PAPER CHECK · EARTHQUAKE FORECASTING

An earthquake-forecasting paper we could not read, in a field with no proven precursor

S0 News said the authors of a new paper think they have "put together a working earthquake forecasting model" by combining ionospheric data with solar signals, and endorsed it: "We need more of this" [2 00:02:15–00:02:30]. The paper is closed access, and even its abstract was out of reach: none is deposited with Crossref or OpenAlex, we found no preprint, and the publisher's page met us with a CAPTCHA that the site's rules do not let us pass [1][3][4]. So this page rates what the title and the published literature support. The largest test of ionospheric precursors we found reported no significant signal [7], and an international commission convened after the 2009 L'Aquila earthquake found that the search for precursors "has not yet produced a successful short-term prediction scheme" [6 p. 319].

By Fact-Checked Science · Published October 22, 2026

OUR ANALYSIS marks our own reasoning, and the verdicts are our assessment. Everything else comes from the numbered sources. For the paper [1] we could read only its bibliographic record, so nothing on this page quotes its text; p. gives a page of a source (the ICEF report's [6] pages run 315–391), § a numbered section, and Abstract the part of a source we quote.

A paper we could not read, in a field with no working forecast yet

OUR ASSESSMENT

0 pages
of the paper we could read: its abstract, highlights and text were all out of reach, and we found no preprint [1][3][4]

1,279
earthquakes of M ≥ 6.0 in the largest test of ionospheric TEC precursors we found, which reported no statistically significant change before them [7 Abstract]

77
neural-network earthquake-prediction papers reviewed in 2020; simpler models seemed to predict as well or better [20 Abstract]

THE CLAIMS

UNCONFIRMED
This team thinks … they have put together a working earthquake forecasting model
The presenter, on this paper [2 00:02:15–00:02:30]

The title promises short-term forecasts from global TEC data, solar activity and machine learning, and nothing we could read says how well they work: we have no hit rate, no false-alarm rate and no word of a test on earthquakes the model had not seen [1][3]. A working model needs frozen rules tested on later events against chance, the standard our own out-of-sample test applies [30 §5.4] and the ICEF set out in 2011 [6 p. 338]. A paper ten days old cannot yet have a prospective record, and whether it reports a held-out test with a false-alarm rate we could not read; no ionospheric method has passed such a test [6 p. 335][7 Abstract]. See section 3.

TRUE
It combines ionospheric data with solar signals
The presenter [2 00:02:15–00:02:30]

That is what the title says: global TEC, a measure of the ionosphere's electron content, and solar activity, fed to a machine-learning model [1]. Which TEC product, which solar indices and which model, the record does not say [3][4]. See section 2.

OVERSTATED
Pre-earthquake atmospheric electricity signals are well documented
The presenter, during the episode's segment on its three pre-earthquake papers [2 00:02:06–00:02:15]

Much reported, yes [8 Abstract][9 Abstract]. But the largest systematic test we found, 1,279 earthquakes of M ≥ 6.0, reported no statistically significant TEC change before them [7 Abstract]; the best-known case, a rise 40 minutes before the 2011 Tohoku earthquake [10 Abstract], is read by its critics as an artifact of the reference curve [12 Abstract][13 Abstract], reproducible with no signal present [15 Abstract], or a product of chance [14 Abstract]; and the ICEF found the averaged signal too weak to give any probability gain [6 p. 335]. See section 4.

UNVERIFIED
Short-term earthquake forecasting from global TEC, solar activity and machine learning
The paper's title [1]

We could not read the abstract, the highlights or the text, so what the model does, on what data and with what skill is unknown to us [1][3][4]. The record shows a peer-reviewed article in a subscription journal, online about October 12, 2026, with 65 references [3]. See section 1.

1 · A PAPER WE COULD NOT READ

Closed access, no abstract on record, no preprint we could find, and a CAPTCHA at the door

The paper is a regular article in the *Journal of Applied Geophysics*, in the issue dated January 2027 and online since about October 12, 2026, ten days before the episode [3][5]. Its authors are at the Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences in Moscow [4]. Everything else about it was out of reach.

