EVIDENCE REVIEW · S0 NEWS, 13 NOVEMBER 2026

S0 News, November 13, 2026: Earth's oxygen leak is old and tiny, and can't make a flood

On November 13, 2026, S0 News said "Earth's oxygen has started leaking" [1 00:00:24–00:00:26], citing a study of the May 2024 storm [1 00:02:20–00:02:27] and a 2014 story that oxygen loss surges in magnetic pole shifts [1 00:01:50–00:02:02], and added that the oxygen makes water [1 00:02:06–00:02:15], for "growth to a super flood" [1 00:00:28]. The study found oxygen ions from Earth's upper atmosphere filling the storm's ring current, not a new loss of air [4 Abstract]; Earth loses about 0.5–2 kg of its atmosphere a second [7 Abstract], and has lost oxygen this way throughout its history [16 Abstract]. The 2014 model's surge needs a field with no dipole at all [5 p. 96], far from today's, and turned entirely into water, today's escape would make less than a billionth of a year's rain (our analysis). The episode also reads a new Schumann-resonance paper as "describing the mechanisms"; the paper says its analysis "cannot establish" one [3 §4].

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OUR ANALYSIS marks our own reasoning and calculations, including our ceiling on the water escaping oxygen could make and our reading of which episodes the episode's list of predictions points to, and the verdicts are our assessment: several restate or follow the site's other checks, as each says. Everything else comes from the numbered sources. For the episode [1], times are positions in the video; for papers, § gives a section, p. a page as printed, and Abstract the abstract.

The May 2024 storm filled near-Earth space with Earth's own oxygen ions, as big storms do; what escapes is far too little to change the air or make a flood

OUR ASSESSMENT

8 seconds

A generous bound on the oxygen the May 2024 storm sent to space, 8,000 tonnes, equals 8 seconds of the air's measured oxygen decline, which comes mostly from burning fossil fuels, as our check of the paper computes.

17 mm

Our analysis: the sea-level rise if all the oxygen a 10,000-year reversal would remove, at the rate a 2014 model needs, became water and fell as rain [5 p. 96]. Today's escape would make less than a billionth of a year's rain.

0.1–0.2%

Median half-swings of the Schumann frequency on the two estimators of the paper the episode says describes "the mechanisms", which it calls "small band-limited shifts" and says may understate short episodes [3 §3.3]. The paper says "No single driver could be established" [3 Abstract].

THE EPISODE'S CLAIMS

MISREAD

Earth's oxygen started leaking

"Earth's oxygen has started leaking." [1 00:00:24–00:00:26] "And the data is in from the May 2024 solar superstorm on this exact oxygen leak. It was unprecedented." [1 00:02:22–00:02:27]

The paper found oxygen ions from Earth's upper atmosphere carrying most of the energy of the ring current, the band of charged particles that swells around Earth in a storm: "an unprecedented dominance of heavy ions originating from the Earth" [4 Abstract]. It measured no oxygen leaving Earth and gives no escape rate. And nothing started: Earth loses about 0.5–2 kg of its atmosphere a second, much as Mars and Venus do [7 Abstract], and has lost oxygen this way throughout its history [16 Abstract]. The same verdict covers "The oxygen leak would begin to show itself, and now it has" [1 00:03:00–00:03:05], as on our check of the paper. See section 2.

FALSE

An excursion is under way now

"During the magnetic pole shifts like the one we're in now" [1 00:01:58–00:02:00] "The problem is that our magnetic field is weak, shifting in the midst of an excursion reversal." [1 00:02:39–00:02:44]

Nothing measured is near one. An excursion is marked by a pole straying more than about 45° from the geographic pole, with the dipole at about half today's strength. Today the dipole's axis is tilted 9.2°, less than in 1900, and the dipole is about 40% stronger than its average over the last two million years, as our guide to the field sets out with its sources. The same claim is rated False on our review of November 9 and of October 22. See section 4.

OVERSTATED

Oxygen loss surges in reversals

"During the magnetic pole shifts like the one we're in now, oxygen loss surges." [1 00:01:58–00:02:02]

This rates the surge; "like the one we're in now" is the claim before. A 2014 model raised oxygen escape a thousand- to ten-thousandfold "only if the magnetic field was extremely weak" [5 p. 94]: its reversing field has no dipole at all [5 p. 96]. Its authors offered it as "a possible explanation" of extinctions [5 p. 97]. Later models find the field's strength changes escape two- to threefold [7 p. 3] [8 §3], and some find a magnetized planet loses more [9 Abstract]. A model by Wang and colleagues, published on November 16, after this review, finds a 39-fold rise along a simplified reversal path, under one fixed solar wind and from a present-day rate its authors put 2 to 3 orders of magnitude below observational estimates (our check of their paper). No reversal has been observed. Stated as fact, "surges" claims much more than these disputed models support. Storms do raise escape, with today's field: about eightfold during the May 2024 storm, by our check of the paper. See section 5.

FALSE

Leaking oxygen makes floodwater

"And the oxygen meets solar hydrogen coming from space in the ionosphere and radiation belts with all the energy to make the water." [1 00:02:06–00:02:15] The opening's "growth to a super flood" [1 00:00:28]

We read this with the opening's flood, as a claim about floodwater. When the ring current's oxygen ions meet hydrogen, it is the hydrogen of Earth's own outer atmosphere, and an ion takes an electron and flies off as a neutral atom: charge exchange, which the paper the episode cites calls an important loss in this very storm [4 Discussion, p. 6]. We found no known process that makes water from free oxygen ions there; solar-wind hydrogen makes water on dust grains, with the oxygen bound in minerals [18]. And if every oxygen ion Earth loses became rain, today's escape would add less than a billionth of a year's rain, and a 10,000-year reversal at the 2014 model's rate 17 mm of sea level (our analysis). The verdict rates that amount. See section 6.

MISREAD

New paper explains mechanisms

"Now on the right, brand new paper describing the mechanisms behind these short-term and lasting impacts." [1 00:01:36–00:01:43]

The paper, linked as "Solar Forcing Schumann", catalogues small swings in the frequency of the Schumann resonance at 8- to 29-day periods at three Arctic stations [3 Abstract]. It suggests they may reflect small changes at the ionosphere's lower edge, but says "the specific mechanism cannot be determined" [3 §4], and that no single driver could be established. It studies these swings, not what follows a storm: it sets its events beside catalogues of fast solar-wind streams and coronal mass ejections, many of which overlapped, but never uses the word "storm" and says nothing of effects that outlast one. The note it was set beside overstated those effects, as our review of the note found. See section 7.

FALSE

All predictions have come due

"Folks, today the list is complete. All predictions for if this is real have come due." [1 00:03:27–00:03:33]

Several of the eight things listed did happen: more aurora records, an oxygen-rich ring current, an Arctic vortex reversed in mid-November. But none is specific to a pole shift: each has an ordinary explanation on offer, such as the solar maximum, a strong storm or the weather in the stratosphere, and for two, the ionosphere's slow change and the radar echoes, the cause is still open. And three of the eight are contradicted: the release the episode links says long-term recovery is "still on track" [35 p. 1]; radiation set off by solar protons has reached the ground in 77 recorded events since 1942 [28 p. 9765]; and the ionosphere's parameters change slowly, over decades, not "rapidly". So the list hasn't come due, and it couldn't confirm a pole shift if it had. Whether any of it was predicted in 2014 we couldn't check. See section 8.

1 · THE EPISODE

Four and a half minutes, five links, and graphics we haven't seen

S0 News of November 13 went up at 12:13 UTC; its transcript runs four and a half minutes [1]. It promised "three hard-hitting sections of science" [1 00:00:18–00:00:20]: the ozone hole, the Schumann resonance, and a top story built on a study of the May 2024 storm [1 00:02:20–00:02:27] and a story from 2014 [1 00:01:50–00:01:58].

