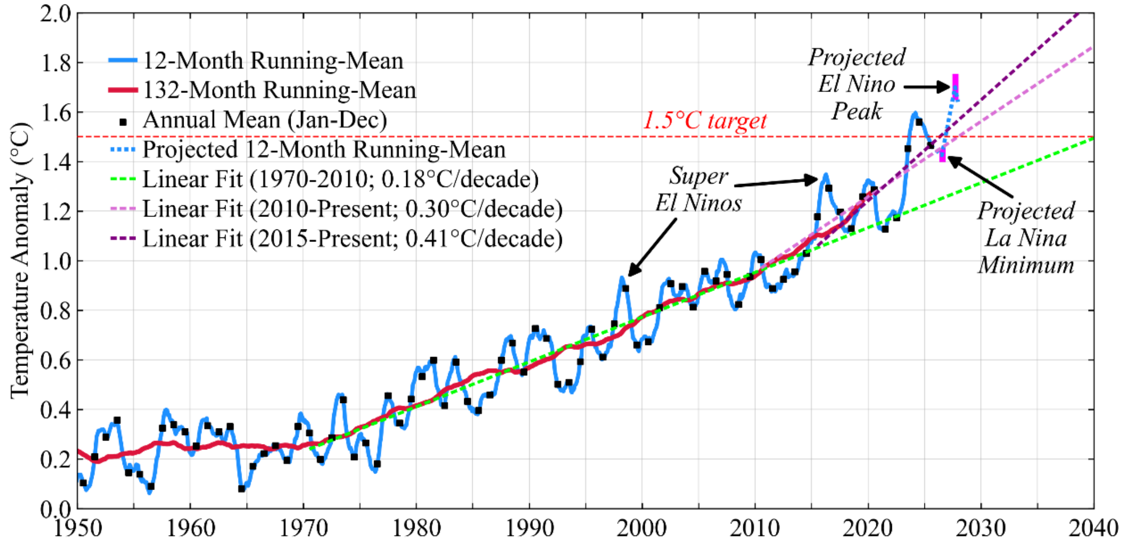

Fig. 1. Global surface temperature (relative to 1880-1920 base period).[1]

Another El Nino Already? What Can We Learn from It?

06 February 2026

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Abstract. The world seems headed into another El Nino, just 3 years after the last one. Such quick return normally would imply, at most, an El Nino of moderate strength, but we suggest that even a moderately strong El Nino may yield record global temperature already in 2026 and still greater temperature in 2027. The extreme warming will be a result mainly of high climate sensitivity and a recent increase of the net global climate forcing, not the result of an exceptional El Nino, per se. *We find that the principal drive for global warming acceleration began in about 2015, which implies that 2°C global warming is likely to be reached in the 2030s, not at midcentury*.

It is important to understand ongoing global temperature change as well and as soon as possible for the sake of policy assessment. As a first step for discussion, let us clarify what is shown by the blue curve in Fig. 1: it is the 12-month running-mean of the global temperature anomaly relative to base period 1880-1920 (the earliest time with data adequate for a reliable multi-decade global mean). Black squares in the blue curve indicate the annual mean (Jan-Dec) temperature.

Researchers often show annual temperatures connected by straight lines, as in Fig. 2.[2] If the blue curve in Fig. 1 is replaced by straight lines connecting the black squares, our graph becomes Fig. 2. We prefer[3] the 12-month running-mean, which takes out noise and seasonality of temperature change at any time of year; no need to wait until December. The higher temporal resolution of the running-mean provides more information, e.g., in studying the global temperature response to a volcano, which may occur in any month with a climate effect of limited duration.

El Nino. The El Nino/La Nina cycle is the main cause of global temperature oscillation in Fig. 1. During the more persistent La Nina phase, easterly (east-to-west) trade winds in the equatorial Pacific push warm surface water toward the western Pacific, causing upwelling of cold deepwater near South America. Atmospheric circulation engendered by this ocean temperature