What the record shows

Title: "Short-term Earthquake forecasting based on global TEC data, solar activity, and machine learning", by E. A. Rodionov and A. A. Lyubushin [1][3]. Volume 256, article 106566; the publisher's record was created on October 12, 2026 and the journal's feed gives "Publication date: January 2027" [3][5].

65 references [3]. Closed access: the record lists only Elsevier's text-and-data-mining licences, and OpenAlex finds no open copy in any repository [3][4]. No abstract is deposited with Crossref, OpenAlex or Semantic Scholar [3][4].

OUR ANALYSIS

What that means for this check

We rate what the title and the published literature support, and we say so in each verdict. Nothing on this page quotes the paper, and nothing is redrawn from it: its licence is closed and we have none of its numbers.

The publisher's page asked us to prove we are human. The site's rules do not allow us to pass a CAPTCHA or any other bot check, so we stopped there. Anyone with journal access, or willing to click through the check, can read what we could not, and the abstract alone would settle several of the unknowns in section 2.

2 · WHAT THE TITLE SAYS

Three inputs and a goal, and nothing about how well it works

A title is a promise, not a result. This one names the inputs and the aim; the record adds the journal, the dates and the reference count, and nothing else [1][3].

INPUT 1
Global TEC
Total electron content: the number of free electrons in a column through the ionosphere, mapped worldwide from satellite-navigation signals. Which map product the paper uses is not on record [1][3].

INPUT 2
Solar activity
Which measures of it (sunspot numbers, radio flux, particle fluxes or geomagnetic indices) is not on record [1][3].

METHOD AND AIM
Machine learning
For "short-term" forecasting. Which model, and what "short-term" means in days or weeks, is not on record [1][3].

What a reader would need to know, and what the record says

QUESTION	ON RECORD
Which earthquake catalogue, and down to what magnitude	Unknown [1][3]
The forecast window behind "short-term"	Unknown [1]
Training and test periods	Unknown [1]
Hits, misses and false alarms, and a comparison with chance	Unknown [1]
Whether the test used earthquakes outside the training data, or events still to come	Unknown [1]
The authors' own caveats, and whether they call the model "working"	Unknown [1]
Journal, issue, date, reference count, licence, affiliation	Known: see section 1 [3][4][5]

OUR ANALYSIS

A known blind spot in global TEC maps

Global TEC maps are built from ground receivers, which are sparse or absent over the oceans. A 2020 study of inland earthquakes warns that over the oceans the maps "are results of interpolation between stations and extrapolation in both space and time, and therefore, they are not suitable for studying the marine EQs" [16 Abstract]. Most of the world's largest earthquakes strike offshore, along subduction zones, so any global TEC method has to say how it treats them. Whether this paper does, we cannot tell.

3 · WHAT A WORKING MODEL MUST SHOW

"Working" means tested on earthquakes the model has never seen

The episode gave this paper one sentence: the presenter reported that the authors think they have a working forecasting model, and backed it with "We need more of this". Here is what that claim would take, by the standard of the international commission convened after the 2009 L'Aquila earthquake and of our own earthquake test [6][30 §5.4].

In the episode's words

Quoted from the automatically generated transcript. "geoysical" and "doumented" are its renderings of geophysical and documented.

"E3S web conference series delivering a banger on the ways the Earth snitches on itself before big quakes through changes in various geoysical parameters."
The presenter, on the episode's two conference papers [2 00:01:57–00:02:08]

"I'm glad to see geomagnetic anomalies continue to receive attention on top of the much more well doumented atmospheric electricity signals."
The presenter [2 00:02:06–00:02:15]

"This team thinks that by combining those various ionospheric and related data with solar signals, they have put together a working earthquake forecasting model. We need more of this."
The presenter, on this paper [2 00:02:15–00:02:30]

The third sentence is the episode's only description of this paper; it was introduced as part of "a triple on pre-earquake electromagnetic signals" and never named [2 00:01:51–00:01:58]. Whether the authors themselves claim a working model, we cannot say, since we could not read their abstract.

