☑ Fact-Checked Science

PAPER CHECK · SPACE WEATHER

A strong storm, as reported; its effects in the air near Moscow rest on one storm alone

Five researchers at the Sadovsky Institute of Geosphere Dynamics in Moscow report that the strong magnetic storm of March 20–23, 2026, which came in two stages and reached Kp 7, "was accompanied by variations in the atmospheric electric field and the amplitude of microbaric oscillations" near the ground, and by changes in the ionosphere [1 Abstract]. Public indices confirm the storm as they describe it, by our check [4][5]; the effects in the air rest on one storm, and their methods could not be read, because the paper is paywalled: this page rests on its public preview, the authors' earlier abstracts and our own analysis of public data. S0 News linked the paper as "Solar Storms Impacting Surface" [2]. Storms do reach the ground, most surely through the magnetic field and the currents it induces [22 Abstract][7], but nothing in the paper's public parts (its abstract, keywords, seven figures and 20 references) concerns the solid Earth or earthquakes.

By Fact-Checked Science · Published October 31, 2026

OUR ANALYSIS marks our own reasoning and calculations: our check of the storm against GFZ's Kp and WDC Kyoto's Dst and SYM-H, the two stages we define around its two maxima, the chart, the Mikhnevo observatory's geomagnetic latitude from IGRF-14, our screen of an airport's weather reports against fair-weather criteria, and our reading of what the paper's public parts do and do not say; the verdicts are our assessment. Everything else comes from the numbered sources. The paper's full text [1] could not be read, so Abstract is its abstract on Springer's page, note 1–3 its three footnotes, which the page prints, and Fig. 1–7 its seven figure previews, which have no captions; we describe only what they plot. Quotations from [1] are of its English translation.

Storms do reach the ground; this paper's effects in the air rest on one storm

OUR ASSESSMENT

7
the highest three-hour Kp, reached twice, on March 21 and 22, in GFZ's definitive index [4]: a G3, "Strong", storm on NOAA's scale [7]

−105 nT
the lowest hourly Dst, provisional, in the hour from 22 UT on March 22; the first stage had reached −96 nT [5]

130 days
how many days of an average 11-year solar cycle see storms at this level, G3, by NOAA's count [7]

THE CLAIMS

TRUE

"Solar Storms Impacting Surface"

S0 News, its label on the link to the paper [2]

Storms do reach the ground, and what is established there is magnetic: storms shake the field at ground observatories, whose records give indices such as Kp and Dst [4][31 Abstract], and the paper itself plots the field at ten of them [1 Figs. 2–3]. The currents those swings induce in long conductors can trip power grids, as induced currents blacked out Hydro-Québec in March 1989 [22 Abstract][23 Abstract]; at this storm's level NOAA lists voltage corrections and false alarms on protection devices [7]. The paper's new effects, swings in the air's electric field and pressure near the ground, rest on one storm (claim 3) [1 Abstract]. Nothing in its public parts concerns the solid Earth or earthquakes: no seismic record in the abstract, keywords or seven figures, and no seismology among its 20 references [1]. For those claims see our test of solar polar fields and great earthquakes and our check of an earthquake-forecasting paper; a study of sunspots, solar wind and geomagnetic activity found no significant triggering of earthquakes [24 Abstract]. See sections 5 and 6.

TRUE

"a prolonged and strong magnetic storm from March 20 to March 23, 2026 (Kp = 7), characterized by two well-defined stages of increased magnetic activity"

The paper's abstract [1 Abstract]

Every part checks against the public indices. GFZ's definitive Kp reached 7o twice, at 00–03 UT on March 21 and at 15–18 UT on March 22, and stood at 5− or more in 15 of the 32 three-hour intervals of March 20–23 [4]. WDC Kyoto's provisional Dst fell to −96 nT, recovered to −21 nT and fell again to −105 nT [5]. Kp 7 is G3, "Strong", on NOAA's scale [7]. Our analysis; see section 2.

UNCONFIRMED

"It is shown that the magnetic storm was accompanied by variations in the atmospheric electric field and the amplitude of microbaric oscillations."

The paper's abstract [1 Abstract]

The abstract gives no sizes, baselines or statistics, and the full text, which might, is paywalled [1]. The finding fits the group's earlier storms at the same observatory [10 Abstract][8 Abstract] and one independent study of the electric field at mid-latitudes [18 Abstract]. But it rests on one storm; the authors note more than one possible mechanism [1 note 1], and a review finds the coupling mechanisms not well understood [19 p. 8]; and local weather moves the same quantities [16][26]. At an airport 51 km away the second stage passed in fair weather, while the first mostly did not, with mist and low cloud (our analysis) [28]. See sections 3 and 4.