In the episode's words

Quoted from the automatic transcript as it stands, here and below. "Schuman" is the Schumann resonance, "superestorm" superstorm, "poll shift" pole shift, "Grockbot" GrokBot, "Noah" NOAA, "Noctalucent" and "messospheric" noctilucent and mesospheric, and "glossery" glossary.

> *"Ozone, the Schuman resonance, and Earth's oxygen has started leaking, signs of the poll shift and growth to a super flood."*
>
> The opening [1 00:00:22–00:00:28]

> *"Now, our top story and it begins with the story from 2014 and which we used to make the video called super flood 12 years ago."*
>
> The top story [1 00:01:50–00:01:58]

> *"Folks, today the list is complete. All predictions for if this is real have come due."*
>
> After a list of eight [1 00:03:27–00:03:33]

The five links, and where each is checked

THE DESCRIPTION'S LABEL	WHAT IT LINKS	WHERE IT IS CHECKED
"EARTH OXYGEN LEAK Begins"	Kitamura and 19 colleagues (2026), *Science Advances*, on the ions of the ring current in May 2024 [4]	Our check of the paper; here, sections 2 and 3
"OBSERVER GLOSSARY"	The Observer Glossary of the Catastrophism Research Association (CRA)	Our review of the glossary; here, section 10
"Ozone Report"	NOAA's copy of the NOAA–NASA release of November 4, 2026, on the ozone hole [35]; NASA posted its own [27]	Our check of the release; here, section 9
"Solar Forcing Schumann"	Tacza and five colleagues (2026), *Scientific Reports* [3]	Here, section 7
"Ben's GrokBot Team on Schumann/Solar"	S0 News's research note 001, which credits an "internal GrokBot Team" [2]	Our review of the note; here, section 7

What we could see, and what we couldn't

We worked from the episode's automatic transcript, supplied by the site's owner, and didn't watch the video [1]. "On the left" [1 00:01:27] and "on the right" point at pictures we haven't seen; the description's links tell us which paper was "on the right" [1 00:01:36–00:01:38]. Nor have we seen the 2014 video the top story builds on, the one "called super flood 12 years ago" [1 00:01:55–00:01:58]; we don't fetch YouTube videos.

Quoted, not rated

After the list the episode promotes membership of the CRA, with "Lots of perks for members and premium members" [1 00:03:50–00:03:53], and Havenbound, a service it calls "the single best safe location finder on Earth. And it's not even close." [1 00:04:03–00:04:08] It adds that "Havenbound is 44 days old and it's been a rocket ride so far" [1 00:03:57–00:04:01]. We didn't visit Havenbound's site or CRA's membership pages, and don't rate the passage. Its "this ongoing poll shift event" [1 00:03:48–00:03:50] repeats the claim rated in section 4. The sign-off, "Eyes open. No fear. Be safe, everyone." [1 00:04:26–00:04:29], isn't rated either.

2 · THE OXYGEN "LEAK"

The paper found Earth's own oxygen filling the storm's ring current, not oxygen leaving the planet

The link "EARTH OXYGEN LEAK Begins" is a peer-reviewed study of the May 2024 storm by Naritoshi Kitamura and 19 colleagues, open access [4]. Its finding is about where the storm's charged particles came from, and it is a striking one.

What the paper measured

The Arase satellite measured the ions of the ring current, which carries a storm's energy close to Earth. Near the storm's peak they were "overwhelmingly dominated (>85%) by terrestrial-origin heavy ions (O^+, O^{++}, and molecular ions) in energy density" [4 Discussion, p. 6]. In the two earlier great storms the paper compares, February 1986 and March 1991, the heavy ions' share reached 59% and about 65–75% [4 Introduction, p. 2]. The solar wind "contributes little to the energy density of the ring current" [4 Abstract].

What it doesn't measure

The ions it counts were lifted from the ionosphere and held around Earth by its field; the paper credits "ion supply processes from the Earth and transport in the magnetosphere" [4 Abstract]. It gives no rate at which oxygen leaves Earth. Its "unprecedented" is the heavy ions' share of the ring current's energy, as our check of the paper sets out.

OUR ANALYSIS MISREAD

"Earth's oxygen started leaking": Misread

Earth has always lost oxygen ions to space. It loses about 0.5–2 kg of its atmosphere a second, much as Mars and Venus do [7 Abstract]. Its oxygen escape rises with geomagnetic activity, and one estimate, which assumes a more active young Sun, puts the total over Earth's history at roughly the oxygen in the air today [16 Abstract]. Oxygen ions in the ring currents of great storms were measured in 1986 and 1991, as above. What is new in May 2024 is the share, the storm's size and the instruments. The episode cites a real and remarkable paper for something it doesn't report: a leak that has "started".

OUR ANALYSIS MISLEADING

"It does have an effect": Misleading

The episode adds: "It doesn't make it impossible to breathe down at the ground, but it does have an effect." [1 00:02:02–00:02:06] The first half is right. On the second, our check of the paper sets the storm's oxygen beside the air's. It puts what the storm sent to space at about 930 tonnes at its central estimate, 8,000 tonnes on generous assumptions and 160,000 tonnes at a ceiling. The air holds 1.19×10^{18} kg of oxygen and is losing 3.1×10^{13} kg a year, mostly to the burning of fossil fuels, on the Scripps record. Against that decline the three figures come to about 1 second, 8 seconds and 2.7 minutes. The generous figure is 150,000 times below the threshold that check sets, generously, for a change the air's oxygen record could show, and a year's escape is about 12,000–63,000 tonnes. Even the rate the 2014 model needs during a reversal would be 1.8% of the air's present measured decline. Over the long run, Gunell and colleagues note, citing an earlier estimate, that at the present outflow of 1 kg a second "less than 1% of Earth's atmosphere is removed" in a billion years [7 p. 3]. No effect anyone could notice.

Our check of Kitamura et al. (2026)

WHAT IT IS

A peer-reviewed article in *Science Advances*, published June 26, 2026, open access under CC BY 4.0: the Arase satellite's measurements of the ring current's ions during the May 2024 storm [4]. The episode's link "EARTH OXYGEN LEAK Begins" [1].

WHAT THE EPISODE SAID

"And the data is in from the May 2024 solar superstorm on this exact oxygen leak. It was unprecedented. They say it wasn't the solar wind delivering the huge amount of oxygen." [1 00:02:22–00:02:33]

WHAT OUR CHECK FOUND

The measurements hold: near the peak, heavy ions from Earth carried over 85% of the ring current's energy, beyond the earlier storms measured, and solar-wind ions at most 15%. The paper credits the Sun's driving and the ionosphere's supply. It measures no escape; a generous bound on what the storm sent to space is 8,000 tonnes.

In our check of the paper: "An unprecedented Earth-ion share" True; "Solar wind ions under 15%" True; "Ionosphere supplied, Sun powered" True; "Earth's oxygen started leaking" Misread; "A weak field, not a big punch" False. The first three are the paper's own claims; the last two are the episode's.

3 · A SMALL PUNCH?

The Sun's punch was one of the space age's biggest, and the weaker field the paper measured was the storm's own

"As viewers of this channel already know, the sun tossed a punch our way, but it wasn't massive. The problem is that our magnetic field is weak, shifting in the midst of an excursion reversal." [1 00:02:33–00:02:44] The paper the episode cites says otherwise on both counts.

What drove the storm, in the paper's words

"multiple coronal mass ejections from the Sun … triggered a super geomagnetic storm (minimum SYM-H: −518 nT …)" [4 Results, p. 2]. "The energy driving the development of this storm was provided by fast solar wind (>700 km s^{-1}) with a mostly southward-directed (negative B_z) interplanetary magnetic field (IMF)" [4 Results, pp. 2–3]. The wind was dense, "several tens of ions per cubic centimeter" [4 Results, p. 3].

