☑ **Fact-Checked Science**

PAPER CHECK · THE SUN

# A superflare forecast's first window closed without one; its evidence is largely in-sample

Velasco Herrera and 12 colleagues forecast stretches of a year or less in which the Sun is more likely to produce flares above X10, which they call S-class superflares, from two oscillations drawn out of the 37 such flares recorded since 1975 [1 p. 1][1 p. 20]. The first window, 2025.7–2026.6, closed without one in NOAA's records [7]; the paper gives no probability to score, and says its skill can be judged only once the solar cycle ends [1 p. 24]. But its evidence is largely built in: the oscillations come from the same flares they are said to fit, and its own Figure 7a draws two later windows, and several past flares, in phases its rule excludes [1 p. 20][1 Fig. 7].

By Fact-Checked Science · Published November 19, 2026

OUR ANALYSIS marks our own reasoning and calculations: our scoring of window A against NOAA's records and STIX's far-side estimates, the base rates, our emulation of the paper's phase extraction and its test against scrambled dates, our two readings of the paper's Figure 7a, and our checks of its tables; the verdicts are our assessment. Everything else comes from the numbered sources.

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## The first window passed without a flare above X10, and the evidence for the windows comes largely from the flares they were fitted to

OUR ASSESSMENT

**0**

flares of X10 or above in window A, 2025.7–2026.6, or in its ±0.2-year margin, in NOAA's GOES-R records; the largest was X8.1 (our count) [7]

**31%**

of all 0.9-year stretches of 1975–2024 held at least one such flare, and 42% of those as long as window A with its margin: base rates the paper doesn't give (our analysis) [3]

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flares fall where both of our re-extracted oscillations are positive; scrambled flare dates give about 26, and phases unrelated to the flares about 9 (our emulation) [3]

THE PAPER'S CLAIMS

**OVERSTATED**

*"we identify 2025.7–2026.6 and 2027.2–2027.9 years, as the primary high-probability windows for S-class flare activity during Solar Cycle 25"*

The abstract [1 p. 1]

Window A has closed, margin included, with no flare at or above X10 in NOAA's records [7][8], and none in STIX's far-side estimates, though STIX saw little of the far side for nearly five months of it [10][11]. One quiet window can't refute a "high" the paper never puts a number on. The odds were raised: with the margin, 3 of the 4 cycles since 1975 had such a flare at that point, if only 1 within the window itself (our analysis). But that is the declining phase, which every cycle passes through, not a skill of the method. See section 2.

**FALSE**

*"Both GLEs and S-class flares occur exclusively during simultaneous positive phases of both oscillations"*

Section 4.11 [1 p. 21]

The oscillations are drawn out of the same 37 flares [1 p. 20], so much of the match is built in: in our emulation, scrambled flare dates land in "positive phases" almost as often as the real ones, and even then 8 of the 37 fall outside (our analysis). And on the paper's own Figure 7a, by two separate readings of ours, at least five of the flares and seven or eight of the particle events sit in a negative phase of one of the two curves [1 Fig. 7]. See section 3.

**MISLEADING**

*"All 77 GLEs recorded between 1942 and 2025 (see Table 4) occur exclusively during coupled positive-phase windows"*

Section 4.11 [1 p. 21]

The particle events, GLEs, are offered as independent validation, but 14 of the 42 in the fitted years, 1978–2017, fell on the very days of the flares the oscillations came from [1 Table 4][3]. The 32 GLEs of 1976–2025 that came more than three days from any of the flares show no significant excess: 11 in both-positive phases, 34%, against 27% by chance (our analysis) [13]. The earlier GLE result it cites drew its 1.7-year oscillation from the GLEs themselves [1 p. 20][27 p. 8]. On the paper's own figure, 24 of the "first 30" sit in a positive 1.7-year phase, but three are drawn in a negative one [1 p. 20][1 Fig. 7]. See section 3.

**FALSE**

*"periods are designated as high-probability windows for S-flare activity if, and only if, both oscillations are predicted to be in simultaneous positive phases"*

The rule, section 4.11 [1 p. 20]; windows C and D, 2028.8–2029.7 and 2030.6–2031.5 [1 p. 21], rated under it in section 4.12 [1 p. 24]

The paper applies the rule to both: C is rated Medium, "Assigned when the coupled-phase criterion is met", and D High at 10°S–15°S, which needs a "strong simultaneous positive phase in both oscillations" [1 p. 24]. Yet on its own Figure 7a the 7-year curve is below zero from about 2028.4 to 2032.4: C and D lie wholly in its negative phase, by both of our readings, and the figure's own letters C and D sit at that curve's crossings, C as it turns negative and D just before it turns positive [1 Fig. 7]. No half of a 7.3-year cycle could hold six windows spread over nine years anyway. Nor do the listed C–F follow the 1.7-year curve, though p. 23 calls A–F its positive-phase windows [1 p. 23]. A slip in the list is possible. See section 3.

**PARTLY TRUE**

*"we analyze two newly identified S-class flares originating on the far side of the Sun, with estimated GOES classes: (a) an X11.1 flare on 14 May 2024, and (b) an X16.5 flare on 20 May 2024"*

The introduction [1 p. 3]; offered as "an independent … validation" [1 p. 25]

The X16.5 of May 20 was a far-side flare, its class an estimate from Solar Orbiter's STIX, not a GOES measurement [5 p. 9]. The X11.1 of May 14 was STIX's estimate for a flare GOES saw too, partly hidden behind the limb, as X8.7 [5 p. 10][8]: the flare the paper's own Table 1 lists as moderate [1 p. 3]. Both came before window A, and that the forecast came first rests on the authors' word. See section 4.

**TRUE**

*"the 37 S-flares recently reported by Tan et al. (2025)"*

The data, section 2.1 [1 p. 4]

The paper's list of flares above X10 since 1975 matches Tan et al.'s in all 37 dates, active regions and latitudes [1 Table 2][3 p. 4], and NOAA's reports in dates and regions [9]. Their classes rest on Hudson et al.'s recalibration, which also gives the 11 July 1978 flare its X45.9 [4 Table 7]. See section 5.

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1 · THE PAPER

## Thirteen scientists forecast the years when the biggest solar flares are most likely

V. M. Velasco Herrera, of the National Autonomous University of Mexico, and 12 colleagues in Mexico, Hungary, the United States, Turkey, Russia, the Czech Republic and China published the forecast in *JGR Space Physics* on February 13, 2026, under CC BY-NC-ND 4.0 [1 p. 1]. S0 News linked it on November 17, 2026 [2].

### What we read

The paper in full, 31 pages with seven figures and five tables, as the publisher's PDF in a copy posted by spaceweather.com, because we don't fetch from the publisher's site [1]. In their arXiv copies: the source of its flare list, Tan et al., and the recalibration that list rests on, Hudson et al. [3][4]; and the far-side estimates it cites, Stiefel et al. and Kontogiannis et al. [5][6]. In full, on copies the site's owner supplied: the group's 2018 paper on the 1.7-year period in GLEs, as its accepted manuscript, and its 2025 paper on the flare index [27][15]. As data: NOAA's and Solar Orbiter's flare records [7][8], the STIX lists [10][11], SILSO's sunspot numbers [12], the GLE lists [13][14] and the authors' flare index [16]. The rest of the literature as abstracts, as each source entry says.

