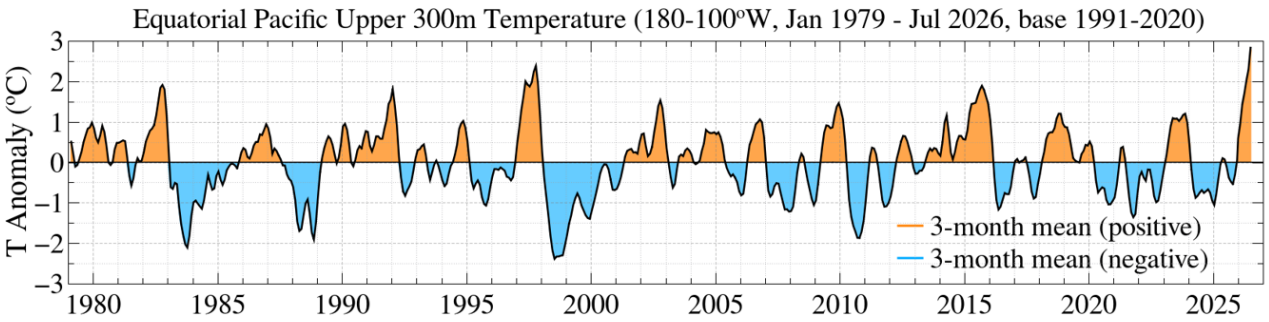

Fig. 1. Equatorial Pacific upper ocean heat anomaly; final point is 1-month mean (Fig. 2).[1]

Super-Duper El Nino and the Bigger Problem

21 August 2026

James Hansen, Pushker Kharecha, Dylan Morgan and Jasen Vest

Abstract. The ongoing El Nino is already the strongest in the modern record. However, increasing global climate anomalies, poleward shifting of climate zones, increased rainfall extremes, more rapid flash droughts and fires, and marine heat waves are a result of accelerating human-made global warming. The abnormal El Nino strength is itself likely human-driven. Our graphs are continually updated on our website.[2] We are on Substack[3].

The El Nino has blossomed. It is off the charts. Usual measures of El Nino have blown past prior record levels in the period with good data, even though maximum effects are still several months in the future. Our preferred metric, the heat anomaly in the upper 300 meters of the Equatorial Pacific Ocean (Figs. 1, 2), already exceeds the 1997-98 super El Nino. Note in Fig. 1 that the 2023-24 El Nino, which drove extreme global warming, was only a moderate El Nino. The more common Nino3.4 metric, sea surface temperature (SST) in the equatorial Pacific, also far exceeds prior values, but this ocean skin temperature is affected more by global warming than the 300 m heat is. The tropical ocean heat content (via heat exhalation to the atmosphere) and the skin temperature (via the Bjerknes feedback) each affect El Nino strength, so both are relevant metrics.

