

# ‘Off the charts’: 2023 was hottest year ever recorded globally, US scientists confirm

New analysis confirms ‘unprecedented’ record reported by European Union and United Nations scientists

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- A child looks at a wildfire in Chasia on the outskirts of Athens, Greece, on 22 August 2023. Photograph: Angelos Tzortzinis/AFP via Getty Images
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Last year was the hottest ever reliably recorded globally by a blistering margin, US scientists have confirmed, leaving researchers struggling to account for the severity of the heat and what it portends for the unfolding climate crisis.



US oil lobby launches eight-figure ad blitz amid record fossil fuel extraction

Last year was the world's hottest in records that stretch back to 1850, according to analyses released concurrently by Nasa and the National Oceanic and Atmospheric Administration (Noaa) on Friday, with a record high in ocean temperatures and a new low in Antarctic sea ice extent.

Noaa calculated that last year's global temperature was 1.35C (2.4F) hotter, on average, than the pre-industrial era, which is slightly less than the 1.48C (2.6F) increase that EU scientists, who also found 2023 was the hottest on record, came up with due to slightly different methodologies.

A separate analysis of 2023 released on Friday by Berkeley Earth has the year at 1.54C above pre-industrial times, which is above the 1.5C (2.7F) warming limit that countries have agreed to keep to in order to avoid disastrous global heating impacts. This guardrail will need to be broken on a consistent basis, rather than one year, to be considered fully breached, however.

The burning of fossil fuels and deforestation has driven the extraordinary warmth, which follows a string of hotter-than-average years in recent decades. Each decade over the past 40 years has been warmer than the last, Noaa said, with the most recent 10 years all making up the hottest 10 years ever recorded. Last year's record heat was further spurred by El Niño, a periodic climatic event that heats up parts of the Pacific Ocean and heightens global temperatures.

However, even with these known factors scientists were left stunned at the severity of 2023, which was initially following the expected long-term warming pattern before seeing record after record obliterated in the second half of the year. Last year beat the previous temperature record, set in 2016, by 0.15C (0.27F), NOAA said, which is a huge margin in climate terms.

“What we’ve seen with 2023 is off the charts,” said Gavin Schmidt, director of NASA’s Goddard Institute for Space Studies.

“We are having a real hard time explaining why 2023 was as warm as it was. What happened last year was unprecedented and it’s a concern. This is the first year I’ve been doing this where I’m far less sanguine about my ability to explain what’s happening.”

“After seeing the 2023 climate analysis, I have to pause and say that the findings are astounding,” added Sarah Kapnick, NOAA’s chief scientist.

Schmidt said that further research, and the outcome of following years, will need to be assessed to see if there are other major factors at play but that the uncertainty was disconcerting. “I am discomfited by the findings beyond just, ‘Oh my gosh, another warm year,’” he said.

He added that 2024 has a “50-50” chance of being the hottest on record, due to a peaking El Niño and that the likelihood of staying within 1.5C warming, which scientists have said is important to avoid catastrophic heatwaves, floods, droughts and other calamities, “has shrunk to almost nothing”.

“We are making the kind of geological mark on the planet that perhaps only cyanobacteria have managed before,” said Schmidt. “That’s a big deal. The biggest driver that has changed our climate is the emissions of greenhouse gases and it’s very important to realize the long-term trends are caused by our activities.”

The 1.5C limit is expected to fall within the next decade, with some scientists saying this process is already happening. Researchers say they are wary after an astonishing past year. “Twenty twenty-three is definitely a major misfit to the model, but it remains to be seen if 2023 is merely an unusual outlier or if it is an indication of unexpected changes ahead,” said Robert Rohde, lead scientist at Berkeley Earth.

The demolition of the previous annual temperature record has heightened calls for greater action to stem the climate crisis. Governments gathered in Dubai for United Nations climate talks in December agreed to “transition away” from fossil fuels but there is little sign of this happening at the scale required, with last year setting a new record for planet-heating emissions and major, climate-breaking oil and gas drilling projects planned around the world.

The toll of climate-driven disasters was painfully felt in 2023, NOAA highlighted, from deadly wildfires in Hawaii to ruinous flooding in Libya. The US alone suffered a record number of extreme weather disasters that caused at least \$1bn in damages in 2023.

“Humanity’s actions are scorching the earth,” said António Guterres, secretary general of the UN. “Twenty twenty-three was a mere preview of the catastrophic future that awaits if we don’t act now. We must respond to record-breaking temperature rises with path-breaking action.”

On Friday, the UN’s World Meteorological Organization (WMO) released its own temperature data, also confirming that last year was the hottest on record, surpassing the pre-industrial period by 1.45C.

“We cannot afford to wait any longer. We are already taking action but we have to do more and we have to do it quickly,” said Celeste Saulo, secretary general of the WMO. “We have to make drastic reductions in greenhouse gas emissions and accelerate the transition to renewable energy sources.”