Climate scientist: Broken temperature records are alarming, but it is not too late to limit global warming

September 4 2024, by Alex Crawford

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July 22, 2024 was the hottest day in recorded human history, with a global average temperature of 17.16 C.

This followed the hottest June ever recorded, which followed the hottest May ever recorded. This all follows 2023, which was the hottest year on record at 1.48 C warmer than the 1850–1900 average, according to the Copernicus Climate Change Service.

As a climate scientist, I am morbidly riveted by these events, checking climate data hubs with the same fervor and frequency that my friends and family check the hockey and football scores. However, when talking to those friends and family about these climate records, I often find that three big questions often arise: What do these numbers mean, how warm will it get and what is the point of no return?

Let's grapple with those questions and put these recent climate records into perspective.

What does 17.16 C mean for me?

It can be difficult to connect 17.16 C for the global daily average temperature to the weather in individual towns and cities. In fact, 17.16 C seems like a pleasant temperature.

Similarly, 1.48 C of total warming doesn't sound like much. So although these numbers are useful global benchmarks for scientists and policymakers, most Canadians will likely only feel the effects of climate change through specific (usually extreme) weather events.

For example, global warming means more sweltering heat waves that make Canadians sweaty, tired and—in some cases—in need of medical care.

Consider the city of Montréal. Between 1900-1923, Montréal averaged six days per year with temperatures over 30 C. Since the year 2000 (2000-2023), the average number of days per year reaching 30 C has been more than double, at 13.

Any individual hot day may still just be a hot day—it's weather. But twice as many hot days over 24 years compared to a century ago? That's climate change.

Will we exceed 1.5 C or 2 C?

The second question I am often asked is how close we are to passing the 1.5 C warming threshold established by the 2015 Paris Agreement. Is a breaching of this threshold imminent? How will we know if it has occurred and what does it mean to do so?

In short, a breach of the 1.5 C threshold is not imminent, though time is running out quickly.

The Copernicus Climate Change Service has a relatively high calculation for global warming. They reported 2023 as 1.48 C warmer than 1850-1900, but NASA reported a lower figure of 1.4 C.

Additionally, because our climate system has substantial variation from year to year (for example, El Niño years tend to be warmer than La Niña years), one year being above 1.5 C is not the same as the average year being above 1.5 C.

A more accurate reflection of 2023's climate is that the 10-year average for 2014–2023 was about 1.19 C warmer than 1850–1900, and the El Niño conditions increased the warming to 1.43 C. With that said, the climate surpassing 1.5 C might happen within a decade, and it is very difficult to prevent. Warming will also not stop at 1.5 C.

A November 2023 evaluation of progress on curbing carbon emissions concluded that current government pledges to reduce emissions have put the world on pace for 2.5-2.9 C warming by the end of the century. There has been much progress toward stemming the rise of carbon emissions, but they need to be cut by 28% more to put us on pace to stay below 2 C.

If we surpass 1.5 C, should we give up?

It can be distressing to think about what will happen if we pass 1.5 C. However, 1.5 C will not make the world uninhabitable. Many global warming impacts, from more extreme heat waves to heavier rain events to the loss of sea ice and snow cover, are reversible.

Although a breach of the 1.5 C threshold will more than likely happen, we can definitely get back below with more aggressive action to reduce emissions. Also, each additional degree of warming leads to greater change than the last, so even if we fail to stay below 1.5 C, it is still worth working toward the Paris Agreement goals to limit warming as much as possible.

That said, some impacts cannot be reversed in a human lifetime, such as the mass die-off of tropical coral reefs that is already underway.

Another major tipping element is the West Antarctic Ice Sheet, the most vulnerable of the world's land-ice masses. If pushed into an unstable state, this ice sheet will experience a gradual but inevitable retreat over the next several centuries, leading to about three meters of sea-level rise (in addition to other sources).

Sea-level rise has already caused climate migration from several low-lying islands and coastal areas. Coastal flooding from the loss of the West Antarctic Ice Sheet (plus some melt from Greenland, East

Antarctica, and mountain glaciers) would force adaptation or migration for hundreds of millions of people.

How much warming is required to destabilize West Antarctica? Calculations range from 1 C to 3 C of warming, with most between 1.5 C to 2 C. In other words, there is a chance the West Antarctic Ice Sheet is already past its tipping point, but if not, any actions taken today to limit global warming may preserve it and our planet as a whole—and spare us all unnecessary harm and hardship in the process.

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