The weaker field it measured

Near Earth the field "decreased by ~40% compared with that calculated using the International Geomagnetic Reference Field", because the ring current's ions "had sufficiently high pressure to deform the background magnetic field" [4 Results, p. 5]. The same team's second paper found the edge of Earth's magnetic field pushed in to 4.96 Earth radii, "one of the innermost magnetopause crossings ever detected", and found the field weaker all the way out to it, "suggesting global weakening by magnetospheric currents" [22 Abstract]: the storm's own currents.

OUR ANALYSIS FALSE

"A weak field, not a big punch": False

The punch was among the biggest of the space age. By our check of the paper, the storm's SYM-H of −518 nT is the second-deepest since 1981 and Kp reached 9, and in NASA's solar-wind records the interplanetary field turned 44 nT southward and the wind's pressure reached 58 nPa. It was the first G5 storm since 2003 (stop 8 of our video check). The episode has a point in part. No superflare was involved: the ejections behind the storm followed flares no larger than X5.8 (our check of a May 2024 aurora study). And a 2026 paper on why some of the storm's effects were comparatively weak offers a reason, unconfirmed: a small jump in the solar wind's electric field at the fronts of its ejections, which may have split energy gains through well (our check of that paper). But that describes the eruptions one at a time and their effect on grids, not a small storm, and S0 News's own link of November 8 called the storm's effect "Intense (Not Weak)" [33]. As for the field, the dipole is about 9% weaker than in 1840, which moves the aurora by a few degrees at most (our aurora check), and on published scalings, changes oxygen escape by 0–10%, where the storm raised it about eightfold while it lasted; over a year at that small, steady change adds up to 0–6,200 tonnes, as much as up to about eight such storms (our check of the paper). No excursion is under way (section 4). The same idea was rated False as "Needs a superflare at full field" on our review of October 22 and as "Less from the Sun does more" on our review of November 11.

OUR ANALYSIS TRUE

"Not the solar wind's oxygen": True

"They say it wasn't the solar wind delivering the huge amount of oxygen." [1 00:02:27–00:02:33] Right about the source: the paper finds that the solar wind, "another expected source of ions, contributes little to the energy density of the ring current" [4 Abstract], under 15% near the storm's peak even if every hydrogen and helium ion is counted as the wind's (our check of the paper). The paper speaks of shares of energy, not amounts of oxygen.

4 · AN EXCURSION UNDER WAY?

The same claim as on earlier episodes, and the same verdict

The episode says it four ways: "signs of the pole shift" [1 00:00:26], "magnetic pole shifts like the one we're in now" [1 00:01:58–00:02:00], "in the midst of an excursion reversal" [1 00:02:41–00:02:44] and "this ongoing poll shift event" [1 00:03:48–00:03:50]. An excursion is a measurable state of the field, and today's field is far from it.

OUR ANALYSIS FALSE

"An excursion is under way now": False

In an excursion the field's pole strays more than about 45° from the geographic pole, with the dipole at about half today's strength. Today the dipole's axis is tilted 9.2°, down from 11.4° in 1900, and the dipole is about 40% stronger than its average over the last two million years. It is weakening, slowly: about 9% weaker than in 1840, about 5% a century; our guide to the field gives the sources. Here "pole shift" means a reversal or an excursion, "an excursion reversal", not the drift of the magnetic poles, which our review of October 24 rates separately. The same claim is rated False on our reviews of October 22, October 23 and November 9 and in our guide. Nothing has changed since.

5 · THE 2014 STORY

A 2014 model made oxygen escape surge only with no dipole at all, and later models disagree about the field's role

The top story "begins with the story from 2014" [1 00:01:50–00:01:52]. The episode names no paper. The one that fits is Yong Wei and colleagues' 2014 study of oxygen escape during reversals [5]: our inference, as we haven't seen the 2014 video.

What Wei and colleagues modelled

They proposed that oxygen escaping to space during the many reversals of some geological periods could have lowered the air's oxygen and helped cause mass extinctions over millions of years [5 p. 94] [5 p. 95]. To test it they adapted an escape model made for Mars [5 p. 94], and built a reversing field by "reducing the dipole term to zero, multiplying the quadrupole term by 10% and keeping the other terms unchanged", which shrinks the magnetosphere to about 1.5 Earth radii [5 p. 96]. To explain the oxygen drop of the Triassic–Jurassic extinction, they found, the escape would have had to run at about 6.5×10^{29} ions a second, "3 orders of magnitude greater than the present outflow rate" [5 p. 96]. Their simulation "could explain at least 50% of the O_2 drop" [5 p. 97]. Their abstract says a reversal could raise escape "by 3–4 orders only if the magnetic field was extremely weak", and calls the idea "a possible explanation" [5 p. 94]. On today they wrote that "the slight changes of O_2 level cannot be regarded as a strong link" [5 p. 97].

What later work finds about the field's role

STUDY	WHAT IT FINDS	WHAT WE READ
Gunell and colleagues, 2018	Measured losses from Earth, Mars and Venus are similar, about 0.5–2 kg a second; escape "can be higher for magnetised planets over a wide range of magnetisations" [7 Abstract]. In their model today's Earth loses 1.4 kg a second, and the escape peaks run two to three times the unmagnetised rate for an Earth-like planet [7 p. 1] [7 p. 3]	Full text
Blackman and Tarduno, 2018	A magnetosphere can capture more of the solar wind than an unmagnetized planet with a small ionosphere; its protection depends on trapping what flows out [12 Abstract]	Abstract
Egan and colleagues, 2019	For a Mars-sized planet, strengthening a weak field first raises escape, then lowers it [11 Abstract]	Abstract
Lingam, 2019	On Gunell's model, escape changes about 2.4-fold with the field: 1.6 kg a second at a tenth of today's dipole against 1.4 today, at most 3.4 [8 §3], as Gunell's Figure 2a shows [7 p. 2]; explaining extinctions by the field "potentially unlikely" [8 Abstract]; a causal link with reversals "elusive, perhaps even nonexistent" [8 §4.2]	Full text
Tsareva and colleagues, 2020	A reversing field still holds off the solar wind at about 3 Earth radii and shields against some losses, though not the polar and auroral winds [13 Abstract]; escape rises about 2.5-fold as the dipole weakens, then about halves at the reversal itself (our check of the paper)	Abstract
Gronoff and colleagues, 2020	A review: "the paradigm of the magnetic field as an atmospheric shield should be changed" [10 Abstract]	Abstract
Ramstad and Barabash, 2021	A dipole field "is not required to prevent stellar wind-driven escape", "and the presence of one may instead increase the rate of ion escape" [9 Abstract]	Abstract
Gong and colleagues, 2022	A simulation of the last reversal, about 780,000 years ago, with Wei as a co-author: the field about 10% of today's, its edge as close as 3 Earth radii [15 Abstract]	Abstract
Tsareva and colleagues, 2025	Shielding "remains effective" at 10% of today's field in quiet times; but "a weak geomagnetic field and strong solar activity lead to a change in the dominant escape mechanism and significant atmospheric losses of comparatively lighter isotopes" [14 Abstract]	Abstract