TRUE

"variations in the critical frequency of F2 ionosphere layer were established caused by a magnetic storm"

The paper's abstract [1 Abstract]

Ionospheric storms are a long-reviewed effect of geomagnetic storms, "an extreme form of space weather", with the F2 layer at the centre of one review and the electron content of 180 storms in another [20 Abstract][21 Abstract], so a storm-time change in the layer's critical frequency is expected. The abstract gives no numbers, and a note says some ionograms are missing [1 note 3]. See section 5.

1 · THE PAPER

Five researchers in Moscow registered a strong storm in the air near the ground, and in the ionosphere

A. A. Spivak and four colleagues at the Sadovsky Institute of Geosphere Dynamics of the Russian Academy of Sciences, in Moscow, report what their instruments recorded "in the surface layer of the atmosphere" during the magnetic storm of March 20–23, 2026, and what ionospheric sounding showed [1 Abstract]. The paper, article 29 in *Doklady Earth Sciences*, was received on May 26, revised on July 6, accepted on July 13 and published online on October 30, 2026 [1][3].

What we could read: Springer's public preview

Springer sells the paper's full text, and we did not buy it. Its page shows the abstract, the paper's three footnotes, its keywords, funding and declarations, its 20 references and seven figure previews without their captions [1]; Crossref holds no abstract [3]. *Doklady Earth Sciences* is the English edition of the Russian Academy's *Doklady Rossiiskoi Akademii Nauk. Nauki o Zemle*, but we found no copy of the Russian original: neither Crossref nor OpenAlex lists a 2026 issue of it, and the Russian journal and library sites did not answer from our network [30].

So this page rests on the abstract, the authors' earlier abstracts and our own checks of public data. Where a question needs the full text, the page says so, and the table in section 8 lists them. Springer adds that "AI tools may have been used in the translation or editing of this article", so our quotations from it are of the English translation [1]. If you have the article, please tell us through the correction form, and we will revise the page.

What the abstract reports

Three results: the storm, with Kp = 7 and two stages; variations in the atmospheric electric field and in the amplitude of microbaric oscillations; and, from "the available data on ionospheric sounding", variations in the critical frequency of the ionosphere's F2 layer [1 Abstract]. Its keywords add acoustic oscillations and the magnetic field, and its title calls all of them "Geophysical Effects Caused by the Strong Magnetic Storm" [1].

The work was funded by the institute's state assignment No. 125012700798-8, "Transformation of Geophysical Fields as the Main Factor of Intergeospheric Interactions", and the authors declare no conflicts of interest [1].

The figure previews, in words

Springer shows the seven figures without captions, so we can say only what they plot, and we read no values off them [1 Figs. 1–7]. One plots Dst and Kp through the storm. Two plot the field's northward component at five European observatories, Valentia, Manhay, Fürstenfeldbruck, Belsk and MHV, the institute's Mikhnevo observatory, and at five North American ones, Brandon, Meanook, Newport, St John's and Victoria [10 Abstract][29]. The others plot the vertical electric field with the magnetic field; pressure oscillations, in pascals, with the field, in two panels; a spectrum against period, in minutes; and the F2 layer's critical frequency with Dst. None is redrawn here.