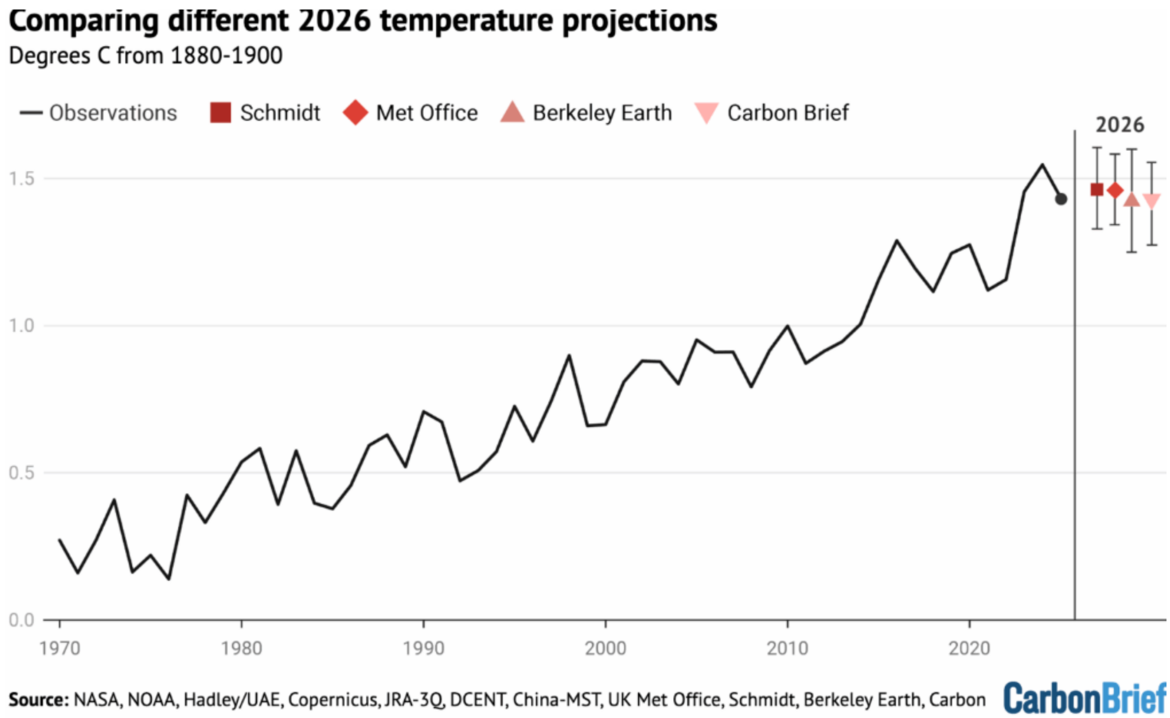

Fig. 2. Multi-analysis-mean global temperature for 1970-2025 and projections for 2026.

pattern reinforces the trade winds and helps perpetuate the temperature pattern (UK Met Office video). This reinforcement (Bjerknes feedback) can temporarily work in the opposite sense and spur an El Nino, if westerly wind bursts cause sufficient eastward movement of warm water. However, many factors including the initial ocean state, the phase of natural (Madden-Julian) atmospheric disturbances, the fickle wind bursts, even salinity anomalies in surface waters,[4] make the occurrence and magnitude of El Ninos difficult to predict.[5,6]

Two years ago, when many doubted the reality of global warming acceleration, we noted[7] that the peak of the ongoing El Nino and the following La Nina valley could help confirm the reality of acceleration and assess whether average global temperature has already reached 1.5°C. The La Nina valley is yet to be determined, as the 12-month mean is still declining. We projected[7] a minimum of 1.4°C to be achieved by the second quarter of 2026. A minimum about 1.4°C will be strong support of global temperature acceleration, as such La Nina *minimum* is higher than any El Nino *maximum* in the prior decade, which included a "Super El Nino." In turn, it supports the mechanisms that we suggest are behind acceleration: high climate sensitivity (at least 4°C for doubled CO_2) and reduction of aerosol cooling due to declining aerosol emissions from East Asia and ships at sea (Global warming in the pipeline,[8] and Global warming has accelerated).[9]

Upon noticing the excellent collegiality of 2026 projections (Fig. 2, right side), we wondered about the basis of the collegiality and if it provides opportunity to test the physics behind global warming acceleration. As explained in *Sophie's Planet*,[10] IPCC's GCM-dominated process of climate assessment leads to a low best-estimate of climate sensitivity (3°C for doubled CO_2) and little role for aerosols in the steady, rapid, global warming that began about 1970 (GCM = global climate model; IPCC = Intergovernmental Panel on Climate Change). In contrast, from four independent evaluations,[11] we find climate sensitivity of at least ~4°C for doubled CO_2. That high sensitivity is consistent with observed global warming of 0.18°C/decade after 1970, if aerosol cooling increased moderately during 1970-2005, as aerosol-cloud modeling suggests.[12]

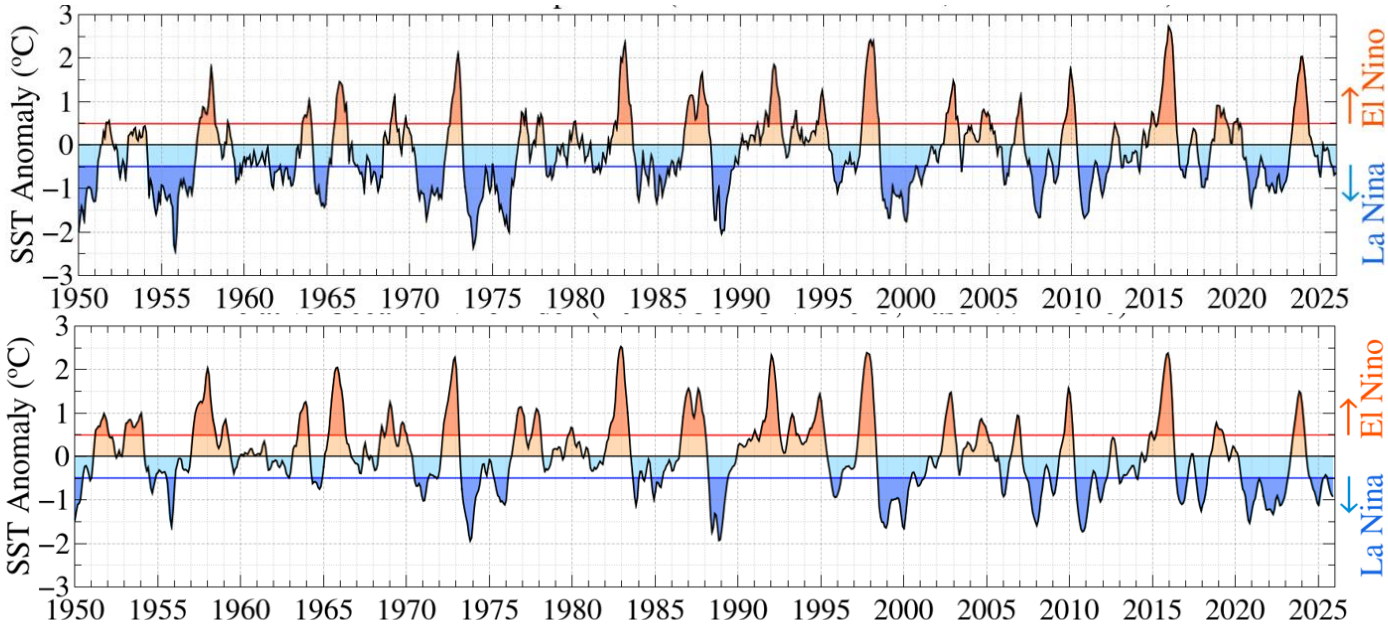

Fig. 3. Nino3.4 SST (ERSSTv5 dataset, base 1991-2020) and RONI Nino3.4 (lower graph).

