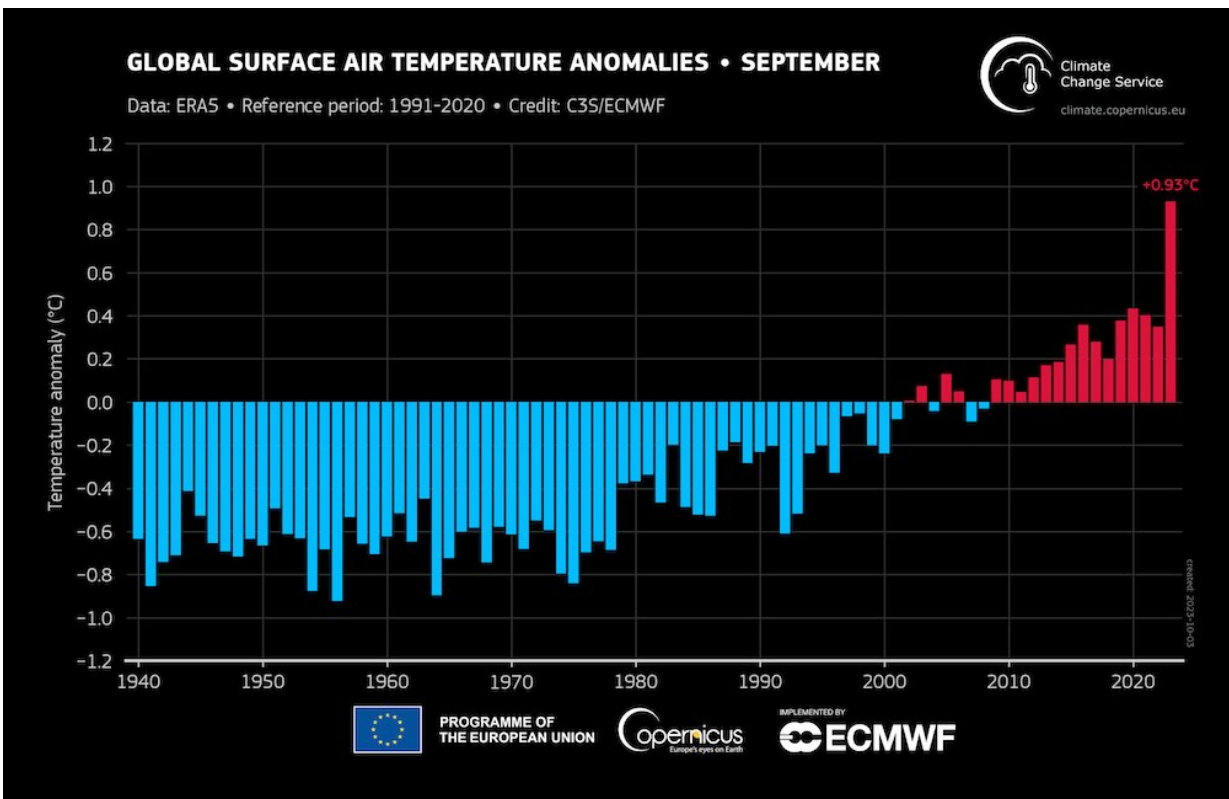


# 6 reasons why global temperatures are spiking right now

October 6 2023, by Andrew King



The preliminary September global temperature is well above every previous value in the instrumental record. Credit: Copernicus

The world is very warm right now. We're not only seeing record temperatures, but the records are being broken by record-wide margins.

Take the preliminary September global-average temperature anomaly of  $1.7^{\circ}\text{C}$  above pre-industrial levels, for example. It's an incredible  $0.5^{\circ}\text{C}$  above the previous record.

So why is the world so incredibly hot right now? And what does it mean for keeping our Paris Agreement targets?

Here are six contributing factors—with climate change the main reason temperatures are so high.