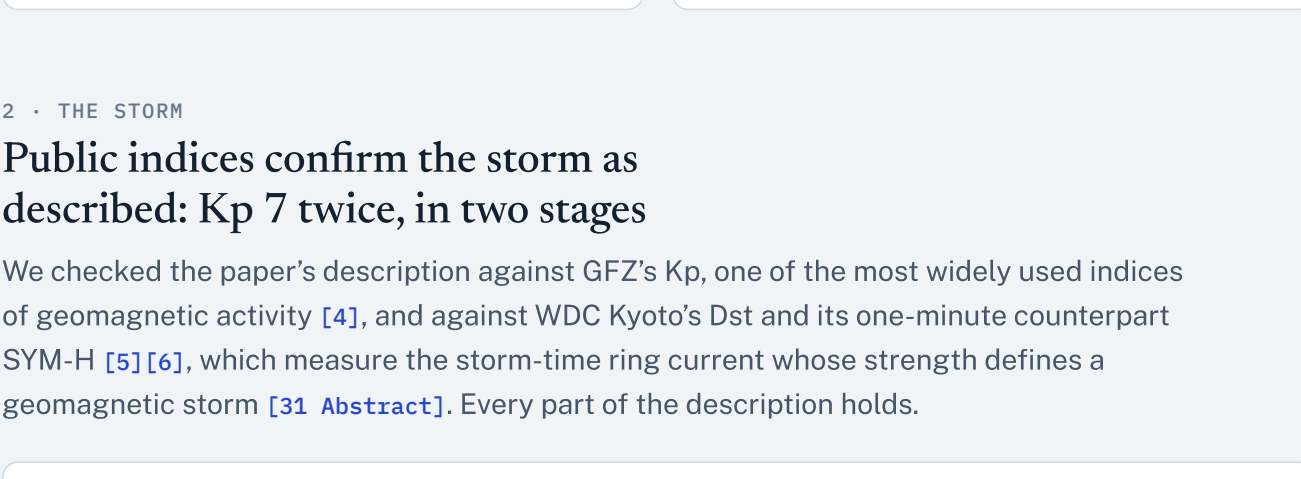
2 · THE STORM

Public indices confirm the storm as described: Kp 7 twice, in two stages

We checked the paper's description against GFZ's Kp, one of the most widely used indices of geomagnetic activity [4], and against WDC Kyoto's Dst and its one-minute counterpart SYM-H [5][6], which measure the storm-time ring current whose strength defines a geomagnetic storm [31 Abstract]. Every part of the description holds.

The storm of March 20–23, 2026, in three indices

OUR ANALYSIS



Our analysis, from GFZ's definitive Kp, CC BY 4.0 [4], and WDC Kyoto's provisional hourly Dst and one-minute SYM-H, shown here in 10-minute means [5][6]. Kyoto's indices are for scientific, non-commercial use; we acknowledge the observatories that supply their data and the WDC for Geomagnetism, Kyoto, and cite the data DOIs 10.17593/14515-74000 and 10.14989/267216. The stages are our definition: the two spans, around the two Kp 7 maxima and the two Dst minima, in which Kp stood at 5− or more. Kp touched 5− and 5o again at 12–18 UT on March 23, during the recovery, with no new Dst minimum, so that span is not a stage. No figure of the paper is redrawn.

HIGHEST KP · OUR ANALYSIS

7o, twice

at 00–03 UT on March 21 and 15–18 UT on March 22; 5− or more in 15 of the 32 intervals of March 20–23 [4]

LOWEST DST, PROVISIONAL · OUR ANALYSIS

−96, −105 nT

in the hours from 01 UT on March 21 and from 22 UT on March 22, with a recovery to −21 nT between; SYM-H reached −125 and −122 nT [5][6]

MIKHNEVO, GEOMAGNETIC LATITUDE · OUR ANALYSIS

50.9°

in March 2026, from IGRF-14: about where NOAA puts a G3 storm's aurora, "typically 50° geomagnetic lat." [27][7]

OUR ANALYSIS

Two stages, as the authors say

GFZ's definitive Kp, in three-hour steps, reads 1+ 3− 3+ 4− 3o 3+ 5+ 6+ on March 20; 7o 6− 5o 4o 3+ 3o 4− 3− on March 21; 4− 5− 5− 6+ 6o 7o 7− 7− on March 22; and 5o 4− 3+ 3− 5− 5o 4+ 4+ on March 23 [4]. Between the two maxima Kp fell to 3− and Dst recovered to −21 nT, so "two well-defined stages" is fair; Dst was at −50 nT or below in 46 of the hours of March 20–24, and daily Ap, an index derived from Kp, was 30, 43, 78 and 31 on March 20–23 [4][5].

SYM-H jumped 27 nT in six minutes from 11:05 UT on March 20, the kind of sudden rise that in March 1989 marked the arrival of shock fronts from the Sun [6][22 Abstract]. The paper's own first figure plots two of the same indices, hourly Dst and three-hourly Kp [1 Fig. 1].

How strong is "strong"

NOAA's scale calls a storm of Kp 7 a G3, "Strong", and counts about 200 such storms, on 130 days, in an average 11-year solar cycle [7]. Among their effects it lists, for power systems, "Voltage corrections may be required, false alarms triggered on some protection devices", and aurora seen as far from the poles as "typically 50° geomagnetic lat." [7]. G4 and G5, at Kp 8 and 9, are rarer: 100 and 4 storms a cycle [7].