OUR ANALYSIS OVERSTATED

"Oxygen loss surges in reversals": Overstated

When the episode aired, the claim had a basis: one peer-reviewed model, from 2014. But that model needs a field with no dipole at all for its rise of three to four orders of magnitude, and its authors hedge it. Later models find the field's strength changes escape two- to threefold [7 p. 3] [8 §3], or 2.5-fold through a reversal (our check of the paper, on Tsareva and colleagues), and others question whether a field shields an atmosphere at all [7 Abstract] [9 Abstract]. A second model that finds a surge, by Wang and colleagues, was published on November 16, after this review: escape rises 39-fold along a simplified reversal path and about 380-fold at a tenth of the dipole, untilted. It is one model, with one fixed solar wind and a pure dipole, a setup its authors call idealized. They report that its present-day rate is 2 to 3 orders of magnitude below observational estimates, put the gap down partly to how escape is defined and measured and partly to what the model leaves out, and rest their case on the relative change. We find that rate 400 to 690 times below the lowest escape satellites measure, and taken at face value the model's reversal peak stays about 60 times below what Earth loses now on average (our check of their paper). No reversal has been observed. The disagreement among the models is ordinary science, and we don't pick a winner in it; what we rate is the episode's flat "surges", which claims much more than that evidence supports. Two points hold whichever model is right. The 2014 surge needs a field with no dipole at all, and the 2026 model's 39- and 380-fold rises come at a tenth of the dipole, while today's dipole is about 9% weaker than in 1840 (section 4). And the surge that did happen in May 2024 came from the storm: escape rises steeply with geomagnetic activity [16 Abstract], about eightfold during this storm, while today's weaker dipole changes it all the time by much less: 0–10% on published scalings, which over a year can add as much as about eight such storms (our check of the paper), and about a quarter on a rough reading of the 2026 model's curves, a change that model can't really resolve (our check of the 2026 paper).

6 · WATER FROM THE LEAK?

No known chemistry there makes water, and every escaping oxygen ion as rain would be less than a billionth of a year's

"And the oxygen meets solar hydrogen coming from space in the ionosphere and radiation belts with all the energy to make the water." [1 00:02:06–00:02:15] We read it with the opening's "growth to a super flood" [1 00:00:28]: as we take it, the claim is that escaping oxygen makes floodwater. Wei and colleagues say nothing about the escaping oxygen making water or floods [5]; that part is the episode's, perhaps from its 2014 video, which we haven't seen.

What happens when the oxygen meets hydrogen

The ring current's ions run into the thin hydrogen of Earth's own outer atmosphere, the geocorona. An ion takes an electron from a hydrogen atom and flies off as a fast neutral atom: "Charge-exchange between energetic ring current ions and neutral exospheric hydrogen is thought to act as a dominant loss" [17 §2]. The paper the episode cites calculated that in May 2024 the oxygen ions deep in the ring current were "significantly lost within the timescale of the main phase (~10 hours)" this way, with "the neutral hydrogen geocorona" [4 Discussion, p. 6]. That exchange makes no water, and the hydrogen is Earth's, not the Sun's.

Where solar-wind hydrogen does make water

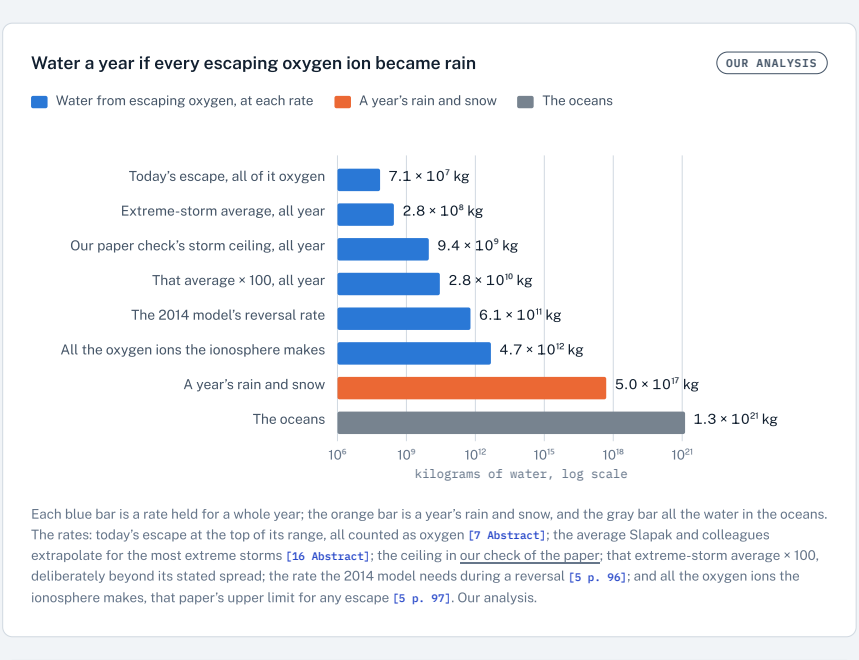
On solid grains. A 2014 study detected "solar wind-produced water" in tiny bubbles in the sun-weathered rims of interplanetary dust particles, where the oxygen is bound in silicate minerals [18]. We found no known process that makes water from free oxygen ions in the ionosphere or the radiation belts, which is not to say that none could.

OUR ANALYSIS

The most water it could make

Before computing anything we wrote down the rates, the comparisons and what would count as negligible. We then assumed, generously, that every oxygen ion becomes one water molecule, that hydrogen is unlimited, that nothing is lost and that all of it reaches the ground. A year's rain and snow is about 495,000 km³ [19]; the oceans hold 1,338,000,000 km³ [20]; for sea level we spread the water over 71% of a sphere 6,371 km in radius [20] [21].

Water a year if every escaping oxygen ion became rain OUR ANALYSIS



Each blue bar is a rate held for a whole year; the orange bar is a year's rain and snow, and the gray bar all the water in the oceans. The rates: today's escape at the top of its range, all counted as oxygen [7 Abstract]; the average Slapak and colleagues extrapolate for the most extreme storms [16 Abstract]; the ceiling in our check of the paper; that extreme-storm average × 100, deliberately beyond its stated spread; the rate the 2014 model needs during a reversal [5 p. 96]; and all the oxygen ions the ionosphere makes, that paper's upper limit for any escape [5 p. 97]. Our analysis.

OUR ANALYSIS FALSE

"Leaking oxygen makes floodwater": False

The rules set two thresholds in advance. The first: even the top rate, all the oxygen ions the ionosphere makes, gives 9.5 millionths of a year's rain in a year, below the one-thousandth we had fixed as negligible. The second: a 10,000-year reversal at the 2014 model's own rate gives 17 mm of sea level, short of the 1 m we had fixed for a flood; at the top rate, 130 mm. At today's escape a year makes less than a billionth of a year's rain. The May 2024 storm, at a hundred times the extreme-storm average for three days, gives about 230,000 m³, some 90 Olympic swimming pools; that rate removes more oxygen than our paper check's own ceiling for the storm, 160,000 tonnes, so it is more generous still. Added after the rules: even all the oxygen the Triassic–Jurassic extinction lost on Wei and colleagues' figures [5 p. 96], turned to water, would be about 1.5 m of sea level, spread over 30 million years (our arithmetic). With no known process, and an amount this small, the claim fails as our rules framed it, on the amount. These numbers bound the most such a process could make; they don't test whether a single molecule ever forms.

7 · THE SCHUMANN RESONANCE

The note overstated lasting effects, and the new paper establishes no mechanism and isn't about storms' after-effects

The Schumann resonance is a natural ringing of the space between the ground and the ionosphere, excited mainly by lightning [3 Abstract]. The episode set S0 News's research note 001 "on the left" [1 00:01:27] beside a new paper "on the right" [1 00:01:36–00:01:38].

OUR ANALYSIS OVERSTATED

"Lasting impacts after storms": Overstated

"you recall our first Grockbot team data release, the impact of the sun on Schuman residents and its lasting impacts even after the solar storm ends." [1 00:01:27–00:01:36] The note says the resonance at one Spanish station stayed disrupted "for a median 79 hours" after storms [2]. Our review of the note found that its 79 hours reproduce from its own table, but on the station team's own fits the median is 49 hours, ordinary storm-free days already need 20 hours under the same rule, and what remains is a shift of a few hundredths of a hertz on one of the station's two sensors. The same verdict as the note's "Disrupted for days, median 79 h" there. The note's text is unchanged since that review.