Prediction or forecast? The ICEF's definitions

After the 2009 L'Aquila earthquake, an international commission reviewed the state of earthquake forecasting for Italy's civil-protection department [6 p. 319]. It drew a line: "A prediction is defined as a deterministic statement that a future earthquake will or will not occur in a particular geographic region, time window, and magnitude range, whereas a forecast gives a probability (greater than zero but less than one) that such an event will occur" [6 p. 319].

On precursors, its abstract is blunt: "The search for diagnostic precursors has not yet produced a successful short-term prediction scheme" [6 p. 319].

Why retrospective success is not enough

"Much of the speculation about predictability has been based on inadequate statistical analysis of retrospective correlations between proposed precursors and subsequent earthquakes," the commission wrote. "Prediction success has often been over-estimated by retrospective testing that was not independent of the data used in the retrospective model-tuning. Prospective testing of formalized models has been infrequent, and, where such tests have been carried out (e.g., in Parkfield, California), the predictions have failed to demonstrate reliability and skill relative to baseline forecasts" [6 p. 338].

The three rules we apply to any earthquake-timing claim

RULE 1
Freeze the rules first
Fix the rules, the data versions and the code before scoring any event, and publish them [30 §5.4].

RULE 2
Compare with chance
Test hit rates against the share of time the alarms cover, with a null model that keeps earthquakes clustered as they really are [30 §5.4].

RULE 3
Hold back, or wait
Hold back part of the record, or wait for new events, before claiming significance [30 §5.4].

OUR ANALYSIS

Why the claim is Unconfirmed rather than wrong

These are the lessons of our own test of a solar-earthquake claim, which applied a 2015 paper's frozen rules to the nine M8+ earthquakes that came after it and found a hit rate consistent with chance [30 §4.2]. By rules 1 and 3, a paper online since about October 12, 2026 can at most report a retrospective or held-out test; a prospective record takes years of earthquakes. By rule 2, even a retrospective result means little without a false-alarm rate and a clustered null, and we could not read whether this paper reports either [1].

So the episode's "working earthquake forecasting model" rests on a single, unread, ten-day-old study, in a field where the ICEF found no precursor scheme that works [6 p. 319] and the largest ionospheric test we found reported nothing to predict with [7 Abstract]. That is a result awaiting confirmation, not a working model. If the paper's abstract reports only retrospective accuracy, "working" would be an overstatement.

4 · DO TEC ANOMALIES PRECEDE QUAKES?

Many reports, and the controlled tests find nothing usable

Reports of ionospheric changes before earthquakes go back decades. The question that matters for forecasting is whether they beat chance, and a 2021 review of the space-based evidence finds that "the statistical significance of the results are highly debated, and more in general a common consensus is still missing" [17 Abstract].

THE LARGEST TEST WE FOUND
1,279
earthquakes of M ≥ 6.0, 2000–2014, compared with global TEC maps near each epicentre: no statistically significant change before them [7 Abstract]

THE AVERAGED SIGNAL
−8 dB
the pre-seismic signal relative to the noise when averaged over a large set of events, in the ICEF's review: too weak for any probability gain [6 p. 335]

THE BEST-KNOWN CASE
40 min
before the 2011 Tohoku earthquake, a reported TEC rise [10 Abstract]; read by critics as an artifact of the reference curve [13 Abstract][15 Abstract] or as chance [14 Abstract]

The reports

In Taiwan, a drop of more than about 25% in an ionospheric frequency during afternoon hours "significantly occurs within 5 days before the earthquakes", in a study of 184 earthquakes of M ≥ 5.0 from 1994 to 1999 [9 Abstract]. A global study of 736 earthquakes of M ≥ 6.0 from 2002 to 2010 reported anomalous TEC days more often in the days before earthquakes than on background days, most for large, shallow events [8 Abstract].