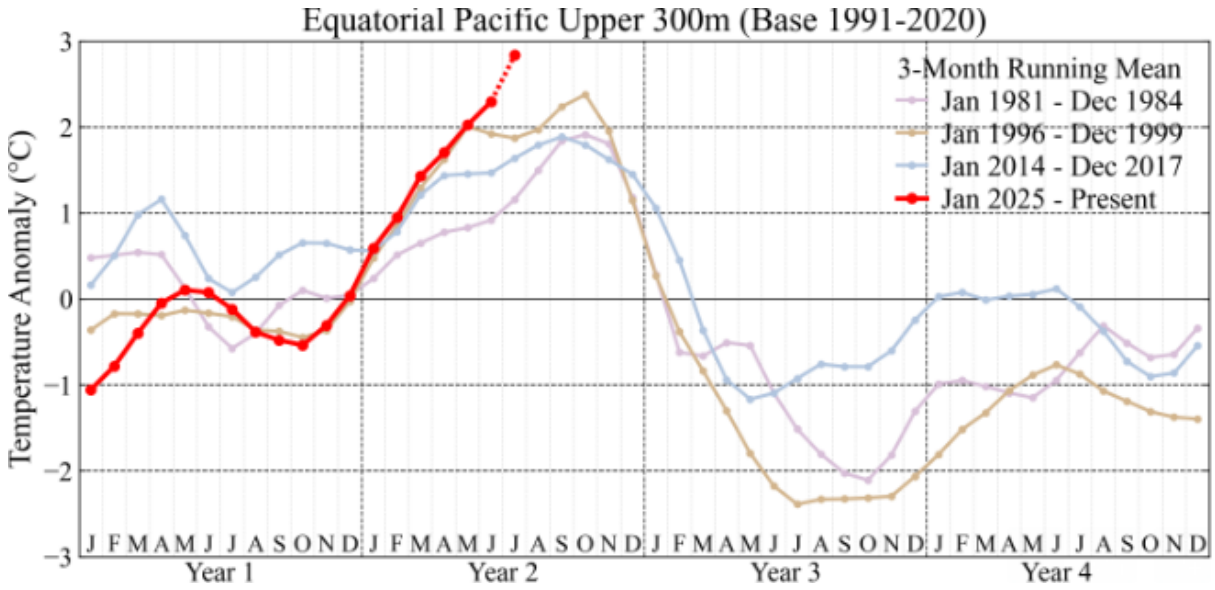

Fig. 2. Four super El Ninos since 1980; final point of current El Nino is the 1-month value.

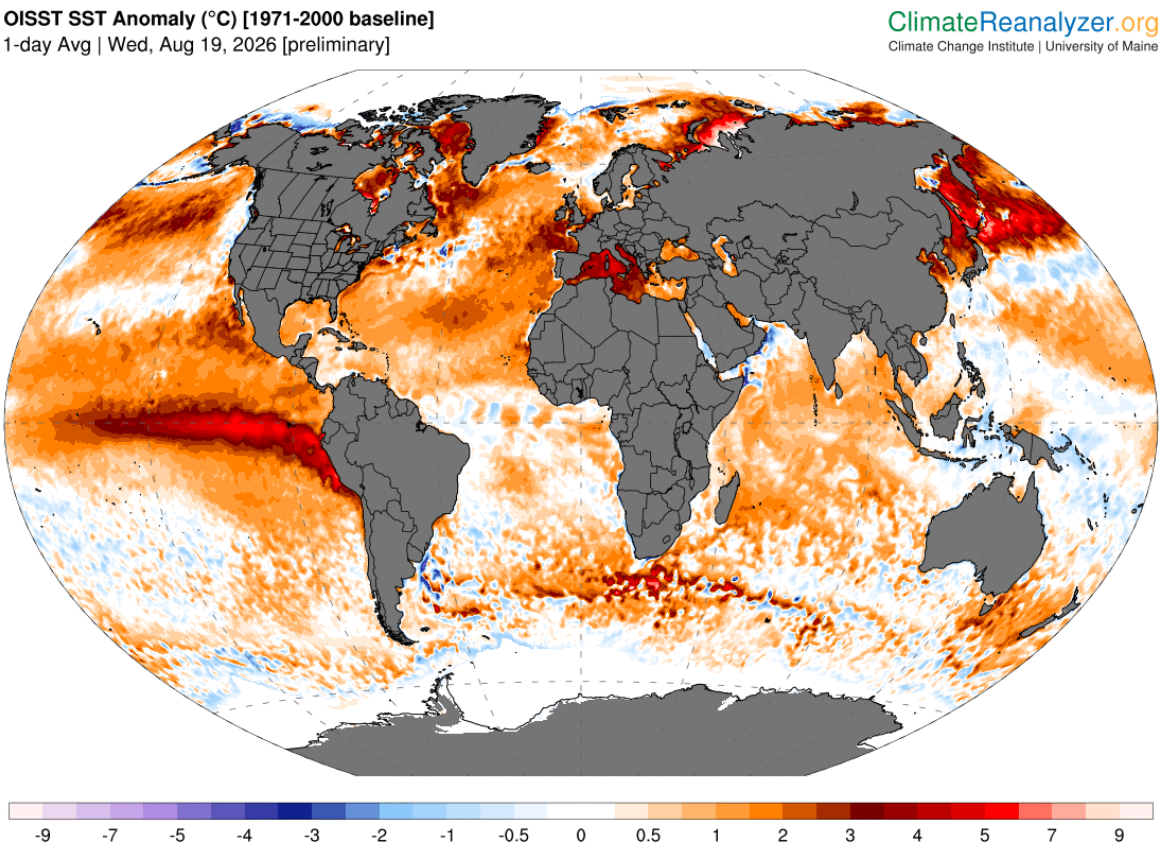

Fig. 3. Sea surface temperature anomaly on 19 August 2026 (NOAA OISST V2.1 data). Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine.