El Nino status. The tropical Pacific Ocean is presently in its cool La Nina phase, but climate models suggest that it will move into the El Nino phase later this year. The El Nino/La Nina cycle is the principal source of interannual variability of global temperature (Fig. 1). Sea surface temperature (SST) anomaly in the Nino3.4 region of the tropical Pacific Ocean characterizes the El Nino status (Fig. 3). We must beware that Nino3.4 SST is no longer "natural," because human-made global warming affects SST everywhere. Global warming exaggerates recent El Nino strength and reduces the depth of La Ninas.[13] For example, the 2015-16 El Nino appears in Fig. 3 to be stronger than the 1997-98 "El Nino of the century," but relative to surrounding ocean temperatures the 2015-16 anomaly was much less than in 1997-98.[13] Similarly, the current and other recent La Ninas actually have greater cooling relative to their surroundings than the Nino3.4 index suggests. NOAA, in recognition of this issue, has just introduced a relative Nino3.4 index (RONI = Relative Oceanic Nino Index) by subtracting the SST anomaly of the global tropics (20°N-20°S). RONI Nino3.4 reduces the magnitude of the 2023-24 El Nino and strengthens recent La Ninas (lower graph in Fig. 3). RONI is probably a better measure of El Nino/La Nina status, but it is not presumed to account for likely complex effects of humans on the El Nino/La Nina cycle.

Nino3.4 SST (Fig. 3) does not yet reveal an El Nino, but NOAA NCEP (National Center for Environmental Prediction)[14] forecasts (Fig. 4) suggest an El Nino may begin by early summer, as Nino3.4 SST indicative of El Nino (+0.5°C) is reached by June 2026 for the average of all model runs in this week's report (lower graph in Fig. 4). Individual model runs have a huge range, which is why forecasters are reluctant to make early predictions. Several model runs with most recent initial conditions (the blue curves in the lower part of Fig. 4) do not even produce an El Nino. Another reason to be skeptical of a strong El Nino this year, is the brief period since the last El Nino. There is no example in the past 75 years of strong El Ninos separated by only three years (Fig. 3), perhaps because of the time required for the ocean to replenish the heat lost during an El Nino.

What is the prospect of getting at least a moderate El Nino this year? The Kelvin wave presently crossing the Pacific may peter out as it did in 2022;[15,16] that one was followed instead by a strong

