

Advances in Earth and Environmental Science

On using 'Advances in Scientific Knowledge' to Preempt Deliberate Misinformation from Sceptics with a Personal Agenda

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The strong "super El Niño" of 2023 will weaken in the summer of 2024, but that will not undermine the high likelihood that the past 18 months will have anchored a new floor from which new warming will reemerge with what has been remarkable persistence for more than a decade. I write this correspondence as a case study in how to use 'advances in scientific knowledge' to preempt claims by personally-motivated deniers, sceptics and opinion-makers. I strongly expect that these important players in forming public opinion will assert with faux authenticity that the coming of a La Niña later this fall will be strong evidence that recent monthly record temperatures will turn out to be anomalies in the record from what is otherwise a benign climate.

As shown in Figure 1, the last 7 months of 2023 were indeed the hottest on record since the beginning of the industrial revolution and the first five months continued that streak (Paddison, 2024). The previous monthly records were not just a little lower than the most recent experience. The last 12 months' temperatures were sometimes as much as 0.5 degrees Celsius hotter than ever before and 0.2+ degrees above the oft-mentioned 1.5-degree target for tolerable warming (relative to the 19th century benchmark) (Voosen, 2024). In 2023, the United States National Oceanographic and Atmospheric Administration (NOAA) recorded 25 weather/climate related disasters with damages in excess of \$1 billion in direct costs and identified dozens of other significant climate anomalies distributed across *all seven continents*. (NOAA 2023).

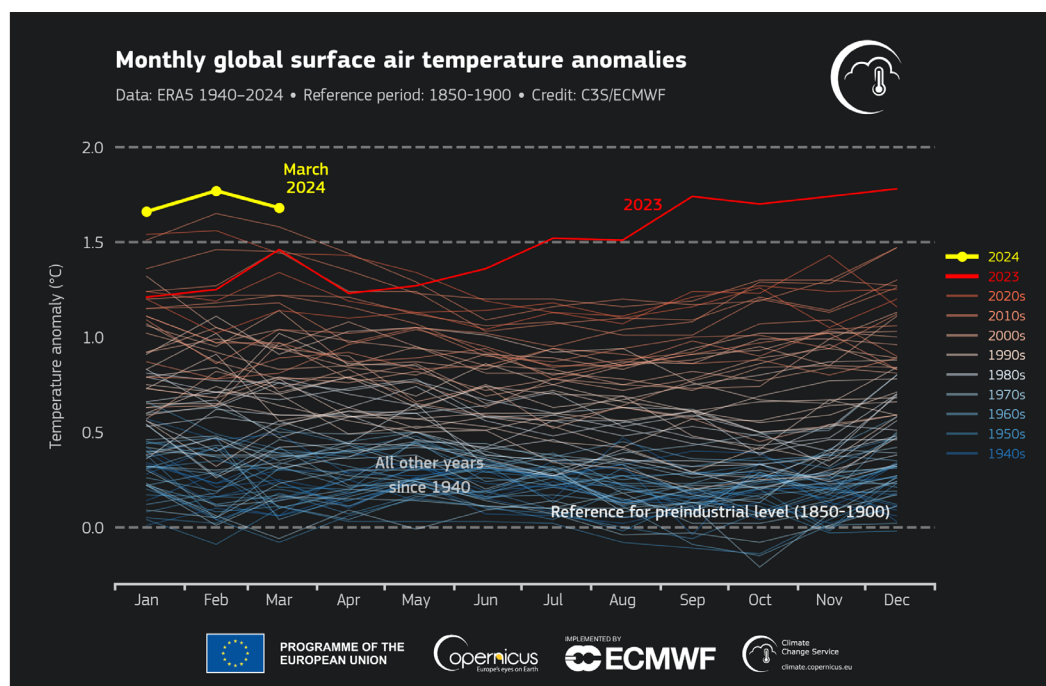


Figure 1: Monthly global surface air temperature. Temperature anomalies relative to the pre-industrial reference point (1850–1900) from January of 1940 through May of 2024.

