basins.

Peak temperatures have been seen across all regions of the globe except Antarctica within the past 51 years. Scientists have only just begun to mine the PAGES data for insights into trends of the past, but already they have made some intriguing discoveries.

After analysing 2000 years of detailed records kept by both nature and humans, researchers have discovered that the average surface temperature of the Earth has warmed faster in the past few decades than it did in the previous 1900 years, proving once again that the current warming the planet is experiencing is unprecedented in the past two millennia.

What’s more, the data also suggest that the warming in the most recent decades has been uniform across all regions of the planet, a phenomenon that scientists say has not been seen in the past 2000 years.
A third study based on the same data shows that for most of the Common Era volcanic events have been the primary driver of global temperature change. Today, greenhouse gases in the atmosphere play a more dominant role in driving global temperature, the authors said.

Raphael Neukom, a paleoclimatologist at the University of Bern in Switzerland who led two of the three studies said the trio of papers, published Wednesday in the journals Nature and Nature Geoscience, all suggest the same thing: "Climate variability in the pre-industrial period is totally different from what we observe today."

Some of the findings reported on Wednesday contradict, or at least complicate, previously held truths.

For example, in the Nature paper, Neukom and his colleagues use the PAGES data to poke holes in the widely accepted theory that periods of cooling and warming over the past 2000 years affected the globe uniformly.

Perhaps the most well known of these epochs is what scientists call the Little Ice Age - a cool period that persisted from the 16th century to the 19th century. Similarly, the Medieval Climate Anomaly is known as a warm, dry period that lasted from AD 950 to 1250.

"The traditional understanding was that climate over these periods were globally coherent" said Nathan Steiger, a paleoclimatologist at Columbia University in New York who worked on the paper. "But when we looked at the PAGES data, we found they are not as coherent as we thought."

After analysing the data using multiple statistical methods, the authors found that what were previously assumed to be global trends in temperature were actually regional trends for all known climate epochs except the one we find ourselves in today.

For example, while the Little Ice Age did represent a global cooling, some parts of the planet were coldest during the mid-19th century, while others had their coldest weather several centuries earlier. At the height of the Medieval Climate Anomaly, only 40 per cent of the Earth experienced peak temperatures at the same time.
But when the authors ran the same analysis for our current climatic epoch, known as the Contemporary Warm Period, they found that peak temperatures have been seen across all regions of the globe except Antarctica within the past 51 years.

Wildfires are burning in the US state of Idaho.

This uniformity was unprecedented in the past 2000 years.

"The familiar maxim that climate is always changing is certainly true," wrote Scott St George, a geographer at the University of Minnesota at Minneapolis who was not involved in the work.

"But even when we push our perspective back to the Roman Empire, we cannot discern any event that is remotely equivalent ... to the warming over the past few decades."

The authors did not look into what might be causing this unique phenomenon, because, as Steiger said, it wasn’t necessary.
A boy plays in a fountain to cool off in Kansas City in the US. The heatwave that has been roasting much of the U in recent days is just getting warmed up.

"There is a lot of evidence that the Contemporary Warming Period is human caused," he said. "We don't need the paleolithic climate data to address that."

In another study, a team of researchers led by Stefan Bronnimann of the University of Bern in Switzerland used the PAGES data to explore the causes of climate fluctuations from 1300 to 1800. This analysis led them to conclude that in this time period a cluster of volcanic eruptions were the primary drivers of global temperature change and that their effects lingered over many decades.

(Large volcanic eruptions can cause wide-scale cooling because their ash gets into the stratosphere and reflects sunlight back into space.)

They argue that at least some of the global temperature increases the Earth experienced starting in the 1830s were probably due to the planet’s slow recovery from the volcanically induced cooling. However, the data also suggest that from the late 19th and early 20th century onward, greenhouse gases in the atmosphere dominated the subsequent warming trend.

Today, there is little doubt among scientists as to how those greenhouse gases got into our atmosphere.

- Los Angeles Times
How Hot Was July?
Hotter Than Ever, Global Data Shows

With temperatures soaring in Europe and Alaska, ice melting in Greenland and forests burning across Siberia, last month seemed like a blistering one worldwide.

It was.

European climate researchers said Monday that last month was the hottest July—and thus the hottest month ever recorded, slightly eclipsing the previous record-holder, July 2016. "While July is usually the warmest month of the year for the globe, according to our data it also was the warmest month recorded globally, by a very small margin," Jean-Noël Thépaut, head of the Copernicus Climate Change Service, said in a statement.

The service, part of an intergovernmental organization supported by European countries, said the global average temperature last month was about 0.07 degree Fahrenheit (0.04 Celsius) hotter than July 2016.