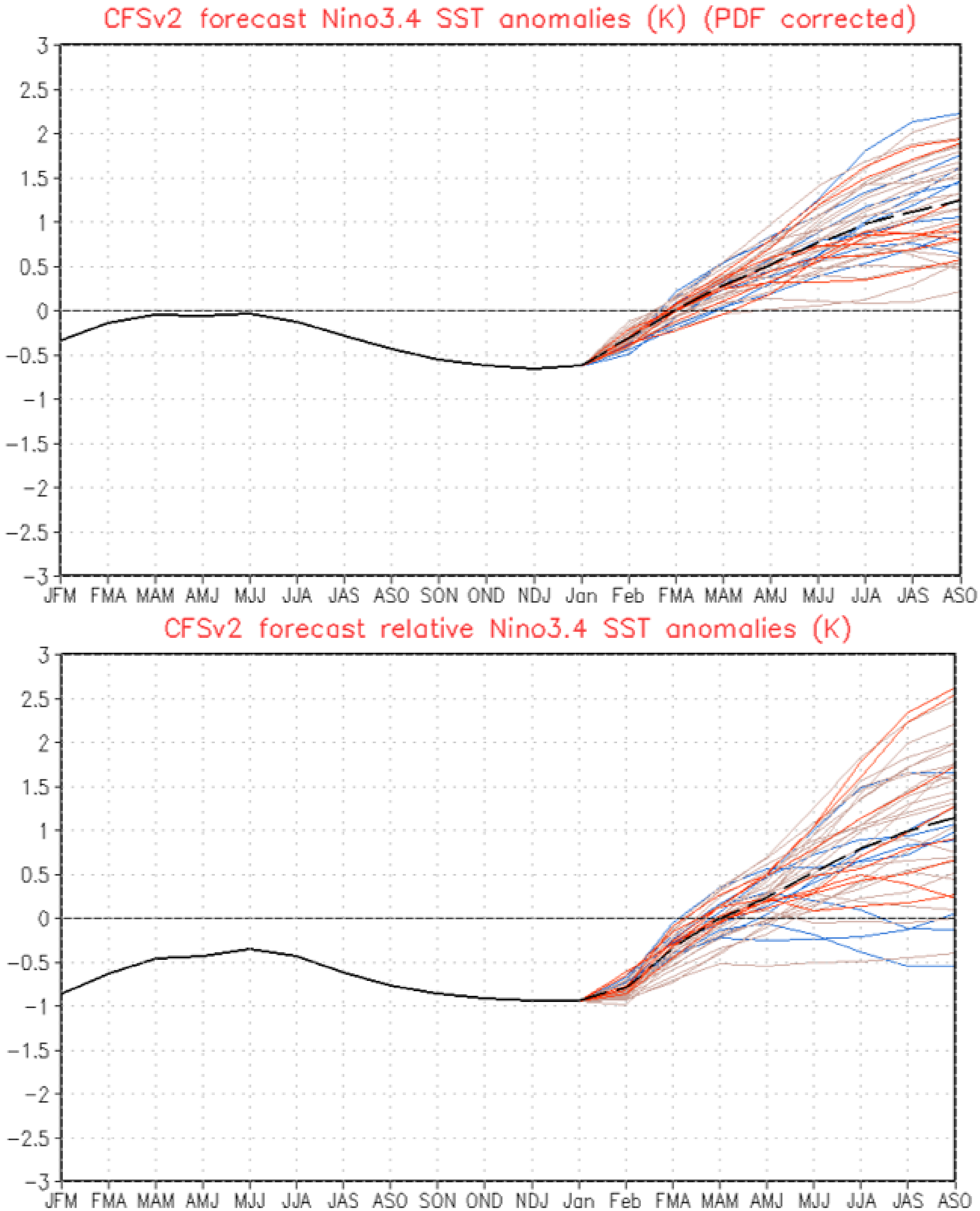

Fig. 4. NCEP Nino3.4 forecasts issued 26 January (above) and 2 February (below).[14]

El Nino the next year. What are the early indications in the real world? Fig. 5 shows two potential predictors: (a) Nino3.4 SST, and (b) equatorial upper ocean (top 300 meters) temperature anomaly at longitudes 180-100°W. The upper ocean heat anomaly seems to be the better predictor, e.g., it shows the 1997-98 El Nino as being the strongest, as 300 m of ocean is less polluted by human-made warming.

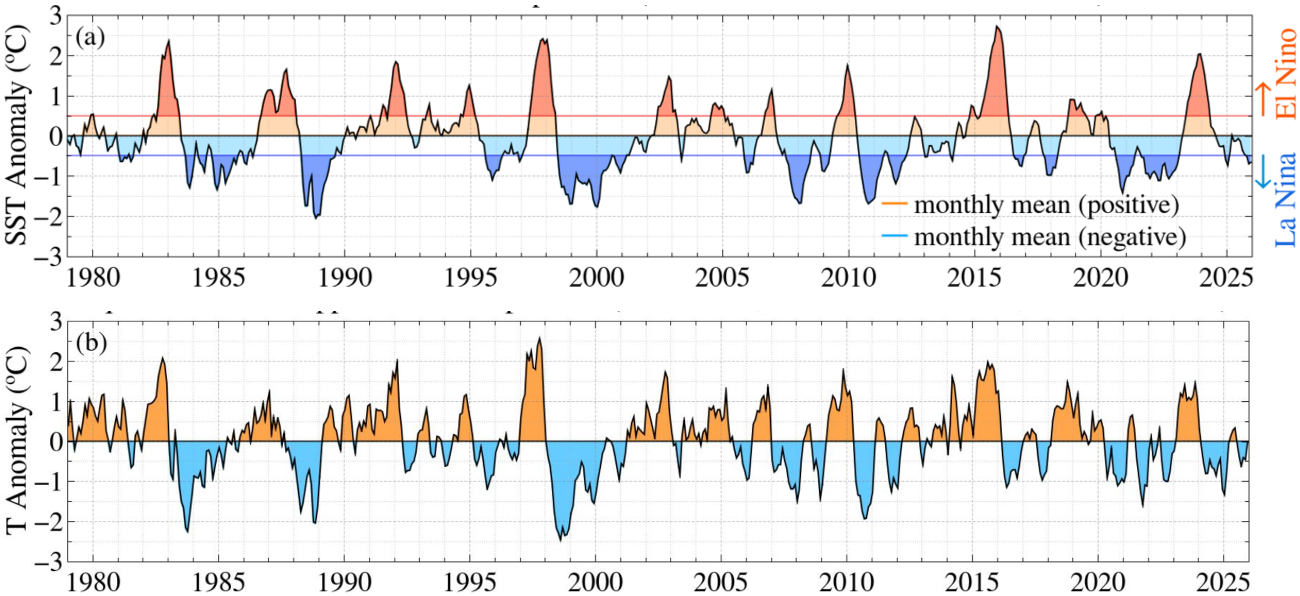

Fig. 5. (a) Nino3.4 SST, and (b) equatorial upper ocean (300 m) heat anomaly (°C) 180-100W.

Another merit of upper ocean heat: it provides a longer lead time. The 12-month running-mean of tropical Pacific upper ocean heat has correlation of >50% with running-mean global temperature, leading global temperature by 9 months (Fig. 6). Nino3.4 has slightly higher correlation, but a lead time of only 4 months. At the end of December, Nino3.4 was still at a minimum, while the upper ocean heat anomaly climbed to zero. If this index continues to rise, it suggests an El Nino peaking near the end of 2026. Fig. 7 provides an update of both indices into 2026. Nino3.4 is still deep in La Nina conditions but the upper ocean temperature anomaly is +0.7°C. If this continues to rise, a significant El Nino becomes more likely, but there are many instances in which the 300 m anomaly reached 1°C without achieving an El Nino (Fig. 5).

Despite the uncertainty, in [Global temperature in 2025, 2026, 2027] we went out on a limb, accepted El Nino projections of multiple dynamical models,[14] and estimated the impact on global temperature – because often something can be learned via educated speculation.[17] We inferred that global temperature, after reaching a minimum about +1.4°C in the first half of 2026, will rise to about +1.7°C in the first half of 2027, as spurred by even a moderately strong El Nino.