### S-class, X10 and "superflares"

GOES satellites class flares by their peak in soft X-rays: X1 is $10^{-4}$ W m$^{-2}$, X10 ten times that. The paper calls flares above X10 "S-class" or "superflares", after Tan et al. [1 p. 2][3 p. 1]. On NOAA's scale an X10 flare is an R4, a severe radio blackout, which NOAA puts at about eight per solar cycle [26]. These aren't the stellar superflares of our checks of the superflare review and the TESS count, which are far larger: Tan et al. note that even the Carrington flare of 1859, nearly X80, wouldn't count as one [3 p. 1].

### How the forecast is built

Two parts. Where: maps of where flares and large sunspots have clustered by latitude and time, the butterfly diagrams, and a "cross-Laplacian" that marks their joint hot spots [1 p. 5][1 p. 14]. When: the 37 flares become a series of ones and zeros, a wavelet analysis finds periods of 1.7 and 7.3 years in it [1 p. 4][1 p. 17], and a machine-learning model, an LS-SVM, projects both oscillations forward; by the paper's rule, a window is where both are predicted to be positive [1 p. 20]. No code is published [1 p. 28].

### The six windows, as the paper lists them

| WINDOW | YEARS, EACH EDGE ±0.2 | CYCLE | ITS RATING AND LATITUDES IN TABLE 5 |
|---|---|---|---|
| A | 2025.7–2026.6 | 25 | High at 5°S–20°S and 10°N–25°N; Medium at 20°S–25°S and 5°N–10°N |
| B | 2027.2–2027.9 | 25 | Medium at 5°S–15°S and 5°N–10°N |
| C | 2028.8–2029.7 | 25 | Medium at 5°S–15°S and 5°N–10°N |
| D | 2030.6–2031.5 | 26 | High at 10°S–15°S; Medium at 5°N–20°N |
| E | 2032.3–2033.2 | 26 | High at 10°N–20°N; Medium at 5°S–15°S |
| F | 2034.1–2034.9 | 26 | High at 5°S–15°S and 10°N–20°N |

The windows [1 p. 21] and their ratings [1 Table 5]. Window A runs from about September 13, 2025, to August 8, 2026, or July 2 to October 19 with its margin; it had begun three months before the paper was submitted [1 p. 1]. Our arithmetic: the six windows fill 55% of 2025.7–2034.9, and 78% of 2025.5–2035.1 with their margins.

### In the authors' words

What the paper claims, and what it says about judging it.

> *"We introduce for the first time, a probabilistic spatiotemporal framework designed to identify extended epochs and heliographic zones with heightened superflare likelihood, rather than predicting individual events."*
>
> The abstract [1 p. 1]

> *"The qualitative probability is based on the amplitude and phase coherence of the 1.7-year and 7-year oscillations, as well as the robustness of the projected negative Laplacian structures"*
>
> Section 4.12 [1 p. 24]

> *"full verification of predictive skill necessarily requires to wait until the completion of Solar Cycle 25"*
>
> Section 4.12 [1 p. 24]

### The authors' own limits

The paper is candid about what it can't yet show. Its probabilities are qualitative, "High" or "Medium", never a number, and it says its rule sidesteps "well-known challenges in probability calibration for rare events" [1 p. 20][1 p. 24]. Its limitations admit that "not every positive-phase window of the 1.7/7-year oscillations coincided with a recorded S-flare", and that "The false-alarm rate and probability of detection can only be fully quantified after Cycle 25 concludes" [1 p. 25]. That is the right test, and it isn't due yet. NOAA's own flare forecasts, the paper notes, don't beat simple baselines, the gap it sets out to fill [1 p. 2][24 Abstract].

2 · WINDOW A

## No flare reached X10 in window A, and the largest came from the northern hemisphere

We listed every flare of X1 or above in NOAA's GOES-18 and GOES-19 records from July 2, 2025, to October 19, 2026, window A with its margin, with regions and positions from SWPC's reports, under rules fixed before we looked [7][8].

FLARES OF X10 OR ABOVE · OUR ANALYSIS

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of the X-class flares, all inside the window itself, from November 4, 2025, to July 4, 2026 [7]

THE LARGEST

**X8.1**

on February 1, 2026, from Region 4366 at 12° north; X8.3 on GOES-19 [7][8]

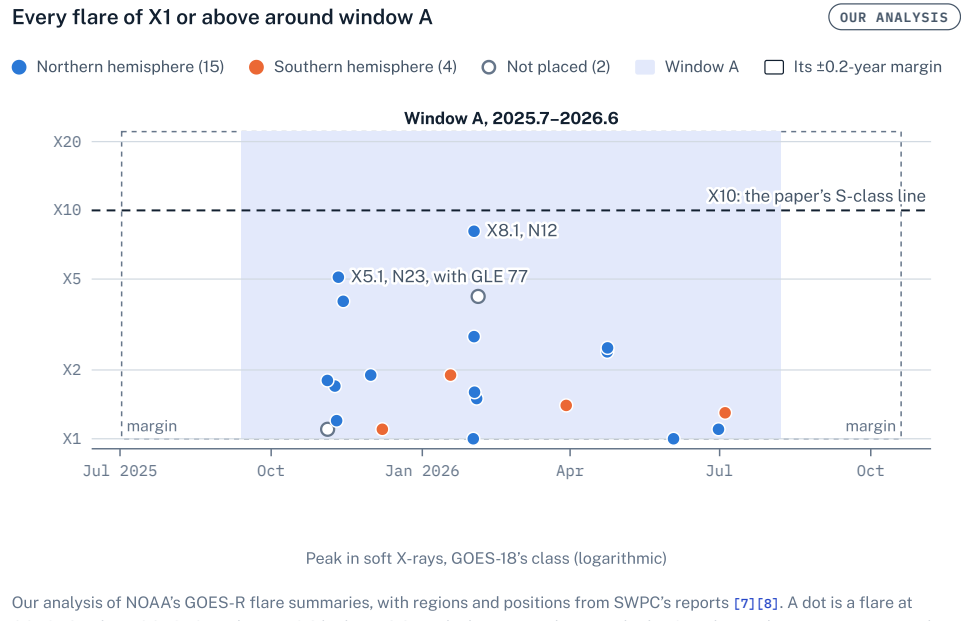
NORTH OR SOUTH · OUR ANALYSIS

**15 to 4**

northern X-class flares to southern, two unplaced; the largest in the band 5°S–25°S was X1.9 [8]

### Every flare of X1 or above around window A

OUR ANALYSIS



Our analysis of NOAA's GOES-R flare summaries, with regions and positions from SWPC's reports [7][8]. A dot is a flare at GOES-18's class; GOES-19 reads up to 0.2 higher, X8.3 for the largest. Nothing reached X10, in the window or its margin. No flare was above M6.4 from July 2 to November 3, 2025, or above M8.2 from July 5 to October 19, 2026 [7]. Of the two unplaced flares, Region 4276's X1.1 sits at 16–17° south in SWPC's later reports [8]; the X4.2 of February 4, 2026, had no region.