A TEC rise was reported to begin about 40 minutes before the 2011 Tohoku earthquake and to reach nearly a tenth of the background value [10 Abstract]; a later method found rate breaks "25–80 min before the eight recent large earthquakes with moment magnitudes (M_w) of 8.2–9.2" [11 Abstract]. A 2020 study of 276 inland earthquakes of M ≥ 6.0 found "no particularly distinct features in the time distribution" of TEC disturbances before them, but higher rates in the five days before than after [16 Abstract].

The tests

The 2017 global test, which declustered aftershocks and looked within 2.5° of latitude and 5° of longitude of each of 1,279 epicentres, concluded: "our analysis has not found any statistically significant changes prior to earthquakes when considering all 1279 earthquakes together. Thus, we have found no evidence that would suggest that monitoring changes in GIM-TEC might be useful for predicting earthquakes" [7 Abstract].

On the Tohoku case, critics attribute the "precursor" to the reference curve subtracted from the data: a tsunami-made hole in the ionosphere after the earthquake can look like a rise before it [12 Abstract]; "the 40 min onset of the ionospheric precursors is an artifact induced by the definition of the reference line" [13 Abstract]; the rises are "sufficiently frequent to explain all the reported enhancements prior to the great earthquakes as a product of chance" [14 Abstract]; and synthetic tests show the method "can lead to spurious precursory signals" even with no signal present [15 Abstract].

> *"This seismo-ionospheric coupling has been mainly described as changes in the F2 layer critical frequency some days before or after the earthquake. When averaged over a large set of events, the amplitude of the pre-seismic signal is small (-8 dB) compared to the noise level, and the conditional statistics of retrospective precursor detection are too weak to provide any probability gain in earthquake forecasting."*
> The ICEF report [6 p. 335]

And the solar half of the recipe

A 2013 test of sunspots, solar wind speed and geomagnetic activity against earthquake counts found "no consistent and statistically significant distributional differences" and concluded: "We cannot reject the null hypothesis of no solar-terrestrial triggering of earthquakes" [18 Abstract]. Our own out-of-sample test of a solar-polar-field claim found a hit rate consistent with chance; see Do the Sun's polar fields time the world's largest earthquakes? [30 §4.2].

5 · MACHINE LEARNING AND PREDICTION

Neural networks have not beaten one-line baselines at predicting earthquakes

Machine learning is the third ingredient in the title. A 2020 review of every neural-network earthquake-prediction paper it could find, 77 of them from 1994 to 2019, concluded that simpler models did as well [20 Abstract].

In the reviewers' words

DNN is a deep neural network. The 2019 comment concerns a deep-learning model of where aftershocks strike, published in *Nature* in 2018.

"Despite apparent positive results observed in this corpus, we demonstrate that simpler models seem to offer similar predictive powers, if not better ones."
Mignan and Broccardo (2020), preprint abstract [20 Abstract]

"we reformulate the 2017 results using two-parameter logistic regression (that is, one neuron) and obtain the same performance as that of the 13,451-parameter DNN. [...] This demonstrates that so far the proposed deep learning strategy does not provide any new insight (predictive or inferential) in this domain."
Mignan and Broccardo (2019), on a celebrated deep-learning aftershock model [21 p. E1]

"These findings indicate that the field is thematically focused but not yet methodologically unified."
Díaz et al. (2026), a review of 56 papers that apply artificial intelligence to TEC and earthquakes [23 Abstract]

What "high accuracy" looks like in this literature

A 2022 Taiwan study is the closest published cousin of the paper's recipe: a deep network trained on TEC with the geomagnetic index Dst, the solar index F10.7, sunspot number and solar Lyman-α emission, to tell 30-day periods before earthquakes of M ≥ 6.0 from quiet periods, 2003–2014 [24 Abstract].

