

This Looks Like Earth's Warmest Month. Hotter Ones Appear to Be in Store.

July is on track to break all records for any month, scientists say, as the planet enters an extended period of exceptional warmth.



By Raymond Zhong

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Weeks of scorching summer heat in North America, Europe, Asia and elsewhere are putting July on track to be Earth's warmest month on record, the European Union climate monitor said on Thursday, the latest milestone in what is emerging as an extraordinary year for global temperatures.

Last month, the planet experienced its hottest June since records began in 1850. July 6 was its hottest day. And the odds are rising that 2023 will end up displacing 2016 as the hottest year. At the moment, the eight warmest years on the books are the past eight.

“The extreme weather which has affected many millions of people in July is unfortunately the harsh reality of climate change and a foretaste of the future,” Petteri Taalas, the secretary general of the World Meteorological Organization, said in a statement. “The need to reduce greenhouse-gas emissions is more urgent than ever before.”

The world has entered what forecasters warn could be a multiyear period of exceptional warmth, one in which the warming effects of humankind's continuing emissions of heat-trapping gases are compounded by El Niño, the recurring climate pattern typically associated with hotter conditions in many regions.

Even so, when global average temperatures shatter records by such large margins, as they have been doing since early June, it raises questions about whether the climate is also being shaped by other factors, said Karen A. McKinnon, a climate scientist and statistician at the University of California, Los Angeles. These elements might be less-well understood than global warming and El Niño.

“Do we expect, given those two factors, the record to be broken by this much? Or is this a case where we don't expect it?” Dr. McKinnon said. “Is there some other factor that we're seeing come into play?”

Many parts of the world are continuing to swelter this week as July enters its final days. In the United States, a dangerous heat wave was taking shape on Thursday in the Northeast and Mid-Atlantic, the National Weather Service said, and high temperatures remained a concern in the Southwest and Central States. It's been scorching in parts of North Africa, Southeastern Europe and Turkey. Wildfires, amplified by heat and dryness, have raged in Canada and around the Mediterranean.

Researchers who analyzed this month's punishing heat waves in the Southwestern United States, northern Mexico and Southern Europe said this week that the temperatures observed in those regions, over a span of so many days, would have been "virtually impossible" without the influence of human-driven climate change.



Residents of Zambujeiro, Portugal, tried to extinguish spot fires this month as a larger blazed menaced. Patricia De Melo Moreira/Agence France-Presse — Getty Images

Still, scientists will need to investigate further to fully understand the "alarming" extent to which the entire surface of the planet has, on average, been hotter than usual this summer, said Emily Becker, a climate scientist at the University of Miami.

Fossil-fuel emissions, which cause heat to build up near Earth's surface, are certainly playing a role. Since the Industrial Revolution, humans have pumped 1.6 trillion tons of carbon dioxide into the atmosphere. This has caused the world to be about 1.2 degrees Celsius, or 2.2 Fahrenheit, warmer than it was in the second half of the 19th century.

But the way this extra heat is distributed around the globe is still shaped by a complex brew of factors spanning land, sea and air, plus a certain amount of random chance. Which is why untangling the specific factors behind this summer's severe heat will take time, Dr. Becker

said. “There’s going to need to be quite a lot of research to understand it, and understand if we’re going to be seeing this again next year or 10 years from now.”

One factor that probably hasn’t been very important so far this summer, at least not in North America, is El Niño, Dr. Becker said. The cyclical phenomenon emerges when the surface of the central tropical Pacific is hotter than normal. Its arrival, which this year occurred in late spring, triggers a cascade of changes to wind patterns and rainfall around the globe. But its most immediate effects are felt in the tropical and far western Pacific, in places like Indonesia.

“In terms of North America, this El Niño is really just getting started,” said Dr. Becker, who contributes to the National Oceanic and Atmospheric Administration’s El Niño and La Niña forecasts. Winter is when North America experiences El Niño’s most prominent effects, including wetter conditions in the Southern United States.

This summer’s record heat could still affect the way this El Niño plays out later this year and into 2024, Dr. Becker said. Large areas of the planet’s oceans have been warmer than average. If this continues into fall and winter, it could lead to even stronger storms, with even heavier rain, in places that typically receive more storms during El Niño, Dr. Becker said.

When it comes to factors besides global warming that may also be worsening heat waves, scientists have been examining potential changes in the jet streams, the rivers of air that influence weather systems around the planet.

In the Northern Hemisphere, the differences in temperature between the Arctic and the Equator keep the subtropical jet stream moving. As humans warm the planet, those temperature differences are narrowing, which could be causing the jet stream to weaken and hot spells to last longer.

So far, though, the evidence for this is inconclusive, said Tim Woollings, a professor of physical climate science at the University of Oxford. “It’s really not clear that the jet has been getting weaker,” he said.

In a study published in April, Dr. Woollings and four other scientists found that human-caused warming might have shifted the jet streams in both hemispheres toward the poles in recent decades. More research is needed to understand this potential shift, he said. But if it continues, it could make subtropical regions susceptible to greater heat and drought, he said.

Raymond Zhong is a climate reporter. He joined The Times in 2017 and was part of the team that won the 2021 Pulitzer Prize in public service for coverage of the coronavirus pandemic. More about Raymond Zhong