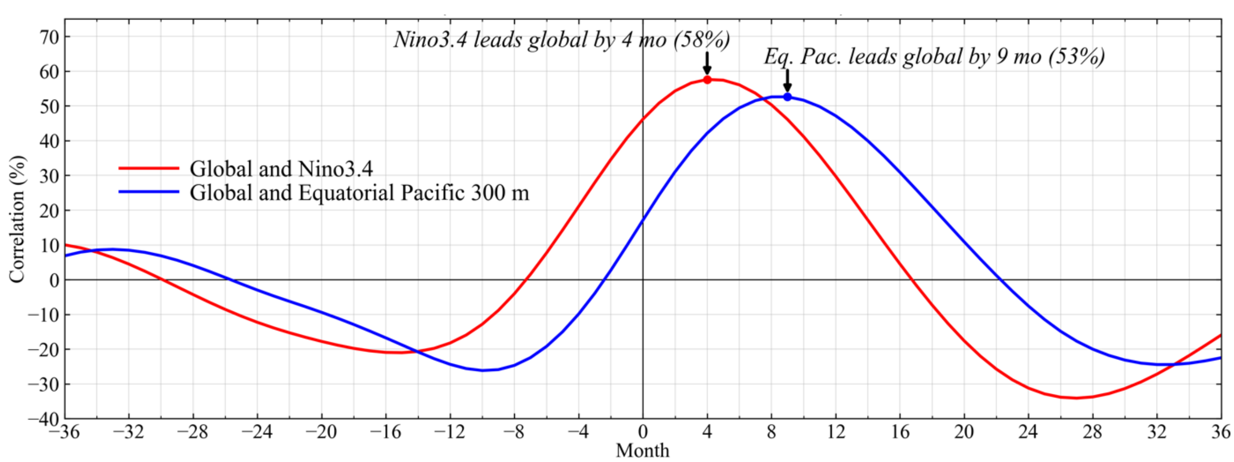

Fig. 6. Correlation of global temperature with Nino3.4 and equatorial upper 300 m temperature.

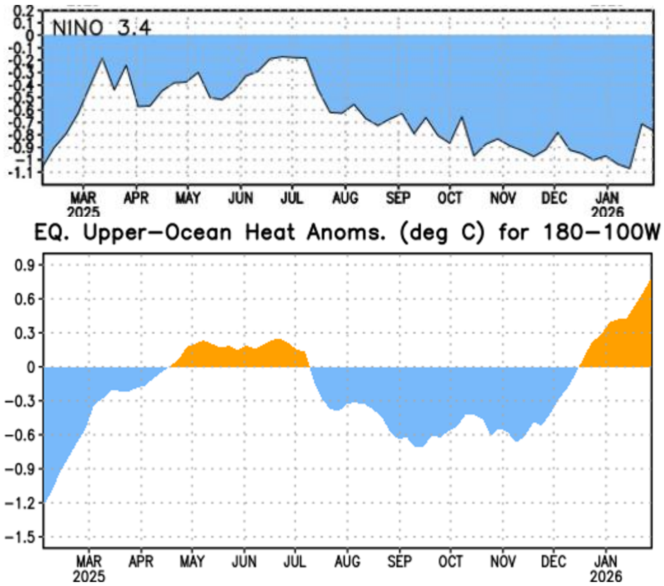

Fig. 7. RONI Nino3.4 and upper ocean heat anomaly to late January 2026.[14]

Zeke Hausfather, not one to be outshone and doubtless sensing that he may have overlooked something, jumped in the saddle and added his own projection[18] for 2027 (Fig. 8). His error bar is so large as to make his prediction useless for any purpose other than covering one's posterior, for which it seems to be big enough for anybody, even Cal Raleigh.[19]

Is there value in our precise projection of the minimum global temperature of the current La Nina and maximum during the upcoming El Nino (Fig. 1, both refer to the more informative 12-month running-mean global temperature, not to Jan-Dec means)? Perhaps it can help force a reckoning of basic climate physics issues that we raised in our papers.[8,9] Our conclusions were: (1) climate sensitivity is significantly higher than IPCC's best estimate, and (2) global warming accelerated

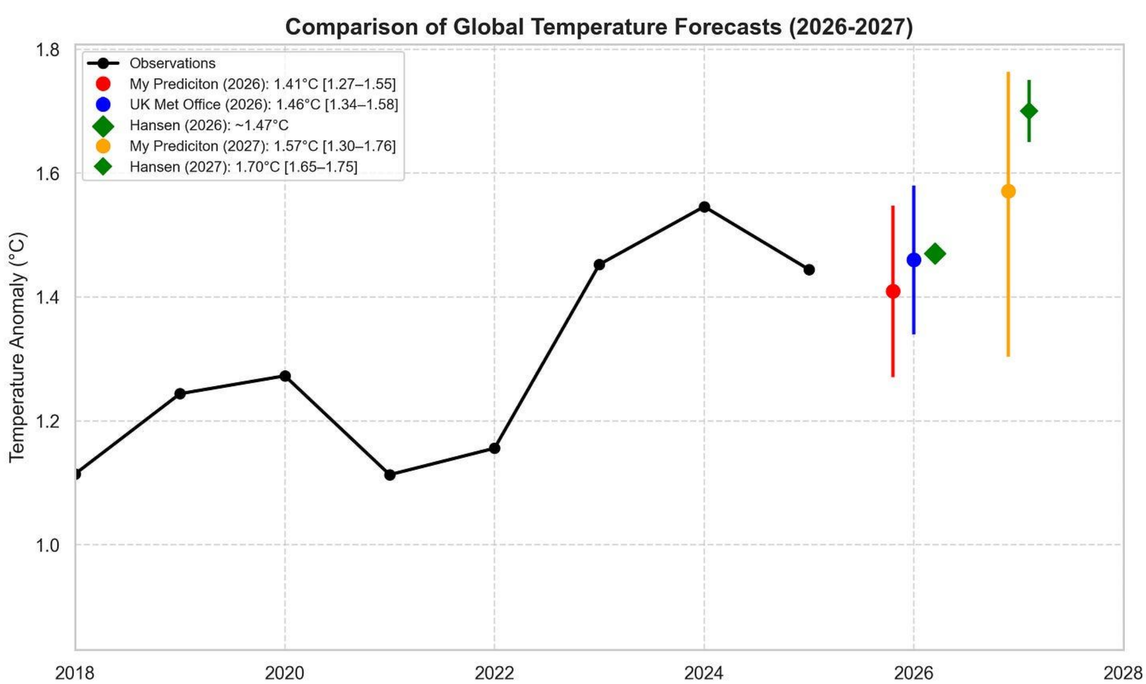

Fig. 8. Hausfather's comparison of predicted 2026 and 2027 global surface temperatures.[18]