### The far side, as Solar Orbiter saw it

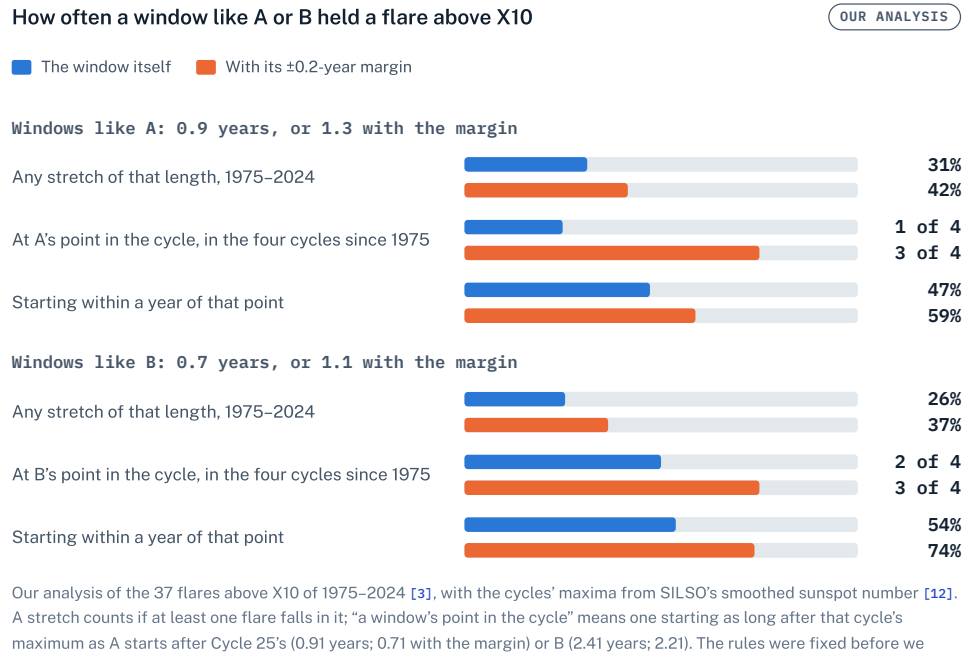
The paper counts far-side flares estimated from Solar Orbiter's STIX, so we checked those too. Neither STIX's science flare list, which covers July 2025 to February 2026, nor its data centre's list for March to October 2026 has any estimate of X10 or above in the window; the only upper bound that reaches it belongs to the Earth-side X8.1 [10][11]. The largest far-side events were about X1 on August 21, 2025, and X2 on May 23, 2026 (our analysis). But STIX sees only the part of the far side Solar Orbiter faces. From July to mid-September 2025 that was most of it; from September 26, 2025, to February 14, 2026, the spacecraft was within 30° of Earth's longitude and saw little of it, nearly five months of the window; and the data centre's list gives no positions for 2026 [10][11]. STIX's estimates also carry a range of about a factor of two [10].

### And Cycle 25 so far

No flare in NOAA's GOES-R records has reached X10 since the cycle began in December 2019 [7][12]: the largest were X9.0 on October 3, 2024, X8.7 on May 14, 2024, and February's X8.1 [8]. Region 4274's X5.1 of November 11, 2025, came with the particle event GLE 77 [13], the subject of our check of the flight-radiation paper.

### How often a window like A or B held a flare above X10

OUR ANALYSIS



Our analysis of the 37 flares above X10 of 1975–2024 [3], with the cycles' maxima from SILSO's smoothed sunspot number [12]. A stretch counts if at least one flare falls in it; "a window's point in the cycle" means one starting as long after that cycle's maximum as A starts after Cycle 25's (0.91 years; 0.71 with the margin) or B (2.41 years; 2.21). The rules were fixed before we counted.

OUR ANALYSIS

### What one quiet window can and can't show

A forecast that names a probability can be scored window by window; this one names none, and a window can pass without a flare in any probabilistic scheme. So window A's outcome doesn't refute the paper. For the window itself, a quiet outcome was the likelier one: since 1975, 31% of stretches of 0.9 years held a flare above X10, and of the four cycles only the one with 1991's flares had one at the same point after its maximum; Cycle 21's, on 6 November 1980, missed the equivalent start by about a week. With the margin, 3 of the 4 cycles had one at that point. That is the declining phase of a cycle, where flares this big cluster: Tan et al., whose list the paper uses, put Cycle 25's flares above X14.3 after the spring of 2027 [3 p. 1][3 p. 7]. It argues for raised odds in the declining years, not for the method's choice of windows, which with their margins fill 78% of mid-2025 to 2035. A hit in window B would mean less than it seems, too: at B's point in the cycle, 2 of the 4 cycles had one, or 3 with the margin. The paper also pairs window A with the southern band, "e.g., 5°S–25°S during 2025.7–2026.6", while its Table 5 rates a northern band, 10°N–25°N, High as well; the large flares fell in that northern band [1 p. 27][1 Table 5].

3 · WHERE THE PHASES COME FROM

## The oscillations come from the same 37 flares they are said to fit, so the match is mostly built in

The 1.7- and 7.3-year periods are peaks in the wavelet spectrum of the flare series itself [1 p. 4][1 p. 17], and the model that projects them is trained on oscillations drawn from that series [1 p. 20].

### In the authors' words

How the oscillations are made, and what the paper says it kept out.

> *"we have converted the S-flares events into a binary digital signal (S) for wavelet analysis and Machine Learning (ML) applications"*
>
> Section 2.1 [1 p. 4]

> *"we train a LS-SVM model using the 1.7- and 7-year solar oscillations derived from wavelet analysis for 1978–2017 (Figure 6)"*
>
> Section 4.11 [1 p. 20]

> *"Our methodology deliberately excludes the 37 known S-flare events (Figure 1, Table 2) from training to prevent overfitting."*
>
> Section 4.11 [1 p. 20]

OUR ANALYSIS

### Left out of training, not out of the oscillations

The model isn't trained on the 37 dates, but on oscillations computed from them, so leaving the dates out doesn't keep them out. A wavelet component of a series of spikes tends to be positive near its clusters of spikes, so flares tend to sit in "positive phases" of oscillations drawn from them, whether or not anything on the Sun oscillates. The paper's "verification period", 2008–2017, lies inside the years whose flares made the oscillations [1 p. 20]. Its methods leave the wavelet's settings, the bands it reconstructs and the model's settings unstated, so we built the nearest simple version and asked how often scrambled flare dates pass the same test.

STEP 1

**A series**

One day at a time from 1975 to November 2025, a one on each of the 37 flare dates and zero elsewhere [3].

STEP 2

**Two oscillations**

A Morlet wavelet, as in Torrence and Compo, reconstructed over 1.5–1.9 and 6.3–8.3 years, the widths the paper gives its peaks [25][1 p. 17].

STEP 3

**Scramble**

10,000 times, move each burst of flares, those within 30 days or from one region, by up to two years, and draw the oscillations out again.

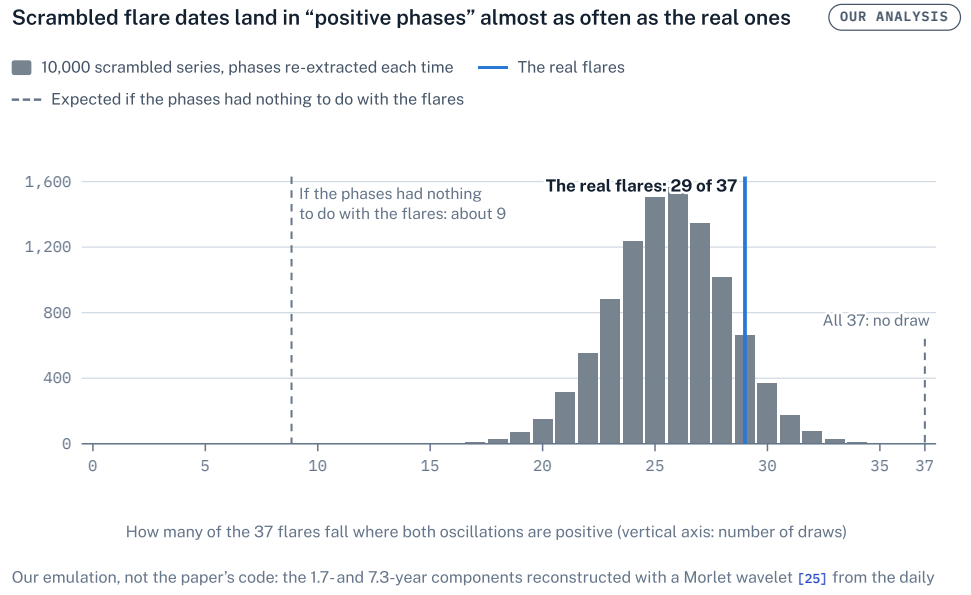
STEP 4

**Count**

How many flares sit where both oscillations are positive, real and scrambled.