What the new paper did

Tacza and five colleagues, in a peer-reviewed article published November 11 as an early "Article in Press", took two decades of daily first-mode frequencies from Hornsund in Svalbard and from Ivalo and Rovaniemi in Finland, and searched them for bursts of variation at 25–29, 12–15 and 8–11 days, the Sun's rotation and periods near a half and a third of it [3 Abstract] [3 §2]. They found 8, 29 and 68 such episodes, 31 of them at two or more stations, coming and going rather than present throughout [3 §3.1]. The swings are small: 0.006–0.010 Hz, or 0.08–0.12% of the frequency, on one estimator, and 0.011–0.015 Hz on another [3 §3.3] [3 §4]. A subset moved with the solar wind's speed and with geomagnetic indices, but no single pairing held up after correction for the many comparisons [3 §3.4], though, pooled, the pairs lined up more often than chance would give [3 §3.6]. Many episodes coincided with fast solar-wind streams or coronal mass ejections in the catalogues it compares [3 Abstract], an overlap it treats as context, not as evidence of a link [3 §2].

In the authors' words

> *"Although the specific mechanism cannot be determined, a relationship with solar-wind and geomagnetic variability is physically plausible."*
>
> Tacza et al. (2026) [3 §4]

> *"No single driver could be established."*
>
> Tacza et al. (2026) [3 Abstract]

> *"...statistical support for an excess above background remains limited and depends on the assumed background, leaving the contribution of solar forcing unresolved."*
>
> Tacza et al. (2026) [3 §5]

OUR ANALYSIS MISREAD

"New paper explains mechanisms": Misread

The paper is careful and plain about its limits: it fixed its bands before searching, simulated what chance would give, corrected for multiple comparisons, and says what it could not establish [3 §2] [3 §4]. It establishes no mechanism: it suggests the swings may reflect small changes at the ionosphere's lower edge, but says its analysis "cannot establish this mechanism or exclude other influences" [3 §4]. And it isn't about what follows a storm: it studies periodic swings, never uses the word "storm", and its daily data "cannot determine sub-daily response times" [3 §4]. It doesn't mention the note or the note's Spanish station. The same group's earlier paper this year comes closer to the episode's words. Testing the stations' response to the onsets of fast solar-wind streams, on the day a stream arrived and the day after, it found a small rise of the frequency, and it describes a response lasting several days, which it puts partly down to daily averaging and to how streams arrive [6 §4]. It reads the rise as consistent with changes at the ionosphere's lower edge, calls that interpretation "indirect", and framed its test as "repeated driver forcing rather than persistent cavity memory from a single event" [6 §1]. Our review of the note finds the note's small after-storm tail fits that description.

Our review of S0 News's research note 001

WHAT IT IS

"Schumann Resonance Stays Disrupted for Days After Solar Storms", a Google Doc headed "Space Weather News Research Note from internal GrokBot Team 001", with the Sierra Nevada station's data from 2013 to 2017 [2]. The episode's link "Ben's GrokBot Team on Schumann/Solar" [1].

WHAT THE EPISODE SAID

"you recall our first Grockbot team data release, the impact of the sun on Schuman residents and its lasting impacts even after the solar storm ends." [1 00:01:27–00:01:36]

WHAT OUR CHECK FOUND

The numbers reproduce. Measured against storm-free days, the lasting part is a frequency shift of a few hundredths of a hertz on one sensor, about a day longer than ordinary days take under the note's own rule.

In our review of the note: "Disrupted for days, median 79 h" Overstated; "42 storms, 25 clean" True; "First-day f1 slightly high" True; "Early disturbance significant" Misleading; "TEC recovers a day sooner" Unsupported; "Kp clock off by days" Overstated.

8 · THE PREDICTIONS

Eight things that happened or were reported, and none of them a sign of a pole shift

"If the pole shift was real, and we needed to worry" [1 00:02:51–00:02:54], the episode says, eight things were to happen, and all have [1 00:02:54–00:03:27]. Which episodes its "last month", "last week" and "yesterday" mean is our reading of S0 News's link records; we haven't seen the graphics.

OUR ANALYSIS UNVERIFIED

"Predicted over a decade ago": Unverified

"We said to watch for it happening in real time next sunspot cycle." [1 00:02:15–00:02:20] "The oxygen leak wasn't the only prediction we made over a decade ago." [1 00:02:46–00:02:51] Both rest on the 2014 video, which we haven't watched. Checking them would take its title, date and words, from a transcript the site's owner could supply, and then a comparison with each item below. Even then, oxygen-rich ring currents in great storms were on record before 2014, from 1986 and 1991 [4 Introduction, p. 2].

The eight items

Scroll sideways to see the whole table →

THE EPISODE'S ITEM	WHAT OUR CHECKS FOUND	WHAT ELSE EXPL
"super auroras were supposed to surge, and they have." [1 00:02:54–00:02:58]	More records from Florida's latitude this cycle, some perhaps real, but counted by eye only two or three of five; "A century of aurora in 3 years" Overstated (our check of note 004); "Less from the Sun does more" False (November 11)	The solar maxim great storm of M 2024, and phon cameras that see glows. A dipole 1 weaker since 20 moves the auror a storm's size 5– (November 1)
"The ozone recovery would not continue, and it hasn't." [1 00:02:58–00:03:00]	The release the episode links says "long-term recovery still on track" [35 p. 1]; "Ozone recovery hasn't continued" False (section 9)	A larger-than-av polar vortex and than-average pla waves (the agenc explanation) [35 ozone-depleting is down by about from its peak, th says [35 p. 4]
"The oxygen leak would begin to show itself, and now it has." [1 00:03:00–00:03:05]	Misread: oxygen ions filling the ring current, not a new loss to space (section 2)	The storm's stren escape rises stee geomagnetic act [16 Abstract]
"Various ionospheric parameters changing rapidly" [1 00:03:05–00:03:08]	Slow changes over decades: at one German station, about 20% less peak electron density at the same solar flux in cycle 24 (2008–2019) than in cycle 20 (1964–1975) on one solar index, 0–8% on another, with the summer storm response unchanged (our check); a faint trend in the equatorial electrojet (our check); a two-to-three-day dip after storms, a textbook result (our check)	Carbon dioxide c the upper atmos proposed but un (our check, Unco the solar cycle; a field's ordinary d
"Noctalucent clouds and polar summer messospheric echoes are on the rise." [1 00:03:11–00:03:15]	The clouds may sit about 0.7 km lower than before 2000, though "99.5%" is overstated (our check); the radar echoes have become slightly more frequent over Norway since the 1990s, cause unsettled (extra x4, Misleading)	For the clouds, n water vapour fro methane high up echoes, no settle their rise remain solar and geoma effects are remo (extra x4)
"Radiation beginning to reach the ground, which we saw last month in the South Atlantic anomaly." [1 00:03:16–00:03:21]	No link of the last month shows it. On October 13, "Radiation Reaching the Surface" linked a conference abstract on cosmic radiation measured across Greenland during a May 2026 storm [31]. On November 1 the presenter said "magnetic deviations are starting to become enhanced at ground level beneath the South Atlantic anomaly" [30 00:01:54–00:01:59], about a preprint on magnetism, not radiation [29], whose effect goes back to 1999 (our check, Misread)	Radiation set off protons reaching ground is a grou enhancement: 7 recorded since 1 [28 p. 9765]; "Be is contradicted
"Airline radiation warnings missed, which we saw last week." [1 00:03:21–00:03:25]	By its words, the radiation storm of November 2025, which S0 News linked on October 28 as "Solar Storm Missed Airline Warning" [32] [23]. The paper's finding that no warning for airlines went out under ICAO's service holds, True, though NOAA did warn, and the flights' own monitors crossed no threshold (our check). By its date, perhaps November 8's paper on radiation and aircraft memory chips [33] [24], which we haven't checked	A warning servic models fed by fe observations, the radiation paper's explanation; the paper ties nothin weaker field, and chips paper's abs mentions none
"And stratospheric anomalies we discussed yesterday." [1 00:03:25–00:03:27]	November 12 linked an Arctic vortex whose winds had reversed, −2 m/s at 10 hPa and 60° N against a normal +28, a major sudden stratospheric warming by the WMO's definition [26], and a paper on anomalous changes of the tropical stratosphere's quasi-biennial oscillation in 2023–2024 [25] [34]. Neither checked by us	Planetary waves from the weathe as the vortex pag explains [26]; ne vortex page nor t paper's abstract the magnetic fiel

Our reading of which episodes are meant, from S0 News's link records [30]–[34]; for "last week", its words and its date point to different episodes.