EARTHQUAKE PERIODS FLAGGED
22 of 22
"all 22 positive cases (earthquakes) are successfully predicted, giving a true positive rate of 100%" [24 Abstract]

QUIET PERIODS LEFT ALONE
10 of 19
"Among the 19 negative cases (normal cases), 10 of them are true negative" [24 Abstract]; overall, "a high accuracy of 78.05%" [24 Abstract]

FALSE ALARMS · OUR ANALYSIS
47%
9 of the 19 quiet periods were flagged. The 78.05% is 32 correct calls out of 41 cases, a selected sample rather than the full run of 30-day windows in 2003–2014, so no real-world base rate is tested.

OUR ANALYSIS

A perfect hit rate with half of the quiet periods alarmed is what an operational forecaster would call a model that cries wolf, and 41 cases is too few to pin down either rate. That is the pattern the 2026 review describes: "anomaly definitions, TEC representations, confounder control, baselines, uncertainty handling, and validation strategies remain pipeline-dependent, which limits cumulative comparability and physical interpretability across studies", and progress "will depend less on adding isolated case studies and more on clearer anomaly criteria, stronger control of solar and geomagnetic effects, explicit baselines, event-wise and region-wise validation, systematic false-alarm reporting, uncertainty-aware outputs" [23 Abstract].

Where machine learning has helped earthquake forecasting is elsewhere: in building far more complete catalogues of small earthquakes, and, three seismologists wrote in 2021, analysing them with unsupervised learning "may be the fastest route to improving earthquake forecasting" [22 Abstract]. A 1997 review of a century of prediction research found no obvious successes, claimed breakthroughs that failed scrutiny, and no reliable precursor despite extensive searches [19 Abstract]; the ICEF reached the same point in 2011 [6 p. 319]. Nothing on record about this paper shows it clearing a bar that the field as a whole has not.

6 · THE AUTHORS' EARLIER WORK

Lead measures, not forecasts, and the authors' own caution

Nothing on this page quotes the 2027 paper. The same two authors have published three open papers since 2023 that show their method and their hedges [25][26][27]. None of them uses TEC or machine learning, and we found no earlier paper by either author on the ionosphere.

Their method, in their words

In 2025 they tested whether the Sun's proton flux triggers earthquakes. Statistics of the flux were computed in five-day windows from 2000 to 2024, their local extrema found, and "for each pair of time sequences of proton flux statistics and earthquakes with a magnitude of at least 6.5 in sliding time windows, the 'advance measures' of each time sequence relative to the other were estimated using a model of the intensity of interacting point processes". The result: "The maximum proportion of the intensity of seismic events for which the proton flux was a trigger was estimated as 0.28" [25 Abstract].

In 2026 they applied the same lead measures to global seismic noise from 229 stations, 1997–2025, and concluded that certain noise statistics "possess significant predictive power for the sequence of strong earthquakes" [26 §2][26 §13]. A 2023 preprint on the global magnetic field, 153 observatories over 1991–2021, reports that "precursor effects are identified" [27 Abstract].

Their own caution

The 2025 paper's introduction says that "methods have not yet been developed that allow us to unambiguously answer the question of whether strong solar flares and other electromagnetic events in the ionosphere have a trigger effect on the occurrence of sufficiently strong earthquakes" [25 §1].

Both open papers state "This research received no external funding" and declare no competing interests; the work falls under the state assignments of their institute [25][26].

OUR ANALYSIS

What that record does and does not tell us

Lead measures of this kind are retrospective statistics of association: they ask whether extrema in a series tend to come before earthquakes more often than after. They are not alarms, and the papers report no hit rate, false-alarm rate or comparison with a clustered null [25][26]. Whether the 2027 paper changes that, with its machine-learning model, is exactly what we could not read.

The senior author, Lyubushin, has made a timed call before. After the 2011 Tohoku earthquake he wrote that seismic danger in Japan remained high in the Nankai region, that "Two possible precursors of this type were found", and that "Both peculiarities of the noise data extract time interval 2013-2014 as the danger" [28 Abstract]. The paper framed these as possible precursors and a danger interval, not a prediction. The interval passed: the largest earthquake near Japan in 2013–2014 was a magnitude 7.1 off the east coast of Honshu on October 25, 2013, and none reached magnitude 8 [29].