### Scrambled flare dates land in "positive phases" almost as often as the real ones

OUR ANALYSIS



Our emulation, not the paper's code: the 1.7- and 7.3-year components reconstructed with a Morlet wavelet [25] from the daily series of the 37 flares [3], then from 10,000 series in which each burst of flares is moved by up to two years and the components are extracted again. Both components are positive 24% of the time. No draw put all 37 flares inside, as "exclusively" would require.

THE REAL FLARES · OUR ANALYSIS

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in both-positive phases, though both are positive only 24% of the time; 8 fall outside, among them the X45.9 of 1978

SCRAMBLED DATES · OUR ANALYSIS

**69%**

on average, 57–81% in nine draws of ten; 13% of draws match or beat the real 29, and none puts all 37 inside

INDEPENDENT EVENTS · OUR ANALYSIS

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GLEs more than three days from any of the flares, in both-positive phases: 34% against 27% by chance, no significant excess [13]

OUR ANALYSIS

### What the test shows

Most of the agreement, from 24% of the time to about 70% of the flares, comes from drawing the oscillations out of the flares. The real flares sit a little higher, 78%, a margin that chance matches 13% of the time when bursts move by up to two years and 18% when they can go anywhere; with the narrowest bands it is 5–12%, depending on the exact scale. So there may be a modest lean, as our check of the tidal-periods preprint found for a fixed 1.7-year period in the strongest events, but nothing like "exclusively": in our version the X45.9 of July 1978, the X19.3 of March 1989 and six others fall outside. The paper's own conclusions say the flares occur "preferentially" in these phases [1 p. 28].

OUR ANALYSIS

### The particle events

The paper offers the ground level enhancements, GLEs, as a test on events that weren't used: "the first 30 GLE events (Table 4), all of which fall within the positive phase of the 1.7-year oscillation", and GLEs 73 to 77, after 2017 [1 p. 20]. But 14 of the 42 GLEs of 1978–2017 fell on the very days of the 37 flares, among them those of October 1989, June 1991 and October 2003 [1 Table 4][13]. Of the 51 GLEs of 1976–2025, the 32 that came more than three days from any of the flares sit in both-positive phases 11 times, 34%, where chance gives 27%, and in a positive 1.7-year phase 15 times, where chance gives 49%: no significant excess. Before 1975, against sine waves fitted to 1978–2017 as a stand-in for the paper's model, 12 of 25 GLEs fall in a positive 1.7-year phase, where half would by chance; GLEs 1 to 26 make 25 dates, as 16 and 17 share a day. On the paper's own figure, though, 24 of the first 30 sit in a positive 1.7-year phase, three in a negative one and three at a crossing, by our second reading, counting GLE 17 with GLE 16; the first finds the same three negative [1 Fig. 7]. Our stand-in isn't the paper's model, and the paper doesn't say what went into its own backcast to 1938, or whether "validated against the first 30 GLE events" means those GLEs helped choose the model [1 p. 20]. It ties the 1.7-year period in GLEs to the same group's 2018 paper [1 p. 18][1 p. 20]. That paper found the period in the GLE record itself, 57 GLEs of 1966–2012 made into a monthly series of ones and zeros, and drew its 1.7-year oscillation from the same series [27 p. 3][27 p. 5][27 p. 8]. So its result was in-sample too: that GLEs fall "preferentially" in the oscillation's positive phase [27 p. 8], or, as its abstract also puts it, "only in a specific phase" [27 p. 1]. It tested its periods against red noise but gave no count of GLEs by phase and no test of that result [27 p. 3][27 p. 5]. Its series began with GLE 15, in 1966, so 16 of the "first 30" were among the GLEs its oscillation came from [27 p. 3].

## What the paper's own Figure 7a shows

**The figure that draws the forecast puts windows C and D, and several past events, where one of its two curves is below zero.**

OUR ANALYSIS

Figure 7a plots the 1.7-year oscillation in orange and the 7-year one as a dark-blue line in a cyan band, its 95% band, against the flares, the GLEs and the windows A–F, and the paper cites it for "All 77 GLEs … occur exclusively during coupled positive-phase windows (Figure 7a)" [1 p. 21][1 Fig. 7]. We read its curves twice, with two separately written scripts that classify pixels by colour, the first under rules fixed before anything was measured; both scripts and their summary outputs are under "Repeat our numbers". These numbers come from a printed image, good to about 0.1 year and 0.03 in value, and the drawn curves may not be exactly the model the authors ran; we show no chart of them, because the figure is the authors' and its licence doesn't allow adapting it.

### Figure 7a, read twice

| WHAT WE READ | FIRST READING | SECOND READING | WHAT IT MEANS |
|---|---|---|---|
| Where the 7-year curve crosses zero, 2020–2037 | 2020.50, 2024.62, 2028.40, 2032.44 | 2020.48, 2024.62, 2028.40, 2032.48 | Positive from 2024.6 to 2028.4 and after 2032.4; negative between |
| The 7-year curve in windows A and B | Positive throughout, +0.31 to +0.81 | Positive throughout, +0.31 to +0.81 | As the rule requires |
| In window C, 2028.8–2029.7 | Negative throughout, −0.24 to −0.61 | Negative throughout, −0.30 to −0.61; the whole band below zero | Outside the rule |
| In window D, 2030.6–2031.5 | Negative throughout, −0.36 to −0.61 | Negative throughout, −0.35 to −0.60; the whole band below zero | Outside the rule |
| In windows E and F | E positive for 71% of its span; F positive | E 83%, crossing zero as it opens; F positive | E starts at the crossing |
| Where both curves are positive, after 2024.9 | 2025.69–2026.42, 2027.00–2027.74 and 2034.79–2035.72; our first script lost the orange trace from 2032.0 to 2033.7 | 2025.79–2026.37, 2027.10–2027.68, 2032.77–2033.78 and 2034.87–2035.67 | Inside A and B; nothing in 2028–2032 |
| The share of windows C to F where the 1.7-year curve is positive | C 54%, D 31%, F 17%; E lost with the trace | C 50%, D 17%, E 50%, F 9% | The listed C–F don't follow this curve either |
| The flares of 11 July 1978 (X45.9), 3 June 1982, 6 March 1989 (X19.3) and 9 August 2011 | 1.7-year curve −0.23, −0.24, −0.65 and −0.15 | 1.7-year curve negative at each, across ±0.15 year | Outside both-positive phases |
| The flare of 2 November 1992, also GLE 54 | 7-year curve −0.32 | 7-year curve −0.36; the whole band below zero | Outside, about half a year after the crossing |
| The flare of 5 December 2006, and GLE 70 | 7-year curve −0.12 | 7-year curve −0.125; the band reaches above zero | The central curve outside |
| GLE 73, 28 October 2021 | 7-year curve −0.36 | 7-year curve −0.36; the whole band below zero | Outside, though the paper cites GLE 73 as validation |
| GLEs 13, 14 and 23 (July 1961, September 1971), among the "first 30" | 1.7-year curve −0.14 and −0.20 at GLEs 13 and 14, two days apart but in neighbouring pixel columns; −0.21 at GLE 23 | 1.7-year curve negative at each | Outside the positive 1.7-year phase |
| GLE 6 (August 1956); GLEs 32 and 64 | 7-year −0.20; 1.7-year −0.37 and −0.15 | 7-year −0.22, band below zero; 1.7-year negative | Outside; GLE 64 only just, about 0.1–0.15 year after the 1.7-year curve crosses zero |
| GLE 3, July 1946, which the paper says aligns "perfectly" with a positive phase [1 p. 21] | 7-year curve −0.06 | 7-year curve −0.06; the band spans zero | Just below zero, the band spanning it; not clearly inside |
| The STIX flares of 14 and 20 May 2024, and GLE 74 | 7-year curve −0.14 | 7-year curve −0.13; the band reaches above zero | At the crossing, which the paper calls the phase's "onset" |