## **1. El Niño**

One reason for the exceptional heat is we are in a [significant El Niño](#) that is still strengthening. During El Niño we see warming of the surface ocean over much of the tropical Pacific. This warming, and the effects of El Niño in other parts of the world, raises global average temperatures by [about  \$0.1\$  to  \$0.2^{\circ}\text{C}\$](#) .

Taking into account the fact we've just come out of a triple La Niña, which cools global average temperatures slightly, and the fact this is the first major El Niño in eight years, it's not too surprising we're seeing unusually high temperatures at the moment.

Still, El Niño alone isn't enough to explain the crazily high temperatures the world is experiencing.

## **2. Falling pollution**

Air pollution from human activities cools the planet and has offset some of the warming caused by humanity's greenhouse gas emissions. There have been efforts to reduce this pollution—since 2020 there has been an [international agreement](#) to reduce sulfur dioxide emissions from the

global shipping industry.

It has been speculated this cleaner air has contributed to the recent heat, particularly over the record-warm [north Atlantic](#) and Pacific regions with high shipping traffic.

It's likely this is contributing to the extreme high global temperatures—but only on the order of hundredths of a degree. [Recent analysis](#) suggests the effect of the 2020 shipping agreement is about an extra 0.05°C warming by 2050.

### **3. Increasing solar activity**

While falling pollution levels mean more of the sun's energy reaches Earth's surface, the amount of the energy the sun emits is itself variable. There are different solar cycles, but an 11-year cycle is the most relevant one to today's climate.

The sun is becoming [more active](#) from a minimum in late 2019. This is also contributing a small amount to the spike in global temperatures. Overall, increasing [solar activity](#) is contributing only hundredths of a degree at most to the recent global heat.

### **4. Water vapor from Hunga Tonga eruption**

On January 15 2022 the underwater [Hunga Tonga–Hunga Ha'apai volcano erupted](#) in the South Pacific Ocean, sending large amounts of [water vapor](#) high up into the upper atmosphere. Water vapor is a greenhouse gas, so increasing its concentration in the atmosphere in this way does intensify the greenhouse effect.

Even though the eruption happened almost two years ago, it's still having a small warming effect on the planet. However, as with the reduced

pollution and increasing solar activity, we're talking about hundredths of a degree.

## 5. Bad luck

We see variability in global temperatures from one year to the next even without factors like El Niño or major changes in pollution. Part of the reason this September was so extreme was likely due to weather systems being in the right place to heat the [land surface](#).

When we have persistent high-pressure systems over land regions, as seen recently over places like [western Europe](#) and [Australia](#), we see local temperatures rise and the conditions for unseasonable heat.

As water requires more energy to warm and the ocean moves around, we don't see the same quick response in temperatures over the seas when we have high-pressure systems.

The positioning of weather systems warming up many land areas coupled with persistent ocean heat is likely a contributor to the global-average heat too.

## 6. Climate change

By far the biggest contributor to the overall +1.7°C global [temperature](#) anomaly is human-caused climate change. Overall, humanity's effect on the climate has been a global warming of [about 1.2°C](#).

The record-high rate of greenhouse gas emissions means we should expect global warming to accelerate too.

While humanity's [greenhouse gas](#) emissions explain the trend seen in

September temperatures over many decades, they don't really explain the big difference from last September (when the greenhouse effect was almost as strong as it is today) and September 2023.

Much of the difference between this year and last comes back to the switch from La Niña to El Niño, and the right weather systems in the right place at the right time.

## **The upshot: We need to accelerate climate action**

September 2023 shows that with a combination of climate change and other factors aligning we can see alarmingly high temperatures.

These anomalies may appear to be above the 1.5°C global [warming](#) level referred to in the Paris Agreement, but that's about keeping [long-term global warming](#) to low levels and not individual months of heat.

But we are seeing the effects of climate change unfolding more and more clearly.

The most vulnerable are suffering the biggest impacts as wealthier nations continue to emit the largest proportion of greenhouse gases. Humanity must accelerate the path to net zero to prevent more record-shattering global temperatures and damaging extreme events.

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