3 · WHAT THE AUTHORS REGISTERED

Swings in the air's electric field and pressure, without numbers in the abstract

The abstract says the storm "was accompanied by" variations in the atmospheric electric field and in the amplitude of microbaric oscillations, and the title calls them effects "Caused by" the storm [1 Abstract][1]. How large they were, how they were measured and against what baseline, the public parts of the paper do not say.

OUR ANALYSIS

"Microbaric oscillations" are not microbaroms

The paper's microbaric oscillations appear, from one figure preview, which plots a spectrum against period in minutes [1 Fig. 6], and from the group's earlier work, to be small swings in air pressure with periods of minutes. That work describes storm-time pressure variations at periods of 20–80 minutes and near the Brunt–Väisälä frequency, the rate at which displaced air bobs in a stable atmosphere (our paraphrase) [12].

They are not the microbaroms of infrasound studies, which are made by ocean waves: "Between 0.1 and 0.6 Hz, the coherent ambient infrasound noise is dominated worldwide by signals originating from the ocean, the so-called microbaroms", with "an energy peaking around 0.2 Hz" [32], a period of about five seconds, by our arithmetic.

OUR ANALYSIS

How large?

The abstract gives no sizes [1 Abstract]. The group's two 2021 summaries of the same 58 storms differ: the Doklady abstract gives a range of electric-field variations "from 5 to 580 V/m", and the SPIE abstract amplitudes of about 5 to 20 V/m (our paraphrase) [10 Abstract][13]. Near the ground in fair weather the field is about 100 V/m [19 p. 3], so the storm effect they report could be a small fraction of the normal field or several times it; only the full texts could say which measure each uses.

The group's earlier storm studies, in their abstracts

STUDY	STORMS AND SITE	WHAT ITS ABSTRACT REPORTS
Riabova and Spivak (2021) [10]	58 strong storms, 2016–2019, at Mikhnevo	With the station's K index above five, "changes in the vertical component of the Earth's electric field", with variations "from 5 to 580 V/m", and larger variations of the atmospheric current [10 Abstract]
Riabova and Spivak (2020) [11]	Storms with K of 5 or more, at Mikhnevo and in Moscow, in fair weather	Increased variations of the field and current with "different morphological structures"; "It is currently difficult to interpret the data." [11]
Riabova, Romanovsky and Spivak (2021) [13]	58 storms, apparently the same, at Mikhnevo	Field variations of about 5–20 V/m and current of up to 4–6 pA/m² (our paraphrase) [13]
Spivak and colleagues (2021) [12]	Storms (site not given in the abstract)	Pressure variations of 2–20 Pa at periods of 20–80 minutes, with several quasi-harmonic components (our paraphrase) [12]
Spivak and colleagues (2021) [15]	50 storms, 2016–2019, at Mikhnevo	Storms of Kp 5 or more noticeably raised the error of GPS positions (our paraphrase) [15 Abstract]
Adushkin and colleagues (2023) [8]	April 23, 2023, Kp = 8, at Mikhnevo, with an ionosonde of the Leibniz Institute of Atmospheric Physics	"during periods of maximum magnetic field variations, increased microbaric variations were recorded and increased electric field variations were observed", and the F2 layer's critical frequency changed [8 Abstract]
Spivak and colleagues (2025) [9]	May 10–11 and October 10–11, 2024 (Kp = 9), and January 1, 2025 (Kp = 8)	"pronounced variations in the electric field, microbaric variations, and increased variations in the pseudopositioning error" of GPS, and changes in turbulence near the ground [9 Abstract]
Spivak and colleagues (2026) [14]	January 19–21, 2026, after a large solar flare	The same kinds of variation, with GPS errors and a change in the F2 layer (our paraphrase) [14]

Rows citing [12] and [13] paraphrase abstracts that reached us only through OpenAlex's index; the row citing [14] paraphrases the abstract its publisher deposited with Crossref. Three of the studies pool many storms at Mikhnevo, 58 in two of them and 50 in the third, of 2016–2019 where the abstracts give years; the others describe one to three storms each. The group's funding names its theme, "Intergeospheric Interactions" [1].

4 · HOW SURE

One storm, an open mechanism, and weather that moves the same quantities

A co-occurrence in one storm is a first step. Three things keep it from being more: no mechanism is settled, local weather drives the same quantities, and the paper's methods are not public [1].