OUR ANALYSIS FALSE

"All predictions have come due": False

Some of the list is true: the aurora records, the oxygen-rich ring current and the reversed vortex happened, and the airline warning did go unissued under ICAO's service. But a list of things with other explanations on offer can't test a pole shift: none of the eight is specific to one, even where, as for the radar echoes, the cause is still open, and our checks find several overstated or misread. And the sentence fails on its own terms: three of the eight items are contradicted on our checks. The ozone recovery continues, radiation set off by solar protons isn't "beginning" to reach the ground, and the ionosphere's parameters change slowly, over decades, not "rapidly". Not all the predictions have come due, and the inference the sentence invites, "if this is real", that the list confirms a pole shift, fails too.

9 · THE OZONE HOLE

A big hole, the largest since 2015, but not a deep one, and recovery on track

"We've got the official report from NASA and Noah linked below." [1 00:01:18–00:01:19] The copy it links, NOAA's, calls the hole "the seventh-largest in 48 years of monitoring, based on NOAA and NASA analysis of the seasonal mean area" [35 p. 2 ¶2], and NASA's copy adds that it "was not as deep as other large holes on record" [27]. Our check of the release checks both against the agencies' data.

OUR ANALYSIS OVERSTATED

"Massive explosion in ozone loss": Overstated

"we have been showing the massive explosion in ozone loss this year." [1 00:00:59–00:01:03] "In many ways, the records have cracked" [1 00:01:19–00:01:22] Large in area, but by the amount of ozone lost the season ranks 23rd of 47, and its records for the date are of area, on 8 days in one analysis and 1 in another, none of depth, and none all-time (our check of the release).

OUR ANALYSIS TRUE

"Largest hole in over a decade": True

"overall it was the seventh largest ozone hole on record, largest in over a decade." [1 00:01:24–00:01:27] Its average area for the season, 24.92 million km², ranks 7th of the 47 years with data and is the largest since 2015 by area, on both the season's average and its one-day maximum, though not by depth (our check).

OUR ANALYSIS FALSE

"Ozone recovery hasn't continued": False

"The ozone recovery would not continue, and it hasn't." [1 00:02:58–00:03:00] The release the episode links is subtitled "While weather caused a greater loss of ozone this year, long-term recovery still on track" [35 p. 1], and NASA's copy says the ozone layer "remains on track for long-term recovery" [27]. The 2026 WMO/UNEP assessment finds recovery continuing despite occasional large holes, and one weather-driven year sits inside the normal scatter, as our check of the release reports.

Our check of the NOAA–NASA release

WHAT IT IS

The agencies' release of November 4, 2026, on the season's Antarctic ozone hole, in NOAA's copy [35], the episode's link "Ozone Report" [1], and in NASA's [27].

WHAT OUR CHECK FOUND

Its numbers hold against the agencies' own data: a hole wide but not deep, made larger by the weather, with the ozone-depleting chlorine still falling.

In our check of the release: "Big, but not as deep" True; "Weather, not a stalled recovery" True; "Massive explosion in ozone loss" Overstated; "Largest hole in over a decade" True; "Ozone recovery hasn't continued" False. The first two are the release's claims; the last three are the episode's.

10 · THE GLOSSARY

The count is right: 238 terms, 16 of them names from the channel itself

"Folks, to help out, we've got a new free resource from CRA. The observer glossary is 238 terms, the ones you hear here regularly." [1 00:03:37–00:03:44] Our review of the glossary counts its terms and checks each factual claim in it.

OUR ANALYSIS TRUE

"The glossary has 238 terms": True

"The observer glossary is 238 terms, the ones you hear here regularly." [1 00:03:39–00:03:44] The PDF prints exactly 238 entries, with 238 distinct headwords: 72 on space weather; 150 on the Earth disaster cycle, of them 128 geophysical, 16 astrophysical and 6 galactic; and a last section of 16 names from the channel itself, so 222 without those, as our review of the glossary counts them. "the ones you hear here regularly" is context: they are the channel's own vocabulary.

Our review of CRA's Observer Glossary

WHAT IT IS

"Observer Glossary — Space Weather & Earth Disaster Cycle", a free PDF from the CRA. The episode's link "OBSERVER GLOSSARY" [1].

WHAT THE EPISODE SAID

"The observer glossary is 238 terms, the ones you hear here regularly." [1 00:03:39–00:03:44]

WHAT OUR REVIEW FOUND

Its space-weather definitions are mostly standard; its disaster-cycle terms state as fact claims the evidence contradicts.

In our review of the glossary: "The glossary has 238 terms" True; "Standard space-weather terms" Partly true; "Kp >1,000 and a 7 °C spike" False; "The Sun steers the weather" Overstated; "Storms harm heart, sleep, mood" Overstated; "A 6,000-year disaster cycle" False. The first is the episode's claim; the rest are the glossary's.

11 · WHAT IT GETS RIGHT, AND WHAT TO WATCH

Real findings, read as a pole shift they don't show

The episode's facts are often right; its frame is not.

OUR ANALYSIS

What the episode gets right

The ring current of May 2024 was dominated by Earth's own oxygen, to a degree not measured before, and the solar wind supplied little of it [4 Abstract]. The 2026 ozone hole was the largest since 2015 by area (our check of the release). Several of the things on its list did happen. And it is right that a small Schumann response to the solar wind has been reported by the same group, a rise lasting several days after fast streams arrive [6 §4]. What the evidence doesn't support is the step from these to a leak that has started, a flood, or a pole shift under way.

What would change these verdicts

01

A measurement of the oxygen Earth lost to space in the May 2024 storm, or a study finding escape surging with today's field, as distinct from storms.

02

The 2014 video's own words, with its date: they would settle what was predicted, and how specifically.

03

A source showing water formed from oxygen ions in the ionosphere or radiation belts at a rate that could matter; or field models showing the dipole's axis or strength moving toward an excursion.

12 · LIMITS

What this check could and couldn't settle

A transcript, not the video

We quote the automatic transcript and haven't seen the graphics; where the episode points at a picture, we can't tell what was shown [1].

The 2014 story is our inference

The episode names no paper. Wei and colleagues' is the 2014 paper on oxygen escape in reversals [5], but we can't confirm it is the story the episode means.

Abstracts for most of the later work

Of the nine later studies of the field's role, we read two in full, Gunell and colleagues' and Lingam's, and seven as abstracts; two figures from Tsareva and colleagues come from our check of the paper. The 2026 model, added to this page on November 19, was read in full for our check of it.

Other pages' numbers

The oxygen budget, the storm's solar-wind figures, the ozone rankings and the 2026 model's numbers are those of our checks of the papers and the release, which show their work. The glossary's count is our review's.

Our reading of the episode's list

Which episodes "last month", "last week" and "yesterday" mean is our reading of S0 News's link records [30]–[34]; two of the links it may mean we haven't checked [24] [25].