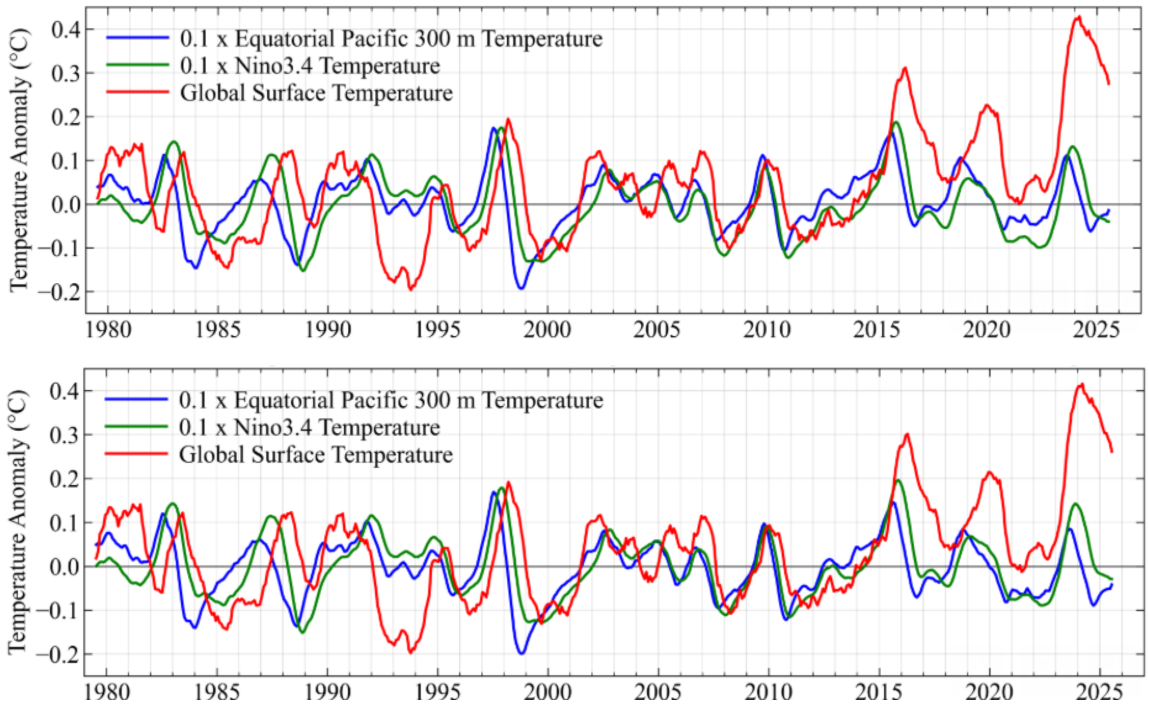

Fig. 9. 12-month running-mean global, Nino3.4, and upper 300 m detrended temperature, after detrending temperatures for base periods 1979-2005 (top) and 1979-2015 (bottom).

in the past decade because the growth rate of the net climate forcing increased, in large part due to reduction of human-made aerosol emissions.

We inferred that IPCC underestimated climate sensitivity because of overreliance on GCM simulations of temperature in the past century. GCMs simulate the large water vapor climate feedback well, but the other large feedback, cloud change, is more difficult. As a result, on average, models are conservative in the cloud feedback and yield, on average, a climate sensitivity of about 3°C for doubled CO_2. With that climate sensitivity, GCMs match observed warming with no contribution from changing aerosols during the period (1970-2010) of rapid, linear, global warming. However, it is likely that aerosol cooling increased in that period, at least up until about 2005, even though global sulfate emissions were roughly constant over that period. Aerosol forcing likely became more negative during 1970-2005 because the aerosol effect on clouds is nonlinear. Emissions into a relatively pristine atmosphere have greater effect than additional emissions into an already heavily polluted atmosphere.

Aerosol-cloud modeling required to calculate the aerosol climate forcing is still primitive, but modeling[12] that incorporates the geographic spread of emissions yields an estimate that aerosol cooling increased during 1970-2005, with a change of aerosol forcing of about –0.5 W/m^2. Such aerosol forcing reduces the net human-made climate forcing so that a climate sensitivity of at least 4°C for doubled CO_2 is needed to match observed post-1970 global warming. That conclusion does not surprise most global modelers; on the contrary, there is widespread suspicion that many GCMs underestimate the cloud feedback. However, the clique of climate scientists who act as principal sources for the media reacted to our papers in a juvenile, unscientific fashion, with ad hominem comments, but with no discussion of the scientific issues we raised.[20] The only discussion of the science was befuddled recognition that something was wrong with the models, which did not reproduce the rapid warming of the past several years.[21]