The electric field

Storms can disturb the electric field near the ground at mid-latitudes. At Swider, in Poland, in fair weather during 14 storms, Kleimenova and colleagues found "Considerable (~100–300 V m^{-1}) decreases in the electric field strength" in daytime, as substorms began on the night side of the auroral zone [18 Abstract]. A review of space weather and atmospheric electricity counts that as evidence, but notes that ionospheric fields reach the ground directly only "within 30° of the poles" and that "the coupling mechanisms are not well understood" [19 p. 7][19 p. 8]. Mikhnevo, at 50.9° geomagnetic latitude, is 39° from the pole (our analysis) [27]. The authors' 2020 abstract proposes a mechanism, "Magnetic storms cause an increase in the ionospheric electric field, which leads to variations in the gradient of the electric field potential near the Earth's surface" [11], and the new paper notes another (below) [1 note 1].

The pressure oscillations

Infrasound from the aurora is well documented at auroral latitudes: at College, Alaska, it was traced to auroral forms moving faster than sound during substorms (our paraphrase) [25]. For storm-made pressure oscillations at the ground at mid-latitudes, we found in a brief search no independent study beyond the group's own, which report variations of 2–20 Pa during storms (our paraphrase) [12]. The search was not exhaustive.

Their notes, and an earlier caveat

The first three are the paper's footnotes; the preview does not show what the second refers to.

> *"Here, it is also worth noting other mechanisms for the excitation of electric field variations, for example, the emergence of polarization electric fields as a result of a sharp local increase in the conductivity of the ionosphere (auroral ionization)."*
>
> Spivak and colleagues (2026) [1 note 1]

> *"It should be noted that this issue requires a separate, more detailed study, which is planned to be done in the process of continuing the current research."*
>
> Spivak and colleagues (2026) [1 note 2]

> *"Partially missing ionogram data."*
>
> Spivak and colleagues (2026) [1 note 3]

> *"It is currently difficult to interpret the data."*
>
> Riabova and Spivak (2020), on the electric field during storms [11]

OUR ANALYSIS

The weather near Mikhnevo during the two stages

Weather moves the electric field and pressure near the ground too: the same group reports the fields changing hours before strong atmospheric fronts arrive (our paraphrase) [16]. Studies of atmospheric electricity therefore keep to fair weather, which Harrison and Nicoll define by three criteria: no hydrometeors (rain, drizzle, snow, fog or mist), aerosol or haze, as shown by a visual range above 2 km; no cumuliform cloud and no extensive stratus below 1,500 m; and a surface wind of 1–8 m/s (our paraphrase) [26]. The paper's preview does not say whether it screened for weather; the group's 2020 abstract did [11].

As a proxy, we screened the weather reports of Moscow Domodedovo airport against those criteria over the two stages, the spans around the two Kp 7 maxima and the two Dst minima in which Kp stood at 5− or more [28][4]. The airport is 51 km from Mikhnevo, where the group's records probably come from: one preview labels a magnetometer record MHV [1 Fig. 2], the code of the Mikhnevo observatory [10 Abstract]. The second stage passed in fair weather at the airport in all 48 reports, with clear skies and light winds, so no front, rain, fog or mist explains it there. The first met all three criteria in only 6 of 31 reports: mist in 16, low cloud from 03 UT on March 21 in 9, and calm air in 2, both also misty, though no precipitation. An airport 51 km away is a proxy, not the observatory.

STAGE	SPAN, UT	REPORTS	ALL THREE CRITERIA MET	MIST	WIND, M/S	VISIBILITY, KM
1	March 20, 18:00 – March 21, 09:00	31	6	16 reports	0–4	3.4–10
2	March 22, 03:00 – March 23, 03:00	48	48	none	1–4	10

METAR reports, about every half hour, from the Iowa Environmental Mesonet [28]; 10 km is the highest visibility the reports give. Our screen uses the reports' weather codes, visibility, cloud and wind, the wind as the reports give it in m/s, as stand-ins for the three criteria.

5 · EFFECTS AT THE GROUND

What storms do at the ground for certain: magnetic swings, the currents they drive, a disturbed ionosphere

That storms reach the ground is not in doubt. The best-established effects are magnetic, and they matter because of the currents they induce [22 Abstract][23 Abstract].

The field, and the currents it induces

A storm's swings in the magnetic field induce currents in long conductors such as power lines and pipelines, the geomagnetically induced currents whose science and engineering a NASA working group reviewed in 2017 [23 Abstract]. In March 1989 they blacked out Hydro-Québec's grid, and later in that storm the expanding aurora brought problems to power systems in the United States, the United Kingdom and Sweden [22 Abstract]. At this storm's level, G3, NOAA lists "Voltage corrections may be required, false alarms triggered on some protection devices" [7]. The paper's own references cite such effects on railways, pipelines and drilling [1].