A ceiling, not a test

Our water numbers bound the most such a process could make; they can't show whether any water forms.

13 · HOW WE WORKED IT OUT

Rules first, one small script, published numbers

The water ceiling is the only number computed for this page. Its inputs are published rates and reservoirs, written down with their sources before the script ran; it needs no download.

STEP 1

Rules first

We wrote the question, the rates, the generous assumptions, the comparisons and the two thresholds into a rules file and logged its checksum before computing anything.

STEP 2

Run

One standard-library script turns each rate into water a year, its share of a year's rain [19], of the oceans [20] and of sea level [21].

STEP 3

Add our paper check's ceiling

As the rules provide, a second run added the largest rate in our check of the paper, 10^{28} ions a second, below the top rate, so the results stand.

STEP 4

Check

A second, separate calculation gave the same numbers.

Code and numbers

PY **water_ceiling.py**
The script, as run, standard library only · 3 KB

JSON **water_inputs.json**
Its inputs: the five rates and the constants, each with its source · 2 KB

TXT **water_ceiling.txt** · **water_ceiling_p1.txt**
Its output: the first run, and the second with our paper check's ceiling · 1 KB and 2 KB

TXT **RULES_water.txt**
The rules, as written before the run · 5 KB

TXT **HASHES.txt**
SHA-256 of the rules, the script, its inputs and its outputs, in the order they were logged · 2 KB

Run it

It needs only Python 3 and no network. Put the script and its inputs in an empty folder and run `python3 -I water_ceiling.py water_inputs.json water_ceiling.txt`. For the second run, `python3 -I water_ceiling.py water_inputs.json water_ceiling_p1.txt 1e28 "page check ceiling"`; the label doesn't change the numbers. Each run takes a moment and writes one text file.

Related checks

FALSE More auroras from less solar input? The Disaster Cycle, Fact-Checked

UNSUPPORTED A magnetic pole flip in the 2040s? The Disaster Cycle, Fact-Checked

MISLEADING Mesospheric echoes and CO2 The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list. For the episode [1] and the episode of November 1 [30], times are positions in the video (hours:minutes:seconds), from the first to the last line of tactiq.io's automatic transcript that holds the words quoted; a bare [1] is the episode as a whole or its description. For papers, § gives a section: for Tacza et al. [3] and [6], the numbered sections their own texts use; for Kitamura et al. [4], Introduction, Results and Discussion name its sections, followed by a page of its typeset PDF. p. gives a page as printed, and Abstract the abstract; for NOAA's copy of the release [35], p. gives a page of the printed copy and ¶ a paragraph. We read the sources on November 13, 2026, except those marked as read for earlier pages. Links checked November 13, 2026.

1 SpaceWeatherNews (S0) (November 13, 2026). Earth Oxygen Begins to Leak | S0 News Nov.13.2026. YouTube video, https://www.youtube.com/watch?v=9Lau3x7wQPc, published 12:13:18 UTC, with the five links of its description as the site's collector recorded them on November 13, 2026. Quoted from tactiq.io's automatic transcript, supplied by the site's owner; times are positions in the video. We did not see the video's graphics.

2 S0 News (undated). Schumann Resonance Stays Disrupted for Days After Solar Storms. "Space Weather News Research Note from internal GrokBot Team 001", a public Google Doc. Our text export of November 13, 2026, 16:22 UTC, had the SHA-256 f3ca788a0a7608b0057d6212c0df666d0e3d1c830490ac61274dd6c52e3fc99a, the same as the copy checked on our review of the note. No licence is stated, so it is linked, not hosted. Peer reviewed.

3 Tacza, J., Bozoki, T., Satori, G., Neska, A., Raita, T., and Bor, J. (2026). A catalogue of solar rotation-scale variations in the first Schumann resonance frequency at high latitudes, 2004–2024. *Scientific Reports*, published November 11, 2026, as an "Article in Press" (accepted November 6; "subject to further edits"). CC BY 4.0. Peer reviewed. Read in full, in the preview PDF that the article page links, with its supplementary file. § gives the numbered sections its own text refers to: §2 data and methods, §3.1–3.6 results, §4 discussion, §5 conclusions.

4 Kitamura, N., Yamamoto, K., Yokota, S., and 17 others (2026). Extreme dominance of Earth-origin heavy ions in the intense ring current near the Earth during the May 2024 super geomagnetic storm. *Science Advances* 12(26), eaee1069. CC BY 4.0, by its own statement. Peer reviewed. Full text from Europe PMC (PMC13308607), read for the passages quoted here, which we then checked word for word against the typeset PDF the site's owner downloaded; checked in full on our check of the paper. Introduction, Results and Discussion name its sections, and p. gives a page of the typeset PDF as printed.

5 Wei, Y., Pu, Z., Zong, Q., Wan, W., Ren, Z., Fraenz, M., Dubinin, E., Tian, F., Shi, Q., Fu, S., and Hong, M. (2014). Oxygen escape from the Earth during geomagnetic reversals: Implications to mass extinction. *Earth and Planetary Science Letters* 394, 94–98. CC BY 3.0. Peer reviewed. Read in full, from a copy the site's owner downloaded, because ScienceDirect refuses our client; its supplementary Appendix A is unread. p. gives a page as printed.

6 Tacza, J., Sátori, G., Neska, A., Raita, T., and Bozoki, T. (2026). Schumann resonance frequency increase following recurrent solar wind stream onsets. *Earth and Space Science* 13, e2026EA005271. CC BY 4.0. Peer reviewed. Read in full for our review of note 001, from the publisher's PDF the site's owner supplied.

7 Gunell, H., Maggiolo, R., Nilsson, H., Stenberg Wieser, G., Slapak, R., Lindkvist, J., Hamrin, M., and De Keyser, J. (2018). Why an intrinsic magnetic field does not protect a planet against atmospheric escape. *Astronomy & Astrophysics* 614, L3. Received March 2, 2018, accepted May 23. Peer reviewed; © ESO 2018, with no licence stated, so it is quoted briefly and none of its figures is redrawn. Read in full, all eight pages with the appendix, in the publisher's PDF the site's owner downloaded. p. gives a page as printed.

8 Lingam, M. (2019). Revisiting the biological ramifications of variations in Earth's magnetic field. *The Astrophysical Journal Letters* 874, L28. Read in full, in the author's version on arXiv, 1904.03353v2.

9 Ramstad, R., and Barabash, S. (2021). Do intrinsic magnetic fields protect planetary atmospheres from stellar winds? Lessons from ion measurements at Mars, Venus, and Earth. *Space Science Reviews* 217, 36. Abstract only, on Springer's page.

10 Gronoff, G., and 19 others (2020). Atmospheric escape processes and planetary atmospheric evolution. *Journal of Geophysical Research: Space Physics* 125, e2019JA027639. Abstract only, as deposited with Crossref.

11 Egan, H., Jarvinen, R., Ma, Y., and Brain, D. (2019). Planetary magnetic field control of ion escape from weakly magnetized planets. *Monthly Notices of the Royal Astronomical Society* 488, 2108–2120. Abstract only, as deposited with Crossref.

12 Blackman, E. G., and Tarduno, J. A. (2018). Mass, energy, and momentum capture from stellar winds by magnetized and unmagnetized planets: implications for atmospheric erosion and habitability. *Monthly Notices of the Royal Astronomical Society* 481, 5146–5155. Abstract only, from its arXiv record, 1801.00895.

13 Tsareva, O. O., Dubinin, E. M., Malova, H. V., Popov, V. Yu., and Zelenyi, L. M. (2020). Atmospheric escape from the Earth during geomagnetic reversal. *Annales Geophysicae* 63(2), PA2222 (PA223 in its Crossref record). Abstract only, as deposited with Crossref; the figures we give from it are those of our check of Kitamura et al.