This super-duper El Nino arrives on a planet already infected by human-made global warming. Heat waves are increasing, at sea and on land. Marine heat waves (Fig. 3) tend to be more extreme in the summer, when the ocean surface mixed layer is thinnest and winds are calmest. Marine heat waves have increased over the past century in response to global warming[4] and recently their intensity is increasing faster, coincident with acceleration[5] of global warming (Fig. 4). Marine heat

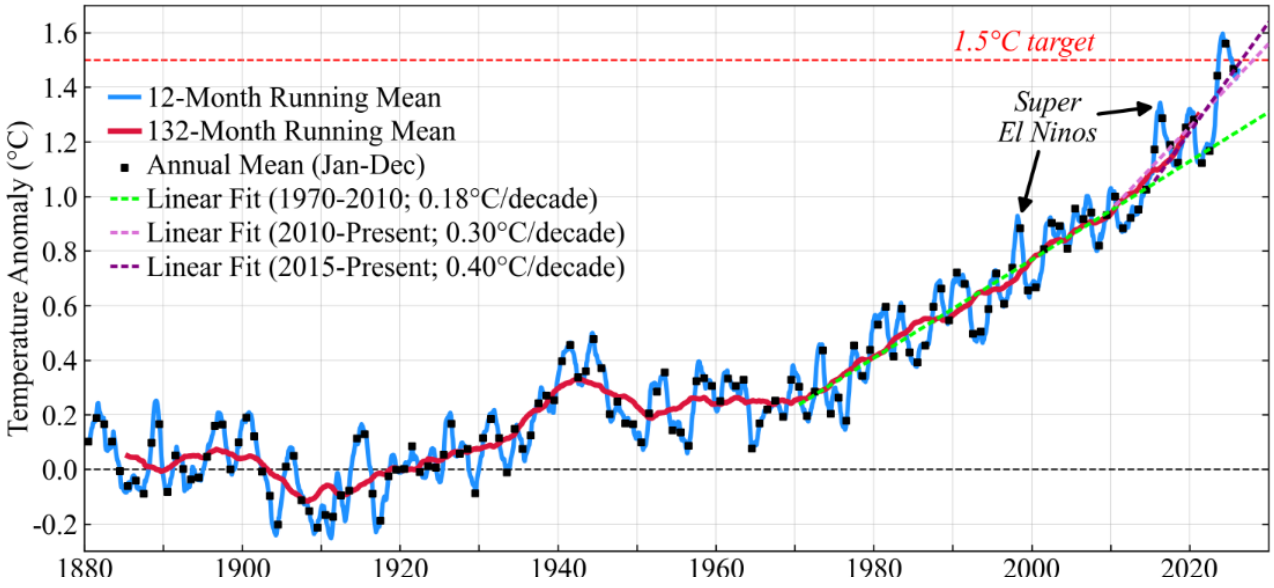

Fig. 4. Global surface temperature (relative to 1880-1920 base period).[6]