The ionosphere

Ionospheric storms, reviewed with emphasis on the F2 layer, are "an extreme form of space weather with important effects on ground-and space-based technological systems" [20 Abstract], and a review of the ionosphere's electron content in 180 storms describes their patterns [21 Abstract]. The paper's third result, a storm-time change in the F2 layer's critical frequency, is therefore expected; its station and its size are not in the public preview [1 Abstract][1 note 3]. The same group has also reported larger GPS positioning errors during storms at Mikhnevo [15 Abstract].

Storm effects at the ground are real. The new ones in this paper, in the air's electric field and pressure, are what remains to be confirmed.

6 · THE SOLID EARTH

Nothing in the paper's public parts concerns the solid Earth or earthquakes

The paper's abstract, keywords, figure previews and 20 references contain no seismic record, no data on the crust and no earthquake [1]. Its effects are in the air near the ground, in the magnetic field and in the ionosphere.

Where we have looked at storms and earthquakes

Claims that the Sun or its storms act on the solid Earth are a different matter, which we have checked elsewhere: an out-of-sample test of solar polar fields and great earthquakes, an earthquake-forecasting paper built on solar and ionospheric data, and papers on electromagnetic earthquake precursors and magnetic anomalies and earthquakes. Testing sunspots, solar wind and geomagnetic activity against earthquake counts, Love and Thomas "cannot reject the null hypothesis of no solar-terrestrial triggering of earthquakes" [24 Abstract]. For the weather, see our check of a paper on storms and weather.

The group's earthquake work runs the other way

The same institute registers earthquakes, volcanic eruptions and falling meteoroids with its instruments, and studies their effects on the air's acoustic field, the magnetic field and the air's electricity, far from the source, with the ionosphere playing a part [17 Abstract]. That is the ground acting on the air. The storm papers of theirs that we found are about the air and the magnetic field [10 Abstract][9 Abstract], GPS [15 Abstract] and the ionosphere [8 Abstract].

7 · THE EPISODE

"Solar Storms Impacting Surface": a fair label for what the paper reports

S0 News linked the paper in the description of its episode of October 31, 2026, under the label "Solar Storms Impacting Surface" [2]. No transcript was available, so the episode's own words about it could not be checked.

The label

It fits what the paper reports, effects "in the surface layer of the atmosphere" [1 Abstract], and storms do reach the ground (claim 1). If the episode meant effects on the solid Earth, such as earthquakes, this paper has none (section 6).

The title's "Solar Impact"

The episode's title also has "Solar Impact" [2], which could describe this paper or the episode's superflare study (our check of it). It adds nothing to the label, so we leave it unrated.

8 · LIMITS

What this check can't tell us

The paper, unread
We read only its public preview. Its methods, numbers and conclusions could change any verdict here, claim 3 most [1].

No Russian original
We found no copy; it might give more detail [30].

Weather, by proxy
An airport 51 km away stands in for the observatory; local mist, wind or cloud there may differ [28].

Provisional indices
Kyoto's Dst and SYM-H for March 2026 are provisional and may still be revised [5][6].

One storm
We checked this storm and the group's earlier abstracts, not the whole literature on storms and the lower atmosphere.

What only the full text can settle

QUESTION	STATUS
The sizes, times and durations of the changes in the electric field and the pressure oscillations	Not in the abstract [1 Abstract]
Where the electric field and pressure were measured, with which instruments and filters	Mikhnevo appears in a figure preview; the rest is not public [1 Figs. 1–7]
Whether the authors kept to fair weather and compared quiet days, with any statistics	Not public; their 2020 study kept to fair weather [11]
Which ionosonde, and how large the change in the F2 layer was	Not public; some ionograms are missing [1 note 3]
Which version of Dst the authors used, and what their conclusions say	Not public [1]
Page numbers for locators	The public record gives an article number, 29, not pages [3]

What would change these verdicts

01
The full text showing fair-weather screening and a comparison with quiet days at the same hours, with changes beyond the usual variability: claim 3 could become True or Partly true.

02
The same signals at other stations in this storm, reported by other groups.

03
A transcript in which the episode says storms shook the ground or set off earthquakes: this paper would not support that, and claim 1 would need another look.

9 · REPEAT OUR NUMBERS

One script fetches the public data and prints every number of ours

The storm's indices, Mikhnevo's geomagnetic latitude and the weather screen all come from one script, run on seven public files.