7 · WHAT WOULD CHANGE THIS

Reading the paper would be a start

We could not read the paper

Every verdict here rests on the title, the bibliographic record and the literature [1][3][4]. The abstract alone could move the first claim: if it reports only retrospective accuracy, "working" would be Overstated; if it reports a held-out test with a false-alarm rate, the fourth claim could be rated.

Our starting point

We came to this paper through an episode built on a pole-shift premise, which could prime us toward skepticism. To limit that, we rated nothing the title does not say, and we report the authors' own hedges alongside the field's tests.

Abstracts, mostly

We read the ICEF report, the authors' three open papers and our own study in full; the other papers as abstracts. Three of those abstracts (the 2011 Tohoku report, the 2011 global study and the 1997 review) could be checked only against a bibliographic index, because their publishers' pages sit behind bot checks, so we paraphrase them rather than quote them [8][10][19].

What would change these verdicts

01 The abstract and text: a reported test on earthquakes outside the training data, with hits, misses, false alarms and a null model that keeps earthquakes clustered.

02 A prospective record: the rules frozen and published, then scored against earthquakes after October 2026 and against chance.

03 An independent replication on another catalogue or region, by a group that did not build the model.

Any of these would let us rate the paper's own claim. A prospective record that beat chance would move the episode's claim toward True; a retrospective result alone would leave it Unconfirmed, or make "working" an overstatement.

Prepared by Fact-Checked Science from the paper's bibliographic record, the episode's transcript and the open literature cited below. No figure or number comes from the paper, whose licence is closed and whose text we could not read. The assessment is our own and has not been reviewed by the authors.

Related checks

FALSE Olivine and earthquakes The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list. For the paper [1] only the bibliographic record was readable, so no locator points into its text. For the episode [2], times are positions in the video (hours:minutes:seconds). p. gives a page of a source: the ICEF report's [6] pages are the journal's (315–391), and the Nature comment's [21] run E1–E3; for the authors' open papers [25]–[27] and our study [30], § gives a numbered section; Abstract names the part of a source we quote. Links checked October 22, 2026.

1 Rodionov, E. A., and Lyubushin, A. A. (2027). Short-term Earthquake forecasting based on global TEC data, solar activity, and machine learning. *Journal of Applied Geophysics* 256, 106566. Online about October 12, 2026; issue dated January 2027. Closed access (Elsevier; its record lists only text-and-data-mining licences). We could read its bibliographic record, not its abstract, highlights or text: see section 1.

2 SpaceWeatherNews (S0) (October 22, 2026). Magnetic Pole Shift & The Largest Extinction Ever | S0 News Oct.22.2026. YouTube video. Quoted from the automatically generated transcript; times are positions in the video.

3 Crossref. Metadata record for doi:10.1016/j.jappgeo.2026.106566. Retrieved October 22, 2026: record created October 12, 2026; volume 256, article 106566, issued January 2027; 65 references; no abstract deposited; Elsevier text-and-data-mining licences only.

4 OpenAlex. Work W7221543494. Retrieved October 22, 2026: closed access, no abstract, no repository copy; both authors listed at the Schmidt Institute of Physics of the Earth, Russian Academy of Sciences.

5 ScienceDirect. RSS feed of the *Journal of Applied Geophysics*. Retrieved October 22, 2026; its item for the paper carries the title, the authors, "Volume 256" and "Publication date: January 2027" only.

6 Jordan, T. H., Chen, Y.-T., Gasparini, P., Madariaga, R., Main, I., Marzocchi, W., Papadopoulos, G., Sobolev, G., Yamaoka, K., and Zschau, J. (2011). Operational earthquake forecasting: state of knowledge and guidelines for utilization. Report of the International Commission on Earthquake Forecasting for Civil Protection (ICEF). *Annals of Geophysics* 54(4), 315–391. Open access; p. gives the journal's page.