Our two readings of Figure 7a [1 Fig. 7], in the figure's own units, where its axis runs from −1 to +1. The event lines are drawn from 0 to +1, so they can hide a curve only where it is above zero, and there both scripts bridge the gap from either side; a negative value shows at the line itself. The second reading counts an event as clearly outside only if the 1.7-year curve stays negative for ±0.15 year around it or the 7-year curve's whole band is below zero. Five flares and eight GLEs pass that bar, GLE 64 only just, and the first reading agrees on all thirteen; the second reading's file also passes 25 January 1991, by a hair, and 6 June 1982, three days after 3 June, sits at the bar.

OUR ANALYSIS

### Ordinary explanations, and what they don't cover

The text may be loose where the figure is right: the conclusions say "preferentially", not "exclusively" [1 p. 28], and section 4.12 calls A–F "the positive-phase windows of the 1.7-year oscillation (labeled A–F in Figure 7a)" [1 p. 23]. But the listed windows C to F don't sit on the drawn 1.7-year curve either: by our readings it is positive for about half of C, a sixth to a third of D, a third to a half of E and under a fifth of F, because its peaks come about 1.5 years apart while the listed windows step about 1.7. The figure's own letters mark the drawn 1.7-year peaks instead, skipping the one at the bottom of the 7-year dip: A to C near the listed windows, but D's at about 2032.1, after the listed D has ended, and F's just after the listed F. Even so, the letters C and D sit at the 7-year curve's crossings, not inside its positive phase. So the list disagrees with the figure as well as with the rule: it may have been made apart from the curves as drawn, or copied out with a slip. What doesn't depend on the figure: half of a 7.3-year cycle lasts more than three years, and the six windows, spread over nine years, are never more than 0.9 year apart, so no reading of its phase puts them all in its positive half. None of this says anything about the Sun; it is about what the paper shows.

We haven't asked the authors which reading they intended.

4 · THE MAY 2024 FLARES

## One far-side estimate holds up; the other is a flare GOES recorded as X8.7

The paper presents two flares of May 2024, estimated from Solar Orbiter's STIX, as Cycle 25's first S-class flares and as "an independent … validation" of its model [1 p. 3][1 p. 25].

### What the STIX paper reports

Stiefel et al. calibrated STIX's background detector against GOES on flares both had seen, giving a GOES-class estimate with "a one sigma uncertainty of ≈ 11%" [5 p. 1]. Their ten largest flares to July 2024 begin with X16.5 ± 1.8 on May 20 and X11.1 ± 1.2 on May 14 [5 p. 9]. They add: "The flares on the 14 and 15 of May 2024 were seen by GOES and STIX but all three flares were occulted from Earth's view. The other six flares are backside flares." [5 p. 10] Kontogiannis et al. confirm the X16.5 of May 20 as the strongest flare of Region 13664, which STIX recorded on the far side [6 §3.1][6 §3.3].

### What the paper says

"we analyze two newly identified S-class flares originating on the far side of the Sun, with estimated GOES classes: (a) an X11.1 flare on 14 May 2024, and (b) an X16.5 flare on 20 May 2024" [1 p. 3]. It adds that they "may indeed serve as an independent (since we did not even know about the existence of these two strong flare events when we were preparing our forecasts and the first version of the manuscript) validation of our model's forecast" [1 p. 25].

OUR ANALYSIS

### An estimate, and a flare already in the paper's own table

The flare of May 20 was behind the Sun's edge as seen from Earth; GOES saw only a C6.7 then [11]. Its X16.5 is a calibrated estimate, not a measurement, from a fit whose largest flare seen by both instruments was about X6 [5 p. 9][5 p. 10], so counting it as an S-flare is reasonable but softer than a GOES reading. The flare of May 14 is another matter. GOES recorded it at 16:51 UTC as X8.7 from Region 13664, just past the west limb [8][5 p. 10], and the paper's own Table 1 lists that X8.7 among Cycle 25's moderate flares, adding that "none of these flares exceeded the X10 threshold" [1 p. 3]. STIX's unhidden view of it gives X11.1; the STIX data centre's own estimates for the two flares are X8 (X4–X18) and X12 (X6–X25) [11], and STIX's science flare list puts a far-side flare of 22 July 2024, X9.6 ± 1.1 for Stiefel et al., at X14 (X7–X30) [10][5 p. 9]. So how many STIX flares pass X10 depends on the estimate, and no GOES measurement in the cycle has. As validation, both May flares came before window A and outside the six windows; the paper places them at "the onset of the positive phase" [1 p. 25], and that its forecast predated them rests on the authors' statement.

5 · THE FLARE LIST

## The 37 flares above X10 match their source and NOAA's reports

The paper's Table 2 lists the 37 flares above X10 of 1975–2024 from Tan et al., with dates, latitudes and active regions but no classes [1 Table 2][3 p. 4].

AGAINST TAN ET AL. · OUR ANALYSIS

**37 of 37**

dates, active regions and latitudes match their Table 1 [3 p. 4]

AGAINST NOAA · OUR ANALYSIS

**33 of 33**

latitudes within 2° of NOAA's reports, where they give one; all 37 dates and regions match [9]

THE LARGEST

**X45.9**

11 July 1978, after Hudson et al. re-estimated the saturated record, listed as X15 [4 Table 7]; they think 4 November 2003, at least X43.2, was probably larger [4 p. 18]

### The scale behind the list

Hudson et al. put the GOES record of 1975–2022 on the scale of today's GOES-R satellites, multiplying the older readings by 1.43, and re-estimated the 12 flares that saturated the detectors; they list 38 flares at X10 or above [4 Abstract][4 Table 8]. Tan et al. count 37 for 1975–2024 [3 p. 2]. The one missing, 24 March 1989, is X11.5 on Hudson et al.'s estimate, rescaled from GOES-6's X8.0 [4 Table 8], where NOAA's yearly report gives X5.7 [9], so the list could hold 38.

OUR ANALYSIS

So the paper's catalogue is sound, and so is its threshold, as long as old and new flares are on the same scale, as they are here. On today's scale the 37 make about eight a cycle; NOAA's scale also gives eight a cycle for flares of X10 or above [26], but its figure dates from the older calibration (our reading). They come in bursts: 37 flares in 22 episodes of flares within 30 days or from one region, nine of the flares in 1991 alone [3 p. 4].