PY **storm_numbers.py**
Downloads the inputs, checks them against the copies we used and prints every number of ours on this page · 15 KB

JSON **storm-numbers.json**
Its output: the Kp maxima, counts and spans at 5− or more, and daily Ap [4]; the Dst and SYM-H minima and the sudden rise [5][6]; Mikhnevo's latitude [27] and the weather screen [28] · 3 KB

CSV **storm-indices.csv**
The chart's Kp and Dst [4][5], with hourly SYM-H minima, March 19–24, 2026; the chart shows SYM-H as 10-minute means [6] · 5 KB

Run it

It needs Python 3.10 or later and nothing else. In an empty folder run `python3 -I storm_numbers.py`: it downloads its seven inputs, about 340 KB, from GFZ, WDC Kyoto, NOAA, IRIS and the Iowa Environmental Mesonet into `storm_numbers_data`, says whether each is the same file we used, and prints every number in a few seconds. Kyoto's values are provisional and may be revised, so a later download can differ slightly.

The outputs carry their inputs' terms. Kp and Ap are GFZ's, CC BY 4.0 [4]. Dst and SYM-H are WDC Kyoto's, for scientific use and no commercial use, with acknowledgement of the observatories that supply the data and of the WDC for Geomagnetism, Kyoto, and the DOIs 10.17593/14515-74000 and 10.14989/267216; that condition carries over to the CSV and JSON [5][6]. The weather reports are in the public domain [28], and IGRF-14 and the station's coordinates are public [27].

Sources

Bracketed numbers refer to this list. For the paper [1] we could read only Springer's public preview: Abstract means its abstract; note 1–3 its three footnotes, which the preview prints; Fig. 1–7 its seven figure previews, which have no captions, so we describe only what they plot and read no values off them. Quotations from [1] are of its English translation. For the episode [2] no transcript was available: we read its title and the links and labels in its description, and quote nothing else of it. For [19], p. gives a page of the accepted manuscript's PDF. Elsewhere Abstract means the abstract of the cited work; where only an abstract was read, the entry says so; abstracts that reached us only through an index are paraphrased, not quoted, and so are the two Russian-journal abstracts [14] and [16]. UT is Universal Time and nT the nanotesla; Kp is given in thirds, as 5−, 5o and 5+. Links checked October 31, 2026.

1 Spivak, A. A., Rybnov, Yu. S., Riabova, S. A., Soloviev, S. P., and Tikhonova, A. V. (2026). Results of Registration of Geophysical Effects Caused by the Strong Magnetic Storm of March 20–23, 2026. *Doklady Earth Sciences* 530(2), article 29. Received May 26, revised July 6, accepted July 13, published online October 30, 2026. Peer reviewed; © 2026 Pleiades Publishing, Ltd., with Springer Nature's text-and-data-mining licence the only licence on record: all rights reserved, not open access. **Public preview only**: Springer's page shows the abstract, three footnotes (note 1–3), the keywords, funding and declarations, the 20 references and seven figure previews without captions, and sells the full text, which we could not read. It is the English edition of *Doklady Rossiiskoi Akademii Nauk. Nauki o Zemle*; we found no copy of the Russian original. No figure of the paper is redrawn.

2 SpaceWeatherNews (S0) (October 31, 2026). Superflare Cycle 2030s, Cosmic Ghosts, Solar Impact | S0 News Oct.31.2026. YouTube video, https://www.youtube.com/watch?v=_8YfY0JF4Cc, published at 11:32 UT. No transcript was available, so we read only its title and the five links in its description, with their labels, as our collector recorded them; the episode's own words could not be quoted. The label "Solar Storms Impacting Surface" is the episode's own, on its link to the paper.

3 Crossref. Metadata record for doi:10.1134/S1028334X26601987. Retrieved October 31, 2026: created October 30, 2026; volume 530, issue 2, article 29; the received, revised, accepted and online dates; the declarations; 20 references; no abstract; Springer Nature's text-and-data-mining licence only.

4 Matzka, J., Bronkalla, O., Tornow, K., Elger, K., and Stolle, C. (2021). Geomagnetic Kp index, version 1.0. GFZ Data Services. CC BY 4.0. Definitive three-hourly Kp and daily Ap for March 17–26, 2026, read through GFZ's web service on October 31, 2026. The index is described in Matzka, J., Stolle, C., Yamazaki, Y., Bronkalla, O., and Morschhauser, A. (2021), The Geomagnetic Kp Index and Derived Indices of Geomagnetic Activity, *Space Weather* 19(5), e2020SW002641, CC BY 4.0, whose abstract we read.