7 Thomas, J. N., Huard, J., and Masci, F. (2017). A statistical study of global ionospheric map total electron content changes prior to occurrences of $M \geq 6.0$ earthquakes during 2000–2014. *Journal of Geophysical Research: Space Physics* 122(2), 2151–2161.

8 Liu, J. Y., Chen, Y. I., Chuo, Y. J., and Chen, C. S. (2006). A statistical investigation of preearthquake ionospheric anomaly. *Journal of Geophysical Research: Space Physics* 111, A05304.

9 Liu, J. Y., Chen, Y. I., Chuo, Y. J., and Tsai, H. F. (2009). Variations of ionospheric total electron content during the Chi-Chi earthquake. *Geophysical Research Letters* 36, L12101.

10 Heki, K. (2011). Ionospheric electron enhancement preceding the 2011 Tohoku-Oki earthquake. *Geophysical Research Letters* 38, L17312.

11 Heki, K., and Enomoto, Y. (2015). M_w dependence of the preseismic ionospheric electron enhancements. *Journal of Geophysical Research: Space Physics* 120(8), 7006–7020.

12 Kamogawa, M., and Kakinami, Y. (2013). Is an ionospheric electron enhancement preceding the 2011 Tohoku-Oki earthquake a precursor? *Journal of Geophysical Research: Space Physics* 118(4), 1751–1754.

13 Masci, F., Thomas, J. N., Villani, F., Secan, J. A., and Rivera, N. (2015). On the onset of ionospheric precursors 40 min before strong earthquakes. *Journal of Geophysical Research: Space Physics* 120(2), 1383–1393.

14 Ikuta, R., Hisada, T., Karakama, G., and Kuwano, O. (2020). Stochastic evaluation of pre-earthquake TEC enhancements. *Journal of Geophysical Research: Space Physics* 125(11), e2020JA027899.

15 Eisenbeis, J., and Occhipinti, G. (2021). The TEC enhancement before seismic events is an artifact. *Journal of Geophysical Research: Space Physics* 126(4), e2020JA028733. CC BY 4.0.

16 Zhu, F., and Jiang, Y. (2020). Investigation of GIM-TEC disturbances before M ≥ 6.0 inland earthquakes during 2003–2017. *Scientific Reports* 10, 18038. CC BY 4.0.

17 Picozza, P., Conti, L., and Sotgiu, A. (2021). Looking for earthquake precursors from space: a critical review. *Frontiers in Earth Science* 9, 676775. CC BY 4.0.

18 Love, J. J., and Thomas, J. N. (2013). Insignificant solar-terrestrial triggering of earthquakes. *Geophysical Research Letters* 40(6), 1165–1170.

19 Geller, R. J. (1997). Earthquake prediction: a critical review. *Geophysical Journal International* 131(3), 425–450.

20 Mignan, A., and Broccardo, M. (2020). Neural network applications in earthquake prediction (1994–2019): meta-analytic and statistical insights on their limitations. *Seismological Research Letters* 91(4), 2330–2342. We quote the abstract of its preprint, arXiv:1910.01178 (October 2, 2019).

21 Mignan, A., and Broccardo, M. (2019). One neuron versus deep learning in aftershock prediction. *Nature* 574(7776), E1–E3.

22 Beroza, G. C., Segou, M., and Mousavi, S. M. (2021). Machine learning and earthquake forecasting — next steps. *Nature Communications* 12, 4761. CC BY 4.0.

23 Díaz, F., Cerna, N., Liza, R., and Motta, B. (2026). Artificial intelligence and total electron content in earthquake-related seismo-ionospheric analysis: a mapping review. *Geomatics* 6(4), 74. CC BY 4.0.

24 Tsai, T.-C., Jhuang, H.-K., Hu, Y.-Y., Lee, L.-C., Su, W.-C., Hung, S.-L., Lee, K.-H., Fu, C.-C., Lin, H.-C., and Kuo, C.-L. (2022). Deep learning of detecting ionospheric precursors associated with $M \geq 6.0$ earthquakes in Taiwan. *Earth and Space Science* 9(9), e2022EA002289. CC BY 4.0.