6 · THE PAPER'S OTHER CLAIMS

## Its first-ever claim is overstated, its count for Cycle 25 has no stated basis, and its own flare index checks out

Six more statements the forecast leans on, or that readers may take from it, rated on the same scale.

### The paper's other claims, row by row

| THE PAPER | OUTCOME | OUR REASON |
|---|---|---|
| "We introduce for the first time, a probabilistic spatiotemporal framework…" [1 p. 1] | OVERSTATED | Others had forecast when the biggest flares should come: Tan et al., whose list the paper uses, after the spring of 2027, noting that such flares mostly come from low latitudes [3 p. 1][3 p. 7]. Dikpati and McIntosh proposed timing bursts of the strongest eruptions by Rossby waves of 6 months to 2 years [21 Abstract], and Korsós et al. tied major flaring to two coinciding periodicities [22 Abstract]; see also McIntosh et al. [23 Abstract]. Probabilities of extreme events go back at least to Riley in 2012 [18 Abstract]. The group's own 2025 paper had already used the positive phase of a 1.7-year oscillation, modelled by machine learning, to say when strong storms are more likely, and projected a 30-year one to Cycle 29 for low-latitude aurorae; this paper says its model draws on that "aurora forecasting" [15 pp. 29–31][1 p. 20]. The particular combination may be new; this paper gives no probability at all [1 p. 24]. |
| "statistically expecting between 3 and 8 events compared to only three in Cycle 24" [1 p. 24] | UNSUPPORTED | No derivation or source is given. Tan et al.'s regression gives 5 ± 2 [3 p. 6]. So far Cycle 25 has no GOES-measured flare above X10 [7], and STIX estimates for one or two far-side flares that pass it (section 4). It can't be scored until the cycle ends. |
| "We anticipate increased S-flare occurrence as the cycle approaches maximum around 2026–2027" [1 p. 7] | FALSE | SILSO's smoothed maximum: October 2024, at 160.9. By December 2025, when the paper was submitted, the smoothed number had fallen to 107.0 [12]. The paper elsewhere speaks of "the early declining phase" [1 p. 3], and the group's 2025 paper called 2024 "the start of the solar maximum" and said the maximum "may extend past 2025" [15 p. 10][15 p. 31]. |
| "Geomagnetic storms and GLE events also occur only in the positive phase of the 1.7-year oscillation" [1 pp. 22–23] | OVERSTATED | The two papers it cites say this of GLEs without showing it, and neither says it of storms [1 p. 23]. The group's 2018 paper is about GLEs and doesn't mention storms: its results put GLEs "preferentially" in the positive phase of a 1.7-year oscillation drawn from the GLE series itself, though its abstract also says "only", with no count by phase and no test (section 3) [27 p. 1][27 p. 8]. The 2025 paper restates that as "all 57 GLEs from 1966 to 2014", which the 2018 paper doesn't claim, and found storms, by the aa index rather than this paper's −250 nT, "considerably more likely" in that phase, not confined to it: 89.8% of 98 storms with a daily aa of 150 nT or more, and 90.0% of the 20 of 250 nT or more [15 p. 29]. Elsewhere the paper itself describes the pattern as one of events coming "preferentially" in positive phases [1 p. 20]. |
| "The maximum SFI recorded over nearly a century of continuous monitoring reached 184.1 on 6 May 2024" [1 p. 3] | TRUE | The SFI here is the authors' own composite flare index, a measure of flaring in the chromosphere [5 p. 5]: it scores each flare seen in hydrogen-alpha light by its area, brightness and duration [15 pp. 2–3]. The "nearly a century" is 88 years joined from two observatories' catalogues, Ondřejov's for 1937–1976 and Kandilli's from 1977; the authors report no gaps since at least 1982 and estimate that under 0.4% of earlier days are missing, entered as zero [15 pp. 3–4], so "continuous" is fair on their account. Their 2025 paper gives 184.10 on 6 May 2024 as the highest since at least 1937 [15 p. 6], and their published daily series agrees; next come 171.58 on 27 October 2014 and 144.32 on 28 October 2003 [16]. It is their record, not an independent one. |
| Table 1, the X-class flares of May and October 2024 and November 2025 [1 p. 3] | TRUE | Each row matches an entry in SWPC's reports by date, class and active region; one is an entry SWPC lists twice [8]. As a summary, it leaves out two: X1.0 on 7 October and X1.8 on 9 October 2024. |

The quotations are from the paper's PDF [1]; outcomes are on the site's scale. Our checks of Tables 1 and 2 ran under rules fixed in advance and are under "Repeat our numbers".

### Small slips we noticed

None of these changes a verdict. Counted from its own Table 2, the paper's flares by cycle are 9, 15, 10 and 3, not the 9, 16, 10 and 2 of its section 4.2.2, and Cycle 23's split is two northern to eight southern, not three to seven [1 p. 10][1 Table 2]; its p. 24 itself says "only three in Cycle 24". The same table gives 1982 five flares and 1989 four, against the text's "most active years being 1991 (9 events), 2003 (4 events), and 1989 (3 events)" [1 pp. 4–5]. The two STIX flares' times are swapped: 05:14 UTC belongs to May 20 and 16:47 to May 14 [1 p. 25][5 p. 9]. Table 4 dates GLE 22 to 24 January 1970 [1 p. 20], but the paper's own Figure 7a draws it in January 1971 [1 Fig. 7], as NOAA's and Oulu's lists date it [14][13], and as the group's own 2018 list does [27 p. 10], so the slip is in the table. The abstract calls A and B "the primary high-probability windows" and the conclusions call A, B and C "high-probability" [1 p. 1][1 p. 28], but Table 5 rates B and C Medium in every band. Table 1 has four X1.0 flares on 8 May 2024 where NOAA's records have three, perhaps because SWPC's report lists the 21:40 UTC flare twice, as events 600 and 620 [8]. Its SFI for 3 May 2024 is 18.003, where the authors' series has 18.08 [16]. And in the references, Camporeale and Berger's article number is printed as e2024SW004123 for e2025SW004546 [24], and Bobra and Couvidat's paper appears twice, under 2014 and 2015.

We haven't asked the authors about these slips, or about what their Figure 7a shows (section 3).

7 · THROUGH A CATASTROPHISM LENS

## A flare above X10 is a severe radio blackout, not a catastrophe, and the record holds 37 of them

Our reading of what the paper means for fears of a coming superflare, a Carrington-class storm or a grid collapse. The paper forecasts none of these as such: its "superflares" are flares above X10; it expects intense geomagnetic storms to be "highly probable" within its zones [1 p. 24], but names no Carrington-class storm and says nothing about grids beyond its opening warning.

AN X10 FLARE

**R4**

a severe radio blackout: shortwave radio lost on most of the sunlit side for one to two hours; X20 makes an R5 [26]

HOW OFTEN

**≈ 8 a cycle**

NOAA's average for flares of X10 or above [26], from the older calibration (our reading); on today's scale, the 37 since 1975 make about eight a cycle too [3]

THE LARGEST SINCE 1975

**X45.9**

on 11 July 1978, on Hudson et al.'s estimate [4 Table 7]; they think 4 November 2003 was probably larger [4 p. 18]

OUR ANALYSIS

### Flares black out radio; storms threaten grids

A flare's X-rays reach Earth within minutes and disturb the sunlit upper atmosphere for minutes to hours. Power grids are threatened by geomagnetic storms, which arrive later, from coronal mass ejections: at the top of NOAA's storm scale, "some grid systems may experience complete collapse or blackouts" [26]. Big flares often launch such ejections, but not always, and an ejection's effect depends on its direction and magnetic field. So the paper's plain-language warning that superflares endanger "power grids, and communications systems on Earth" runs through storms [1 p. 1]. The paper does expect intense storms to be "highly probable" within its zones, saying past storms stronger than −250 nT fell in the same phase windows as the flares [1 p. 24][1 p. 27]; but it gives no size or date for any storm, and those windows come from the flares themselves (section 3). The paper's statement that storms come "only" in the positive phase of the 1.7-year oscillation goes further than the two papers it cites for it (section 6). See our page on the Sun's two worst cases.