Source : <https://climate.copernicus.eu/copernicus-march-2024-tenth-month-row-be-hottest-record>

Many factors contributed to the 12 months of record warmth, including

- An historically strong and prolonged El Niño event in the Pacific Ocean;
- The enforcement of stricter sulfur emissions from ocean-going cargo ships ;
- An historically high solar radiation maximum began to appear; and
- Continuation of an accelerating trend in anthropogenic forcing.

Strengthening restrictions on sulfur emissions was an effective one-off event, but they are permanent (Hausfather & Forster, 2023). The solar maximum is expected to peak between late 2024 and sometime in 2026 (Dobrijvic, 2024). The “super” El Niño is weakening (as also seen in Figure 1) and should be replaced by a cooling La Niña event (of unknown strength) in the fall of this year, (Gilbert, 2024). but anthropogenic forcing will continue as part of a long-term trend (IPCC (2023).

The net result of these changes on temperature is unclear, but Berkeley Earth is estimated (in early 2024) a 67% chance that 2024 will set another all-time record and a 99% chance that it will finish no lower than second (Paddison 2024). It should be noted in passing that (Bonfils, et al., 2015). have already reported a similar pattern in relative strengths with regard to regional precipitation across the El Niño – La Niña cycle. They wrote just before their conclusions that, over the northeastern Pacific, future precipitation “response to La Niña lies within the range of historical variability while the future response to El Niño is projected to be outside the range of historical responses.”

Temperatures may fall a bit from their record highs toward the end of 2024, but 21st century experience tells us that most of the years in the next decade will repopulate the top of the all-time list. Humanity will be left waiting for the next upward surge that will begin from a higher plateau than ever before and again put 1.5 degrees of warming since pre-industrial levels more firmly in the rear-view mirror.

At this point as summer begins in North American in 2024, I am sure that deniers, sceptics and their opinion mouthpieces will soon jump at this coming pause to assert that 2023 and 2024 can be both dismissed because they are “never to be

repeated anomalies”. They will call coverage of those years “hyperbole” and many people will believe them.

I therefore write now before this happens to preempt these attacks – to get the word out that the coming La Niña is not a “*get out of jail free*” card – a working title that I used for this piece. It might be strong enough to create a temporary pause in the record setting pace, but that is not guaranteed. In any case, it will set the foundation for the next surge in global temperatures at levels that will (with very high confidence) be higher than they were just 5 years ago. A hiatus does not a new trend make, and so we must be prepared for those who will assert the opposite and dangerous perspective.

The recent unprecedented heat is not the only piece of new scientific information that serve to inspire new advances in climate science. Recent diagnostic analyses using paleo-data of the few couplings of ice-sheet models with ocean-atmosphere models for the southern latitudes have not been promising. They are finding that neither set of models is fit for the purpose of explaining recent and sudden ice sheet dynamics after 9,000 years of stability; nor is either fit for the purpose of projecting humanity’s crossing an ice-sheet collapse tipping point anytime soon (Edwards, et al 2021). As a result, decision-makers whose portfolios include protecting coastal lives and properties are left in a quandary about how best to proceed with planning where and when to spend the requisite tens of billion dollars of adaptation funding. Here is a case where ‘advances’ in climate science needs to preemptively protect itself from sharp criticism by being honest about the state of knowledge compared with the successful detection and attribution work of the past decades and by instructing the public about iterative risk management, mid-course corrections, hedging, and insurance.

Sometimes ‘advances’ in science reveal what we do not know, and that is especially important when some think otherwise. Other times advances outpace public discourse, but that does not assure accurate public perception or what just happened and what will happen soon. Secure in the understanding that their chances of doing exactly the right thing in both cases, climate scientists’ decision-making clients know that their probabilistic tradeoff lies in weighing regrets from doing too much too soon and likely more extreme regrets from doing too little too late.

¹The author benefited from extensive conversations on this specific topic with his writing colleagues on many other efforts: Benjamin Santer, Richard Alley, Henry Jacoby, and Richard Richels.

²Sulfur emissions have a cooling effect, so their reduction adds to the pace of the global warming trend of the past 70 years

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