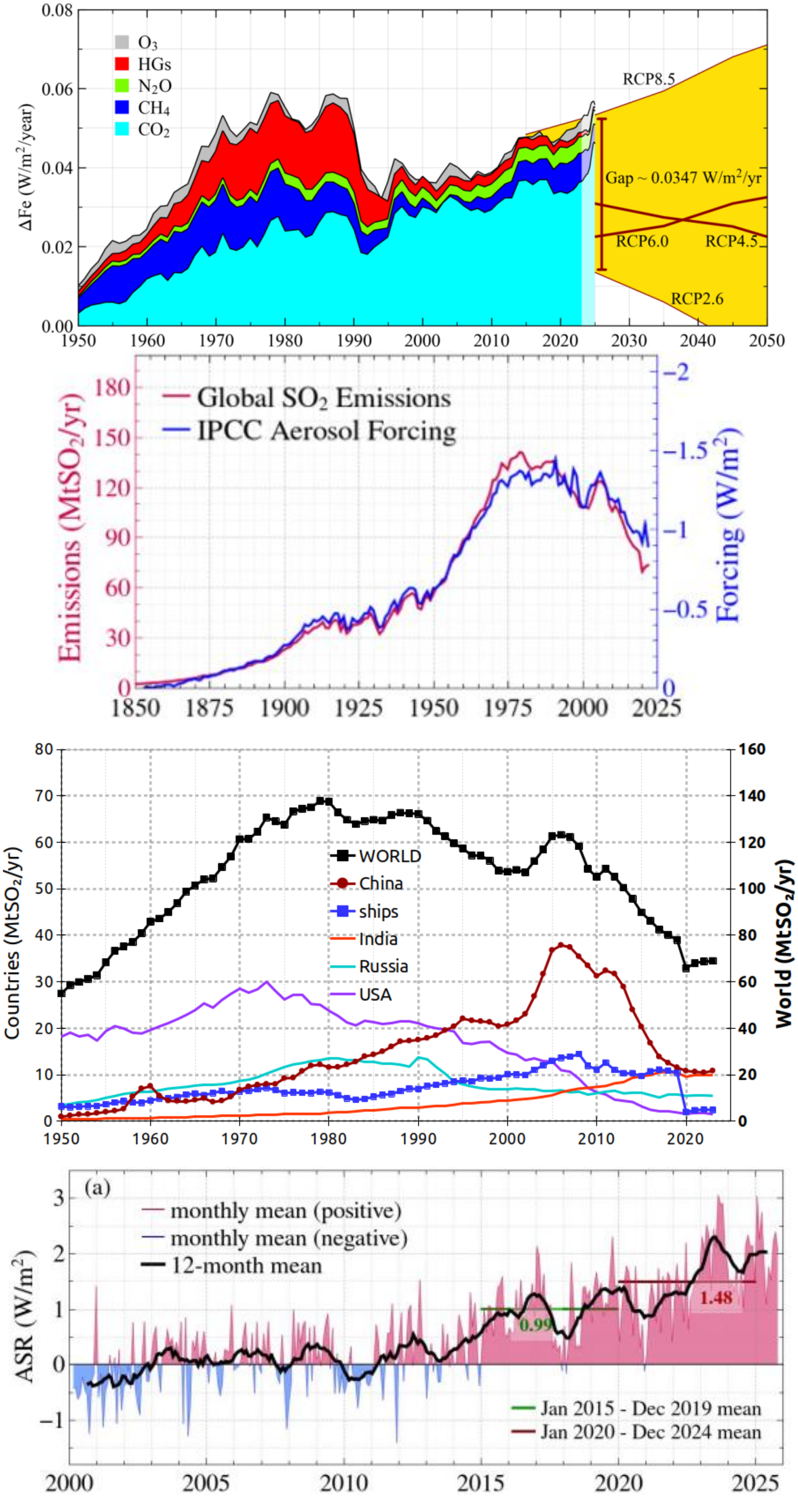

Fig. 10. Quantities relevant to the forcings that drove acceleration of global warming

A brief climate event, such as an El Nino or volcanic eruption, by itself does not yield much information on equilibrium climate sensitivity because the response to a climate forcing is nearly independent of climate sensitivity for the first year or two after a forcing is applied.[22] The reason for that behavior is that climate feedbacks do not come into play in direct response to a climate forcing, but rather in response to the (delayed) temperature change caused by the forcing, and it is the feedbacks that distinguish high sensitivity from low sensitivity. However, within several years after a forcing is introduced the responses for different sensitivities begin to separate. Thus, we focus here on the global warming acceleration in the past decade and its potential information on climate sensitivity. Temperature trends are subtracted to obtain Fig. 9. It makes little difference whether the period used to define the trends is terminated in 2005, 2010 or 2015. We show the two extreme cases (2005 and 2015) in Fig. 9. The graph begins in 1979 because upper 300 m data only goes back that far, but the trend rates of global temperature and Nino3.4 are nearly unchanged when their data begin in 1970. Global warming begins to diverge from the linear trend in about 2015. The magnitude of this gap is the source of befuddlement for climate models, especially those with low climate sensitivity. This persistent, seemingly growing, gap implies an increase of the net climate forcing.

Fig. 10 shows quantities relevant to the major forcings, greenhouse gases and aerosols. The greenhouse forcing increased by about 20% between 2010 and 2015, with the main increase slightly closer to 2015. Aerosol forcing change is difficult to estimate from only global sulfate emissions, mainly because of the nonlinearity issue, but the major turning point seems to be between 2010 and 2015. Higher temporal resolution in the second graph of sulfate emissions shows that Chinese emissions declined most rapidly between 2013 and 2014. Ship emissions declined most in 2020. The final graph in Fig. 10, change of solar radiation absorbed by Earth provides a valuable overview: its change must result mainly from aerosol forcing (reduced aerosol amount) and feedbacks (mainly reduced cloud albedo, but also reduced sea ice). The change of absorbed solar energy begins between 2010 and 2015, but mostly about 2015.

If we characterize this forcing change with a single "turning point," that turning point is in the range 2010 to 2015, probably closer to 2015. Thus, in finding the best linear fit to accelerated global warming in Fig. 1, we show results with the linear fit starting on the trend line for both choices: 2010 and 2015. The latter, more realistic, choice results in global warming reaching 2°C in the 2030s.