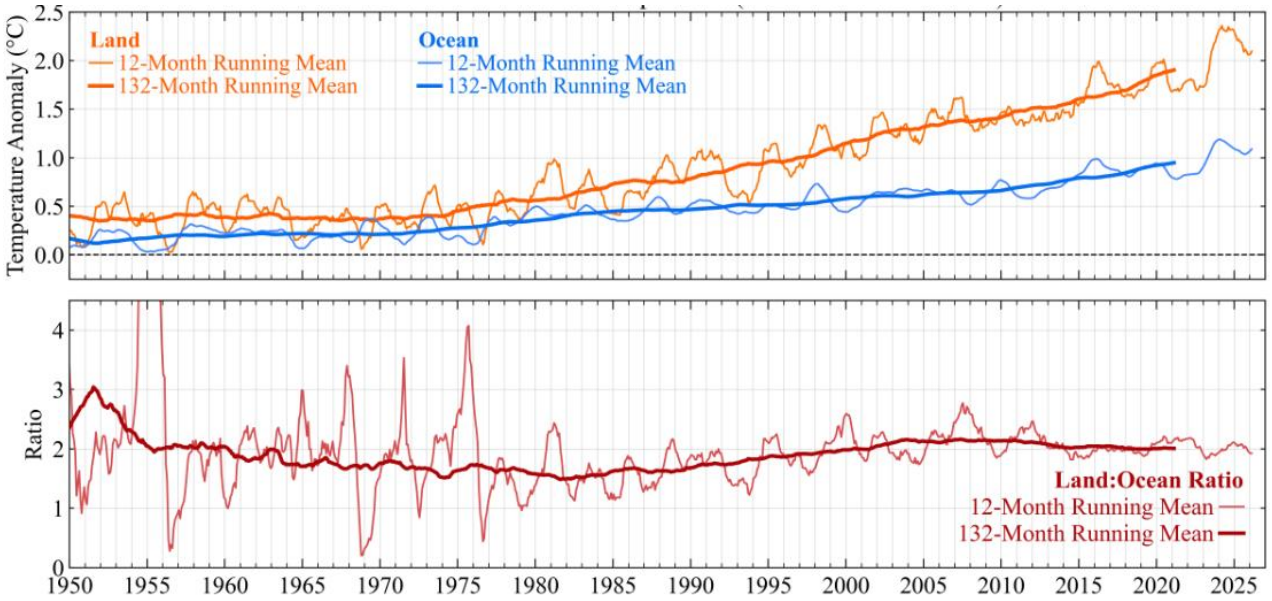

Fig. 5. Surface temperature over land and ocean (relative to 1880-1920 base period).[6]

waves already affect the integrity of marine ecosystems and associated ecosystem services.[7] Temperature change is twice as large over land as it is over ocean (Fig. 5). Land temperature reached +2.4°C relative to the 1880-1920 mean during the 2023-24 El Nino and is likely to approach +2.7°C in 2027 (almost +5°F).

Consequences of high temperatures on humans have been underestimated by failure to account for the dependence of heat tolerance on a person's age.[8] People over 60 years old are much more vulnerable to high temperatures than young people are. In the referenced study it is estimated that 22% of the people in the world over 60 years of age are exposed to unsafe temperature levels for at least one month per year with global temperature at its recent level of about +1.5°C. Numerous news reports today have the excess deaths in Europe this summer already over 25,000 and rising. Although greater use of air conditioning may reduce future fatalities there, the worst-affected regions – South Asia, the Gulf nations, and Africa, including India, Pakistan, Bangladesh, Myanmar and Niger – have large populations with high levels of poverty and little access to cooling. Kong et al. estimate that each degree Celsius of global warming adds a month of intolerable heat for one billion people.

This and other emerging climate impacts should provide incentive for the world to finally get serious about understanding and addressing human-made climate change. Global warming is accompanied by a shifting of climate zones with consequences. Many living spaces occupied based on 20th century climate will not be well-suited to habitation later in the 21st century, if we allow climate change to continue. The extreme heat and drought anomalies in the Mediterranean and neighboring European regions, as well as conditions in the Southwest United States, where drought has intensified and the levels of Lake Mead and Lake Powell keep falling, will continue to worsen unless we reverse the trends of human-made climate forcings. Living conditions for large populations in South Asia, Gulf nations and Africa threaten to become intolerable.

The present acceleration of global warming (Fig. 4) is well-established and its cause is known. Climate sensitivity is significantly higher than the best estimate of IPCC (Intergovernmental Panel on Climate Change) and the net human-made climate forcing, including aerosol effects, is now