OUR ANALYSIS

### What the windows do and don't say

Nothing in the paper forecasts a Carrington-class event. Its windows fill more than half of 2025–2034, and flares above X10 cluster in the declining phases of cycles anyway, as Cycle 25's has been since October 2024 [3 p. 1][12]; Tan et al. expect one to three above X14.3 after the spring of 2027 [3 p. 7]. A big flare in 2027–2028 would be ordinary for the cycle, not a confirmation. Estimates of a Carrington-like storm within a decade run from about 0.5–1.9% [20 Abstract] to 12% [18 Abstract], and of a Carrington-like flare once in about 100 years [19 Abstract]: wide, uncertain odds that these windows don't move.

OUR ANALYSIS

### Forecasts from fitted oscillations have missed before

A 2021 machine-learning forecast by two of the authors put Cycle 25's peak yearly sunspot number at 95, probably 80 to 115, between 2023 and 2025, within a new phase of extended solar minima [17 Abstract]. The timing held; the size didn't: SILSO's yearly mean for 2024 was 154.7 [12]. Our check of the tidal-periods preprint found that a fixed 1.7-year clock in the strongest events stays open as a modest lean, that "extreme events can come at any phase", and that its own test falls due around late 2027, overlapping window B; this page agrees with it. Superflares in the stellar sense, far larger, are a separate question, covered in our superflare check and the TESS count.

8 · WHAT THIS CHECK CAN'T SETTLE

## The paper's own model, one window, and the far side we can't see

### Not the paper's code

The paper names its methods but not the wavelet's settings, the bands it reconstructs or the model's, and publishes no code, so our test is an emulation of its first step, labelled as ours, not a reproduction [1 p. 20][1 p. 28].

### One window

A forecast without probabilities can't be scored from one window; the paper's own test, of hits and false alarms across the cycle, can only come after Cycle 25 ends [1 p. 24][1 p. 25].

### STIX's view

STIX sees only the part of the far side Solar Orbiter faces: little of it from late September 2025 to mid-February 2026, when the spacecraft was near Earth's longitude, and its data centre's list gives no positions for 2026. A far-side flare above X10 outside its view would go unrecorded, and its estimates span about a factor of two [10][11].

### A printed figure

Our readings of Figure 7a come from the image in the PDF, good to about 0.1 year and 0.03 in value; the drawn curves may not be exactly the model the authors ran [1 Fig. 7].

### Accepted manuscripts

We read Hudson et al.'s paper and the group's 2018 GLE paper as their accepted manuscripts, not as published [4][27].

### What would change these verdicts

01

A flare above X10 in window B, 2027.2–2027.9, would be a hit for the paper, though windows like it hold one about a quarter of the time overall and half the time at the same point in the cycle; a run of hits across windows A–F, beyond those rates, would move "high S-flare odds" toward True.

02

The paper's curves or code, published, would let anyone test its windows and its "exclusively" directly, and settle whether C and D are a slip.

03

GLEs that weren't flare days falling in its positive phases far more often than chance, in a test fixed in advance, would make "GLEs validate the phase model" closer to True.

9 · REPEAT OUR NUMBERS

## The rules, the scripts and our outputs; the paper and the raw data stay with their owners

Each rules file was written and hashed before the test it governs first ran. One script fetches every input by URL under a plain client name and checks it against the copies we used; run again on those inputs, the scripts gave every output byte for byte.

ZIP **repeat-our-numbers.zip**

Everything below and more, in its folders: the script that fetches every input by URL and checks it, the seven scripts of our tests, the scripts of our two readings of the paper's Figure 7a and their summary outputs, the event lists, the rules and all our outputs, with a README. 40 files · 79 KB

TXT **RULES_window_a.txt, RULES_base_rates.txt, RULES_phase_test.txt and RULES_tables.txt**

The rules of our four tests: window A, the base rates, the phase test and the tables. Each was written and hashed before its test ran · 14 KB

TXT **RULES_fig7a.txt**

The rules of our first reading of the paper's Figure 7a, written before any pixel was measured · 4 KB

CSV **window_a_flares.csv**

Every flare of X1 or above around window A, with both satellites' classes, SWPC's region and position, and where each sits against the paper's bands · 3 KB

TXT **HASHES.txt**

The SHA-256 of every file here and in the zip · 5 KB

### Run it

Unzip, then `python3 -I code/fetch_inputs.py` fetches the inputs, about 54 MB, and checks them against our copies; then, from `code/`, run the numbered scripts with Python 3 and numpy, pandas and netCDF4. The README in the zip gives the order. Run on the inputs we used, they reproduced every output byte for byte; NOAA renames its daily flare files, so a later fetch gets newer ones. The two readings of Figure 7a need your own copy of the paper's PDF, from which `extract_fig7.py` takes the figure.

### What we don't host

The paper and its figures, which the journal serves under CC BY-NC-ND 4.0 [1]; NOAA's and SILSO's files and the STIX lists, which the script fetches from their owners [7][12]. We host only our own rules, code and derived numbers, and the event lists /rieger-tidal-periods/ already hosts.

### Related checks

PARTLY TRUE A "small" flare? The Disaster Cycle, Fact-Checked

## Sources

Bracketed numbers refer to this list. For the paper [1], p. gives a page of its 31-page PDF, § a section, Table a table and Fig. a figure; its windows are in decimal years, so 2025.7 is about September 13, 2025. Elsewhere p. gives a page of the copy named in the list, Table and Fig. its tables and figures, and Abstract marks a source of which we read only the abstract. Flare classes are GOES's soft X-ray classes: X1 is a peak of 10<sup>−4</sup> W m<sup>−2</sup> and X10 ten times that, on the scale of NOAA's GOES-R satellites; older GOES readings are multiplied by 1.43 to match it, as in source 4. A GLE, a ground level enhancement, is a burst of solar particles energetic enough to register at ground level. Links checked November 19, 2026.

1 Velasco Herrera, V. M., Velasco Herrera, G., Soon, W., Özgüç, A., Babynets, N., Tlatov, A., Švanda, M., Qiu, S., Baliunas, S., Kotan, B., González González, G., Bautista Flores, L. A., and Pazos, M. (2026). A New Method for Probabilistic Spatiotemporal Forecasts of Solar Soft X-Ray "S-Class" (>X10) Superflares. *Journal of Geophysical Research: Space Physics* 131(2), e2025JA034977. Received December 16, 2025, accepted January 31 and published February 13, 2026, in the special collection "Space Weather Events of 2024 May 9–15". CC BY-NC-ND 4.0. Read in full, as the publisher's PDF in a copy posted by spaceweather.com, because we don't fetch from the publisher's site: 31 pages, SHA-256 f2c7909f…, fetched November 18, 2026.

2 SpaceWeatherNews (S0) (November 17, 2026). Super Flare Forecast & Government Meeting | S0 News Nov.17.2026. YouTube video, https://www.youtube.com/watch?v=bc6nSEOV_6I. Linked the source; no transcript was available, so nothing it says is rated here.