The researchers noted that their finding was based on analysis of only one of several data sets compiled by agencies around the world.
Analyses by other agencies, including NASA and the National Oceanic and Atmospheric Administration in the United States, will be released over the next several weeks and could be slightly different.

But whatever its ultimate ranking, last month is part of a long-term trend: As human-related emissions of greenhouse gases have continued, the atmosphere has continued to warm. The past five years have been the hottest on record, including the record single year in 2016. The 10 hottest years have all occurred in the past two decades.

This June was the warmest on record, and the previous five months were among the four warmest for their
respective months, the climate researchers said. That puts this year on track to be in the top five, or perhaps the hottest ever.

“With continued greenhouse gas emissions and the resulting impact on global temperatures, records will continue to be broken in the future,” Mr. Thépaut said.
The highest above-average conditions were recorded across Alaska, Greenland and large swaths of Siberia. Large parts of Africa and Australia were warmer than normal, as was much of Central Asia. Cooler than average temperatures prevailed in Eastern Europe, much of Asia, the Northern Plains and Pacific Northwest of the United States and over large parts of Western Canada.

The year 2016 was a record-setter in part because the world had just been through a strong El Niño. During an El Niño there are changes in sea temperature, atmospheric pressure and winds in the equatorial Pacific that can influence regional weather patterns around the world and lead to short-term variations in temperature. The world experienced a weak El Niño earlier this year and further weakening has occurred. It is not clear what, if any, effect this has had on temperatures.
Europe’s record heat melted Swiss glaciers

By Chelsea Harvey, E&E News Aug. 5, 2019, 8:39 AM

The sweltering heat wave that roasted much of Europe last month has since moved north, where it’s wreaking havoc on the Greenland ice sheet. But while all eyes are currently trained on the Arctic ice, scientists are finding that Europe’s coldest places have also suffered.

According to initial findings from the Swiss Glacier Monitoring Network (GLAMOS), Swiss glaciers experienced unusually high melt rates during the last heat wave, which occurred in late July, and an earlier heat wave that struck the continent in late June.

Matthias Huss, a glaciologist with Swiss University ETH Zurich and head of GLAMOS, tweeted last week that the nation’s glaciers lost about 800 million metric tons of ice during the two heat waves alone.

"Absolutely exceptional for a period of only 14 days in total!" he commented in the tweet.

The estimate is still preliminary, he told E&E News in an interview. It’s based on an early analysis of on-site measurements at certain sites, combined with a model that scales up the measurements to estimate total ice losses throughout the country. A more detailed analysis will follow at the end of the summer, which will estimate the season’s cumulative losses and compare them to previous summers.

But the data already suggests that the losses this year have been unusually rapid.

During the winter, the region received an above-average amount of snowfall, Huss pointed out. So the glaciers actually started the summer with a high level of snow cover and were doing "extraordinarily well" compared to the last few seasons, which have logged particularly strong losses, he noted. Scientists were hopeful that they’d end the season on a better note than the last few years.

But once the first heat wave struck, the snow began to rapidly melt away.

"Now, because of these two heat waves, we have tracked very fast downward," Huss told E&E News. "And we are now at the average of the last 10 years, or even already a bit below."

Across the European Alps, other regions have also been feeling the heat this summer. The Tignes ski resort in the French Alps announced at the end of July that the nearby Grande Motte Glacier was no longer safe for skiers after this summer’s excessive melting.

And about 50 miles to the north at Mont Blanc, the highest mountain in the European Alps, mountaineer Bryan Mestre was stunned to stumble across a large pond of liquid water pooled on top of the snow as he hiked through in late June. Just 10 days earlier, before the first heat wave set in, the same area had been
completely frozen. His Instagram post has been widely shared by media outlets around the world.

It’s the latest continuation of a long trend. According to Huss, alpine glaciers have been retreating since at least the mid-19th century. And the losses seem to be accelerating over the last few decades.

The most impressive changes have been observed at the region’s largest glaciers, he noted. Aletsch Glacier, the largest glacier in the Alps, has retreated by nearly 2 miles since the year 1870.

The pattern isn’t limited to Swiss glaciers. Scientists have observed declines across Europe, including glaciers in the mountains of France, Austria, and Italy. And as long as global temperatures continue to rise, the losses are expected to continue.

One recent study published earlier this year in The Cryosphere estimated that about a third of all the glacier volume in the European Alps could be lost by the year 2100, even if world nations manage to meet the climate targets outlined in the Paris Agreement. Under a scenario in which greenhouse gas emissions continue at their current levels, more than 90% of the ice could disappear.

Other studies have made similarly dire projections for mountain glaciers in other parts of the world, including the Hindu Kush and the Himalayas.

Summers like this one, marked by extraordinary heat waves and high levels of melt, only exacerbate the problem.

"Now we are really seeing almost every year another extreme year," Huss said. "And this is what is actually a problem."