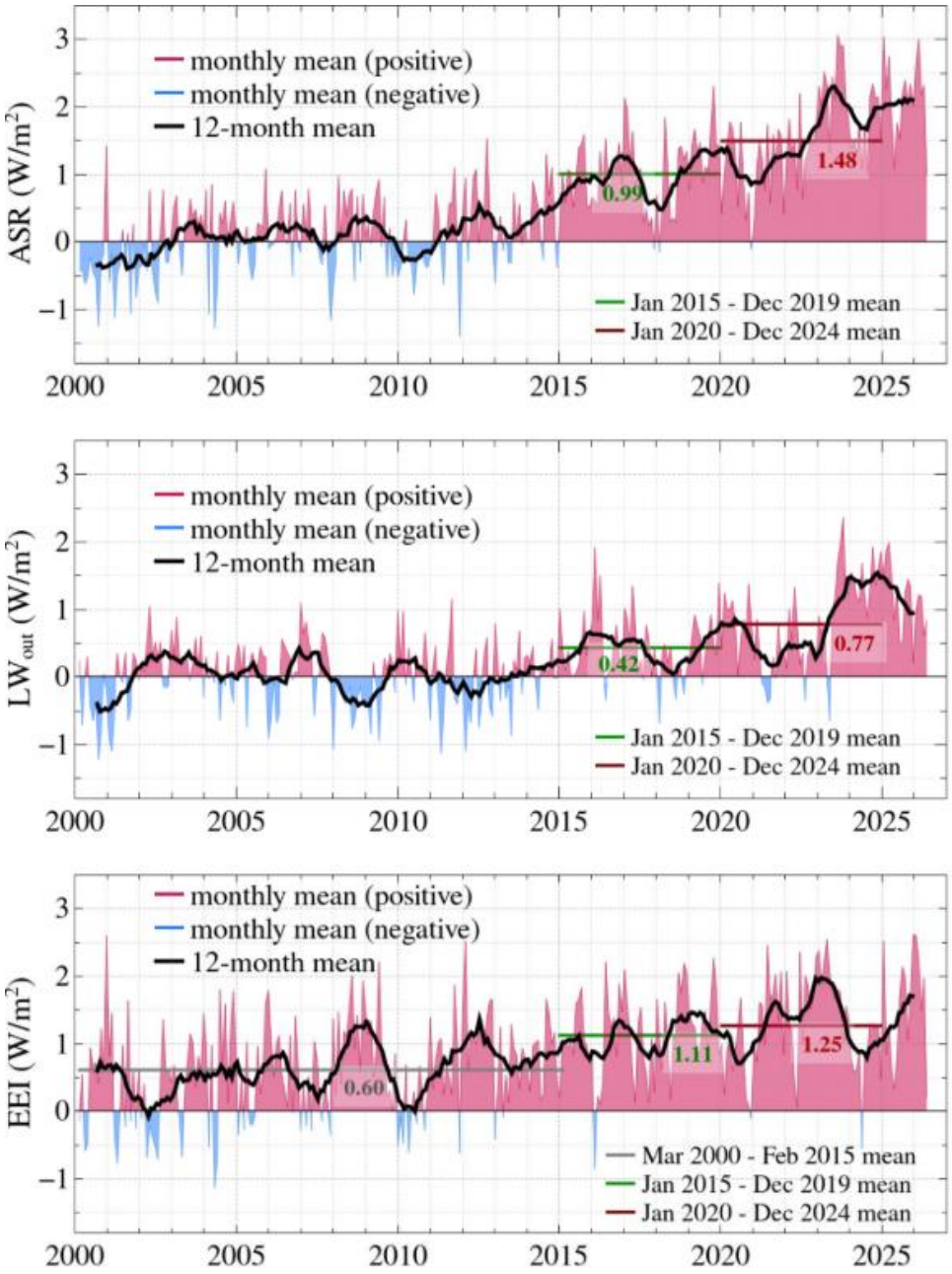

Fig. 6. Earth's satellite-observed absorbed solar radiation (ASR) and longwave (thermal) emission to space (LW),[9] both relative to their 2000-2010 averages, and the absolute Earth energy imbalance (EEI) calibrated with aid of Argo-measured heat storage in the ocean.[10]

larger than their best estimate. There are multiple confirmations of this assessment, as delineated on page 5 of our earlier communication.[11] The accelerated warming rate will continue in at least the near future, as its proximate cause is the doubling of Earth's energy imbalance (Fig. 6), which is not declining. It is still feasible to alter this situation and the prospects for today's young people, as will be discussed in future communications.