3 Tan, B., Zhang, Y., Huang, J., and Ji, K. (2025). The Occurrence of Powerful Flares Stronger than X10 Class in Solar Cycles. *The Astrophysical Journal Letters* 979, L16. CC BY 4.0. Read in full in the arXiv copy, 2501.03791v2; pages are that copy's. Its list of 37 flares is the one /rieger-tidal-periods/ hosts.

4 Hudson, H. S., Cliver, E. W., White, S. M., Machol, J., Peck, C., Tolbert, K., Viereck, R., and Zarro, D. (2024). The Greatest GOES Soft X-ray Flares: Saturation and Recalibration over Two Hale Cycles. *Solar Physics* 299, 39. Read in full in the arXiv copy, 2310.11457v1, the accepted manuscript; pages and tables are that copy's.

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6 Kontogiannis, I., Zhu, Y., Barczynski, K., Stiefel, M. Z., Collier, H., McKevitt, J., et al. (2025). Near-continuous tracking of solar active region NOAA 13664 over three solar rotations. *Astronomy & Astrophysics* 704, A105. CC BY 4.0. We read its sections on the data and the flares in the arXiv copy, 2510.05979v1.

7 NOAA National Centers for Environmental Information. GOES-R XRS science flare summaries, GOES-16, GOES-18 and GOES-19, version 2-2-2, with records to November 17, 2026; retrieved November 18, 2026. US government work, public domain.

8 NOAA Space Weather Prediction Center. Daily solar event reports and solar region summaries, NCEI's archive, for May and October 2024 and June 2025 to November 2026; retrieved November 18, 2026. The reports for December 30 and 31, 2025, are missing from the archive. Public domain.

9 NOAA National Geophysical Data Center. GOES XRS flare reports, the yearly files for the 14 years with a flare above X10, 1978–2011; retrieved November 18, 2026. Public domain.

10 Hayes, L. A. stix_flarelist_science, version 1: Solar Orbiter STIX's flare list with locations and estimated GOES classes, February 14, 2021, to February 28, 2026. BSD 3-Clause. Retrieved November 18, 2026.

11 Solar Orbiter STIX team. STIX Data Center, its operational flare list with estimated GOES classes, May 2024 and February to October 2026; retrieved November 18, 2026.

12 Source: WDC-SILSO, Royal Observatory of Belgium, Brussels, DOI: https://doi.org/10.24414/qnza-ac80. Sunspot number, version 2.0: yearly, monthly and 13-month smoothed values, retrieved November 18, 2026. CC BY-NC 4.0, credited in the form SILSO's data page gives; this site is non-commercial.

13 GLE database, University of Oulu. https://gle.oulu.fi, list of formal GLEs, as /rieger-tidal-periods/ retrieved it on November 4, 2026 (GLE 5 to 77). The site asks users to acknowledge it when using the data, as we do here.

14 NOAA National Centers for Environmental Information. Ground level enhancements, GLE 1 to 71, the list the paper cites; retrieved November 18, 2026. Public domain.

15 Velasco Herrera, V. M., Soon, W., Knoška, Š., Özgüç, A., Velasco Herrera, G., Yeşilyaprak, H., et al. (2025). Solar Flare Activity, 1937–2024: Introducing the New Hemispheric Solar Flare Index (hSFI) in the Context of 2024's Major Solar Storm Events. *Space Weather* 23, e2025SW004515. CC BY-NC-ND 4.0. Read in full on November 19, 2026, 37 pages, from the publisher's PDF, which the site's owner supplied; pages are that copy's.

16 Velasco Herrera, V. M., et al. (2025). Solar flare activity, 1937–2024: Introducing the new hemispheric Solar Flare Index (hSFI) in the context of 2024's major solar storm events [data set], version 4. Harvard Dataverse. CC0 1.0. The workbook Data_hSFI-1937-2024.xlsx, read in full on November 18, 2026; its hemispheric series are doi:10.7910/DVN/TSQEPB and doi:10.7910/DVN/C1L8ZX.

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21 Dikpati, M., and McIntosh, S. W. (2020). Space Weather Challenge and Forecasting Implications of Rossby Waves. *Space Weather* 18, e2018SW002109. CC BY 4.0. Abstract only, as Crossref records it.

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23 McIntosh, S. W., Leamon, R. J., Krista, L. D., Title, A. M., Hudson, H. S., Riley, P., et al. (2015). The solar magnetic activity band interaction and instabilities that shape quasi-periodic variability. *Nature Communications* 6, 6491. CC BY 4.0. Abstract only, as Crossref records it.

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26 NOAA Space Weather Prediction Center. NOAA Space Weather Scales: radio blackouts, solar radiation storms and geomagnetic storms, with their physical measures and average frequencies. Read November 18, 2026.

27 Velasco Herrera, V. M., Pérez-Peraza, J., Soon, W., and Márquez-Adame, J. C. (2018). The quasi-biennial oscillation of 1.7 years in ground level enhancement events. *New Astronomy* 60, 7–13. Read in full on November 19, 2026, as the accepted manuscript, dated August 25, 2017, 11 pages, which the site's owner supplied; made available under the Elsevier user license. Pages are the manuscript's, not the journal's 7–13.

METHOD

## How this was checked

On November 18, 2026, we read the paper in full, all 31 pages, and checked its claims against its sources, NOAA's and Solar Orbiter's flare records and the literature: 25 other sources, in the Sources list. Of the papers, we read four in full or in the sections we needed, from arXiv copies, and on November 19 two more in full, the group's 2018 and 2025 papers, from copies the site's owner supplied; the rest as abstracts or records, as each entry says. Quotations were checked word for word against the saved texts.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources. No transcript of the episode in which S0 News linked the paper was available, so this page rests the paper on its own and rates nothing from the episode.

Under rules written before each test ran, we listed every flare of X1 or above from July 2025 to October 2026 in NOAA's GOES-R records and STIX's far-side estimates; worked out how often windows like A and B held a flare above X10 in 1975–2024; emulated the paper's extraction of its two oscillations and tested it against 10,000 scrambled flare series; and checked its Tables 1, 2 and 4 against NOAA's records and their sources. We also read the paper's Figure 7a with two separately written scripts, the first under rules fixed before any pixel was measured; those numbers come from a printed image. Run again from the hosted copies on the inputs we used, the scripts reproduced every output byte for byte. The paper's wavelet settings and model aren't published, so ours is an emulation, not a reproduction. Before publication, a reviewer who hadn't seen the drafting re-checked the page against the paper and the data, reproduced its main numbers with separate code and read Figure 7a a third time. A second reviewer then checked the November 19 revisions, made after the group's 2018 and 2025 papers were read in full, against those papers.

This page was researched and written with Claude, an AI assistant made by Anthropic, and then re-checked against its sources in a separate verification pass.

### The verdicts on this page

| | |
|---|---|
| FALSE | The evidence contradicts the claim. |
| MISLEADING | Contains something true but leaves a false impression, usually by leaving out key context. |
| OVERSTATED | Has some basis but claims much more than the evidence supports. |
| UNSUPPORTED | No evidence we could find backs it up, though it hasn't been strictly disproven. |
| PARTLY TRUE | Part of the claim holds up and part doesn't. |
| TRUE | The evidence supports the claim. |

All ten verdicts, and how we check

CORRECTIONS

## Corrections and changes

If we get something wrong, we fix it and record the change below with the date. If a correction changes a verdict, the log says what the old verdict was.

### Change log

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