Why do we expect the next year or two to yield increased illumination of climate sensitivity and global warming acceleration? Climate feedbacks come into play only slowly, in response to global temperature change. In the first year after a forcing is applied, feedbacks are slight because the temperature change is small. For example, consider a Pinatubo-size volcanic eruption. If Pinatubo aerosols stayed in the stratosphere indefinitely, the eventual cooling would be about 3°C (the exact value depending on climate sensitivity). However, actual cooling in one year is only about one-tenth of that amount because of the ocean's thermal inertia; one year is not long enough to initiate much feedback amplification. Global cooling in response to a Pinatubo eruption does not rise above about 0.3°C because aerosol amount begins to decrease rapidly within a year, as aerosols fall into the troposphere and are washed out by rainfall.

In contrast to a brief forcing such as volcanic aerosols, a long-standing forcing generates a response that grows. After a few years, the climate response begins to be significantly more for

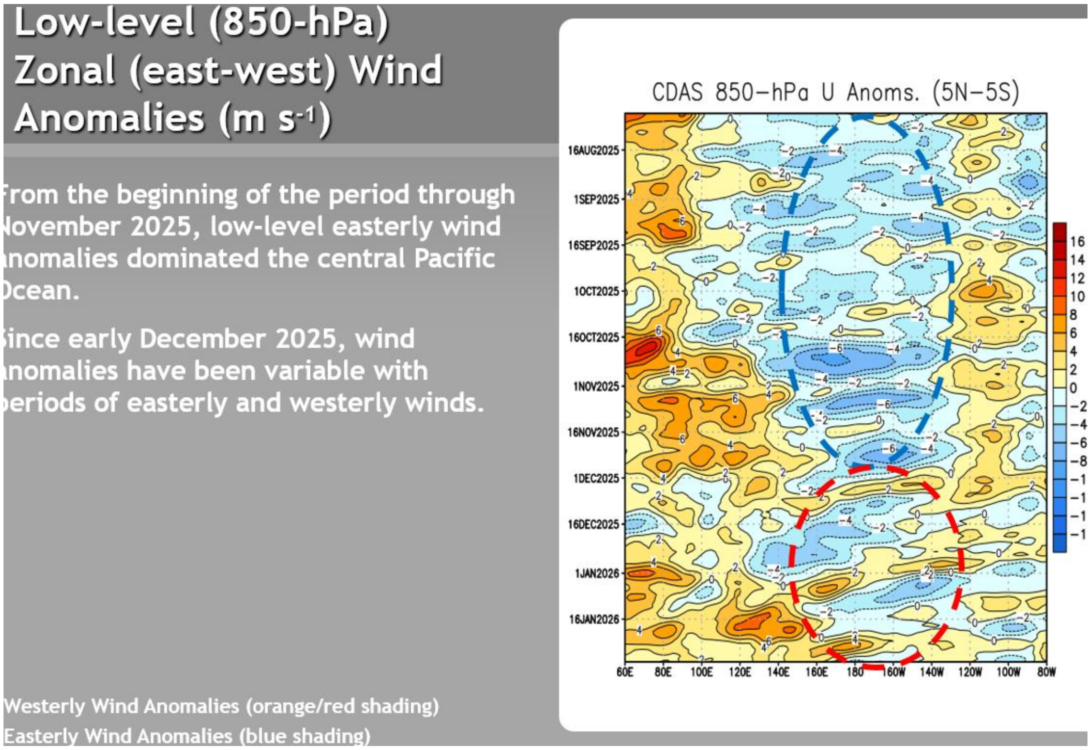

Fig. 11. Equatorial wind anomalies; westerlies (orange-red) have been dominant in the past month.[14]

high climate sensitivity than for low climate sensitivity. That statement is true regardless of whether an El Nino occurs, but the distinction will be more obvious if there is a substantial El Nino. It will become increasingly difficult to dismiss accelerated warming as being within the model fog of climate simulations employed by IPCC.

Thus, let us first see whether an El Nino is occurring, which will be clearer within the next few months. In the past month (the lowest part of Fig. 11, in which time runs from top to bottom) westerly wind anomalies have been dominant, which weakens the east-to-west equatorial trade winds, thus allowing warmer water from the West Pacific to slosh back toward Peru. If the fickle winds continue that tendency into Northern Hemisphere Spring, and if human-made warming has sped recharge of Western Pacific heat content, we may get a substantial El Nino only three years after the last one, for the first time in the past 75 years.

A horse race will then ensue. Our bet, based on evidence for high climate sensitivity, would be on the side of record global temperatures, perhaps even with annual mean record warmth in 2026 and surely in 2027. This is the sort of bet that one prefers to lose. We leave this race for George Jones to call, as he realizes that the winner loses all. [BTW, the better version of George Jones and *The Race is ON* that we used a few years ago has disappeared from Youtube – it included a great solo by a bespectacled young guitarist – if anyone has a copy of that, please let us know.]

Don't be too pessimistic as the evidence for high climate sensitivity grows. Realistic understanding of the climate situation, and public recognition of that, is the essential first step toward successfully addressing climate change. Progress in climate science during the next 5-10 years is needed for the development of effective energy and climate policy because the pressure for policy action will grow along with climate impacts as global temperature approaches +2°C.

The current flippant attitude – 1.5°C isn't so bad, we can deal with 3°C – of people who should know better will dissolve, if we can improve understanding of the danger of passing the point of no return.

Yes, we know, this all sounds very theoretical. That is the world we live in. Politicians cannot see past the end of their nose, the next election. Young people understand that and have the potential to affect the future. It will be an interesting story.

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