Appendix

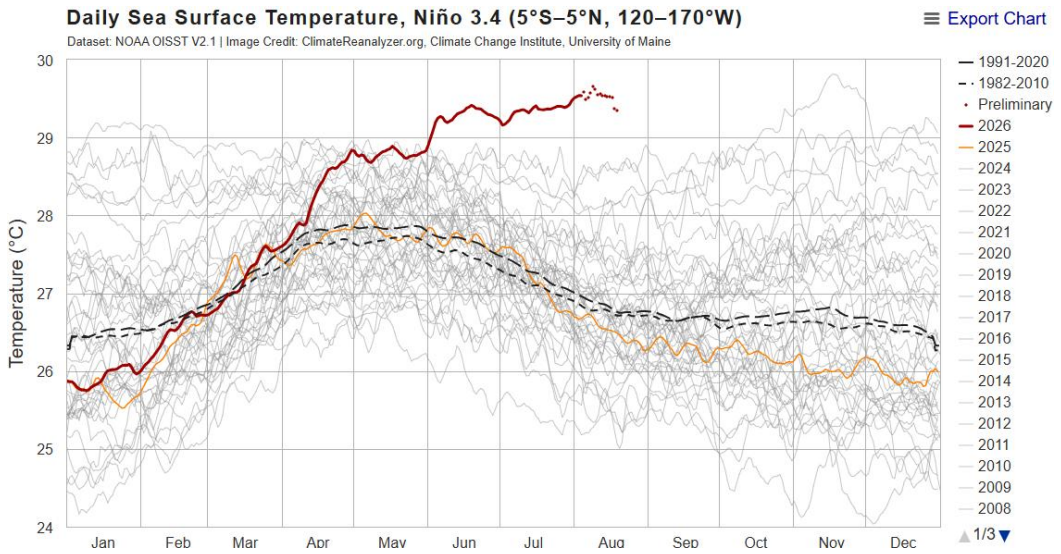

Fig. A1. Nino3.4 temperature index (NOAA OISST V2.1 data). The red curve is 2026. Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine.

---

[1] NOAA PSL Central Pacific heat content (upper 300 m temperature anomaly) . Data table (CPC equatorial upper-300 m temperature anomaly index; 180°W–100°W): heat_content_index.txt

[2] Our communications (posts) and data are available now via Hansen's website while we continue to develop and populate our websites and data pages. Figures in communications and papers that remain of current interest will be updated at appropriate intervals, usually monthly, with the most recent date of update indicated on the website.

[3] https://jimehansen.substack.com/

[4] Oliver ECJ, Donat MG, Burrows MT, *et al*. Longer and more frequent marine heatwaves over the past century. *Nature Comm* **9**, 1324, 2018 DOI:10.1038/s41467-018-03732-9

[5] Hansen JE, Kharecha P, Sato M *et al*. Global warming has accelerated: are the United Nations and the public well-informed? *Environ.: Sci. Pol. Sustain. Devel.* 67, 6–44, 2025, https://doi.org/10.1080/00139157.2025.2434494

[6] Temperature is from Goddard Institute for Space Studies analysis described by Hansen J, Ruedy R, Sato M *et al.* Global surface temperature change, *Rev Geophys* **48**, RG4004, 2010; Lenssen NJL, Schmidt G, Hendrickson M *et al*. A NASA GISTEMPv4 Observational Uncertainty Ensemble, *J Geophys Res Atmos* **129**, e2023JD040179, 2024

[7] Smith KE, Burrows MT, Hobday AJ, *et al*. Biological impacts of marine heatwaves. *Ann Rev Mar Sci* **15**, 119-45, 2023

[8] Kong Q, Vecellio DJ, Huber M, *et al*. Exceeding human heat tolerance in a warming, ageing world: a global projection modelling study. *Lancet Planet Health*, doi.org/10.1016/j.lanplh.2026.101494, 2026

[9] Loeb NG, Johnson GC, Thorsen TJ *et al*. Satellite and ocean data reveal marked increase in Earth's heating rate. *Geophys Res Lett* **48**, e2021GL093047, 2021

[10] von Schuckmann K, Cheng L, Palmer MD *et al*. Heat stored in the Earth system: where does the energy go? *Earth Sys Sci Data* **12**, 2013-41, 2020

[11] Hansen J Kharecha P, Morgan D, Vest J. Super El Nino? Super warming is the main issue. 23 March 2026