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METHOD

How this was checked

On October 31, 2026, we tried every route the site allows to the paper's text: Springer's page, with a script and in a browser, the DOI, Crossref, OpenAlex and web searches. Springer shows a public preview and sells the full text, which we did not buy; Crossref and OpenAlex hold no abstract and no open copy. We found no copy of the Russian original: neither index lists a 2026 issue of the Russian edition, and the Russian journal and library sites did not answer from our network, one of them with a certificate our tools do not trust, which we did not override. So the page rests on the preview, that is the abstract, the three footnotes, the keywords, the declarations, the 20 references and seven figure previews without captions; on ten earlier papers of the same group (seven abstracts from the publisher's page or as deposited with Crossref, one conference abstract read in full and two abstracts that reached us only through an index; those two and the two Russian-journal abstracts are paraphrased); on the episode's title and description, there being no transcript; on eleven papers on storms, atmospheric electricity, the ionosphere, infrasound and earthquakes (two read in full and nine as abstracts, two of those through an index); and on public data and records from GFZ, WDC Kyoto, NOAA, IGRF-14, IRIS, the British Geological Survey, Crossref, OpenAlex and an airport's weather reports: the 32 sources listed. Quotations were checked word for word against the saved sources; the publishers' hyphen characters are printed as ordinary hyphens.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources. They include our check of the storm against GFZ's Kp and Ap and WDC Kyoto's Dst and SYM-H, the two stages we define around its two Kp maxima and Dst minima, the chart, the Mikhnevo observatory's geomagnetic latitude from IGRF-14, our screen of the airport's weather reports against fair-weather criteria, and our reading of what the paper's public parts and the authors' earlier abstracts do and do not say. The full text could change claim 3 most: if it shows that the authors kept to fair weather, compared the storm with quiet days at the same hours and found changes beyond the usual variability, the claim could become True or Partly true. If you have the article, please tell us through the correction form, and we will revise the page.

Our script, storm_numbers.py, hosted under Repeat our numbers, downloads its seven inputs, checks each against the copy we used by its SHA-256, and prints every number of ours on this page; run on October 31, 2026, it fetched the same files and gave the same results. No figure of the paper is redrawn and no value is read off its previews: the chart is our own, of public indices. We could not recompute anything of the paper's own, whose data and methods are not public, or check its instruments, its filtering, its baselines or the station behind its ionospheric data.

After the page was built, a fresh reviewer who hadn't seen the drafting re-ran the script from fresh downloads, which reproduced its outputs byte for byte, and re-checked every quotation, number and reference against the saved sources. The review found one error, in our own weather screen: it read a reported wind of 1 m/s as 0.998 m/s, through the archive's conversion to knots and back, and it let mist pass the first fair-weather criterion. Corrected, the first stage meets all three criteria in 6 of 31 reports rather than 15, and the second in all 48 rather than 45; no verdict changes. The other changes that followed: the two stages are now defined around the two Kp maxima and Dst minima, and the short span at Kp 5− and 5o on the afternoon of March 23 is named; Kp's lowest value between the maxima is given as 3−; Kp is called three-hourly; claim 3's short label names the storm; the authors' note on a second mechanism is no longer read as saying the mechanism is open; a range of periods read off a figure preview is gone; "nothing in the paper" is now "nothing in its public parts"; the descriptions of the group's earlier studies and of the hosted CSV are corrected; and ten smaller fixes, among them the WDC's acknowledgement of the observatories that supply its data and the English titles of two Russian papers as their publisher deposited them.

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

UNCONFIRMED	Rests on a preliminary result that hasn't been confirmed.
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 31, 2026	Published on factchecked.science after a full check against the sources. Built from the paper's public preview on Springer, since its full text is paywalled and no Russian original could be found, with ten earlier papers of the same group, the episode's title and description (no transcript was available), the literature on storms at the ground, atmospheric electricity, the ionosphere and earthquakes, and our own analysis of public storm indices and an airport's weather reports, whose script is hosted on the page: four claims rated on the site's scale, one the episode's and three the paper's. No figure of the paper is redrawn. Before publication a fresh review corrected our weather screen, which now finds the first stage in fair weather in 6 of 31 airport reports and the second in all 48, defined the two stages more exactly, relabelled claim 3 to name the storm, and made seventeen smaller fixes; no verdict changed.

Fact-Checked Science is independent. It isn't affiliated with the channels, presenters or authors whose claims it checks.

Last updated Oct 31, 2026