25 Lyubushin, A., and Rodionov, E. (2025). Quantitative assessment of the trigger effect of proton flux on seismicity. *Entropy* 27(5), 505. CC BY 4.0.

26 Lyubushin, A., and Rodionov, E. (2026). Relationship of multifractal and entropic properties of global seismic noise with major earthquakes, 1997–2025. *Fractal and Fractional* 10(4), 267. CC BY 4.0.

27 Lyubushin, A., and Rodionov, E. (2023). Global correlations of the Earth's magnetic field and their connection with strong earthquakes. Research Square preprint rs-3172394/v1, July 20, 2023, not peer reviewed. CC BY 4.0. Published as Wavelet-based correlations of the global magnetic field in connection to strongest earthquakes. *Advances in Space Research* 74(8), 3496–3510 (2024).

28 Lyubushin, A. (2013). How soon would the next mega-earthquake occur in Japan? *Natural Science* 5(8A), 1–7. CC BY 4.0.

29 U.S. Geological Survey, ANSS Comprehensive Earthquake Catalog (ComCat): every M7.0+ earthquake within 24–46°N, 122–150°E from January 1, 2013, to December 31, 2014, from its FDSN event service, as CSV. Retrieved October 22, 2026.

30 Martin, B. (October 6, 2026). An Out-of-Sample Test of the Proposed Link Between Solar Polar Magnetic Fields and M8+ Earthquakes. Study, PDF, 14 pages, with its code and data at Do the Sun's polar fields time the world's largest earthquakes? on this site; § gives a section of the study.

METHOD

How this was checked

On October 22, 2026, we tried sixteen routes to the paper's text, abstract and highlights and read none of them, so the page rests on the paper's bibliographic record (Crossref, OpenAlex and the journal's feed), the episode's automatically generated transcript, 23 published papers on ionospheric precursors, machine-learning earthquake prediction and the authors' earlier work, our own out-of-sample study and a USGS catalogue query: about 70 statements, numbers and quotations in all. The ICEF report, the authors' three open papers, our own study and the catalogue query were read in full; the other papers as abstracts. Quotations from abstracts that reached us through OpenAlex or Semantic Scholar were re-checked against the publisher's page or the publisher's deposited abstract where one was reachable; three abstracts that could be checked only against an index are paraphrased, not quoted. A fresh reviewer then read the built page against the sources. That check reworded the first verdict card, which had said a paper ten days old could not have had the test a working model needs, when a held-out test is possible inside a paper and only a prospective record is ruled out by its age; moved one citation on the Tohoku case from "chance" to "artifact"; restored the presenter's hedge that the team "thinks" it has a working model; and tightened a dozen smaller statements.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources: our reading of what the title does and does not establish, the arithmetic on the Taiwan model's hits and false alarms, the point about ocean coverage, the Japan check of the 2013 window, and our reading of what the field's tests and reviews show.

Nothing from the paper could be recomputed, because nothing from it could be read. We recomputed the Taiwan model's confusion counts from its abstract (22 hits, 9 false alarms among 19 quiet periods, 32 of 41 correct) and re-queried the USGS catalogue for Japan in 2013–2014. No figure is redrawn: the paper's licence is closed and no number from it is available.

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

OVERSTATED — Has some basis but claims much more than the evidence supports.
UNCONFIRMED — Rests on a preliminary result that hasn't been confirmed.
UNVERIFIED — We couldn't find the source or record it depends on.
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

Oct 22, 2026 — Published on factchecked.science after a full check against the sources. Built from the paper's bibliographic record, because its text, abstract and highlights could not be read, together with the episode's transcript and the published literature on ionospheric precursors and machine-learning earthquake prediction. The verification report proposed Misleading for the episode's shared premise that pre-earthquake atmospheric signals are well documented; it is restated as Overstated to match the two companion pages on the episode's conference papers.