14 Tsareva, O., Cannell, A., Levashov, N., Malova, H., Popov, V., and Zelenyi, L. (2025). Atmospheric losses of N^+ and O^+ under extreme solar conditions during geomagnetic reversals. *Cosmic Research* 63, 74–84. Abstract only, on Springer's page.

15 Gong, F., Yu, Y., Cao, J., Wei, Y., Gao, J., Li, H., Zhang, B., and Ridley, A. (2022). Simulating the solar wind–magnetosphere interaction during the Matuyama–Brunhes paleomagnetic reversal. *Geophysical Research Letters* 49, e2021GL097340. Abstract only, as deposited with Crossref.

16 Slapak, R., Schillings, A., Nilsson, H., Yamauchi, M., Westerberg, L.-G., and Dandouras, I. (2017). Atmospheric loss from the dayside open polar region and its dependence on geomagnetic activity: implications for atmospheric escape on evolutionary timescales. *Annales Geophysicae* 35, 721–731. CC BY 3.0. Abstract, as deposited with Crossref.

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18 Bradley, J. P., Ishii, H. A., Gillis-Davis, J. J., Ciston, J., Nielsen, M. H., Bechtel, H. A., and Martin, M. C. (2014). Detection of solar wind-produced water in irradiated rims on silicate minerals. *Proceedings of the National Academy of Sciences* 111, 1732–1735. Its title and significance statement, as deposited with Crossref.

19 NASA Earth Observatory (October 1, 2010). The Water Cycle. Read November 13, 2026, for "some 495,000 cubic kilometers" of water cycled through the atmosphere every year and its table of reservoirs, after Gleick (1996). A work of the US government.

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30 SpaceWeatherNews (S0) (November 1, 2026). Pole Shift Deep Dive Shows Rapid Decay | S0 News Nov.1.2026. YouTube video. Quoted from tactiq.io's automatic transcript, supplied by the site's owner; times are positions in the video. Its link "SAA Ground Magnetism" is the preprint by Piassi and colleagues.

31 SpaceWeatherNews (S0) (October 13, 2026). Radiation Reaching the Surface, 2 Asteroids in 2 Days | S0 News Oct.13.2026. YouTube video, not watched, with no transcript. Described from its description's links, as the site's collector recorded them: "20% Ground Radiation Surge" is Reuveni, Y., and colleagues, "Mobile High-Latitude Measurements of Cosmic Radiation Across the Greenland Ice Sheet During a May 2026 Geomagnetic Storm", an AGU Fall Meeting 2026 abstract, of which we have the record only.

32 SpaceWeatherNews (S0) (October 28, 2026). They Should Have Warned the Airline | S0 News Oct.28.2026. YouTube video. Its link "Solar Storm Missed Airline Warning" is the paper by Baird and colleagues, as reviewed on our check of that paper.

33 SpaceWeatherNews (S0) (November 8, 2026). Pole Shift Airplane Risk & Magnetic Field Erosion | S0 News Nov.8.2026. YouTube video, not watched, with no transcript. Described from its description's links, as the site's collector recorded them: "Solar Storm Aviation Risk" (Barker and colleagues) and "Intense (Not Weak) May 2024 Solar Storm Effect" (Yamamoto and colleagues).

34 SpaceWeatherNews (S0) (November 12, 2026). Two Major Atmospheric Changes, Record Shattered | S0 News Nov.12.2026. YouTube video, not watched, with no transcript. Described from its description's links, as the site's collector recorded them: "Polar Vortex Reversed" (polarvortex.earth) and "QBO Anomaly 2023-2024" (Gabis).

35 National Oceanic and Atmospheric Administration (2026). NOAA, NASA release measurements of 2026 ozone hole. News release, November 4, 2026 ("Last updated November 4, 2026"); the episode's link "Ozone Report". Read in full, in a copy the site's owner printed on November 13, 2026, because noaa.gov refused our client; p. gives a page of that five-page print and ¶ a paragraph on the page. Checked against NASA's copy and the agencies' data on our check of the release. A work of the US government.

METHOD

How this was checked

On November 13, 2026, we checked every statement, number and quotation on this page against its source: S0 News of November 13, through tactiq.io's automatic transcript, quoted verbatim with its timestamps, and its description's five links [1]; the Schumann paper it links, read in full with its supplement [3]; the 2014 paper on oxygen escape during reversals, read in full [5]; the full text of the oxygen-ion paper, for the passages quoted here, and its typeset PDF [4]; nine later studies of the field's role in escape, two read in full [7] [8] and seven from their abstracts; a review of what happens to the ring current's ions [17] and a study of water the solar wind makes on dust grains [18]; NASA's and the USGS's figures for the world's water [19] [20]; NOAA's copy of the ozone release, the one the episode links [35], and NASA's [27]; and the records of the episodes the list of predictions points to [30]–[34]. In all, 35 sources. The oxygen-ion paper, the ozone release, the glossary and research note 001 are checked on their own pages, and their verdicts appear here on cards.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources: the ceiling on the water escaping oxygen could make, and our reading of which episodes the list of predictions points to. Several verdicts restate or follow the site's other checks, and say so: "Earth's oxygen started leaking", "A weak field, not a big punch" and "Not the solar wind's oxygen", from our check of the oxygen-ion paper, and "It does have an effect", on that check's numbers; "An excursion is under way now", from our guide to the field and earlier reviews; "Lasting impacts after storms", from our review of the note; the three verdicts on the ozone hole, from our check of the release; and "The glossary has 238 terms", from our review of the glossary.

What was re-run: the water ceiling, from rules written before any number was computed, once with five published rates and again, as the rules provide, with the largest rate in our check of the oxygen-ion paper; a separate calculation gave the same numbers. What couldn't be checked: the 2014 video, which we haven't watched, and so whether anything on the episode's list was predicted then; the full texts of seven of the nine later studies; and the episode's graphics.

After the page was built, a fresh reviewer who hadn't seen the drafting re-found every quotation and locator, recomputed the water ceiling in separate code, re-ran the hosted script, and checked every DOI and source. The changes that followed: two ozone quotations are now credited to NASA's copy of the release, which has them, and NOAA's copy, the one the episode links, is quoted in its own words; the Schumann paper's suggested mechanism, its comparison with solar-wind catalogues and its pooled result are now described, with the earlier paper's several-day response; the water verdict says "no known process" and rests on the amount, as our rules framed it, and its label became "Leaking oxygen makes floodwater"; the list of predictions no longer says every item has a documented cause; and about thirty smaller fixes of wording, figures, citations and locators were made. Two verdicts changed: "Oxygen loss surges in reversals" from Unconfirmed to Overstated, since the episode states as fact a surge that one disputed model found only with no dipole at all; and "All predictions have come due" from Misleading to False, since three of the eight items are contradicted and none is specific to a pole shift.

After publication, the site's owner supplied two papers as their publishers typeset them: the oxygen-ion paper, whose passages we had read in Europe PMC's text, and Gunell and colleagues' letter, which we had read only as an abstract [4] [7]. Every quotation from the first matched, under the sections we gave, and we added its page numbers. The letter bore out everything we had taken from its abstract, and its Figure 2a, read against the figure's own axes, bears out the three numbers Lingam takes from it: 1.6 kg a second at a tenth of today's dipole, 1.4 today and at most 3.4. We now call its 0.5–2 kg a second measured, as it does, and added its model's rate for today's Earth, its escape peaks of two to three times the unmagnetised rate, and the estimate it cites of what the present outflow removes in a billion years. Where we had said the field changes escape about twofold, we now say two- to threefold, or about 2.4-fold on Lingam's reading. No verdict or label changed.

On November 19 we added a model published on November 16, three days after this review: Wang and colleagues' model of oxygen escape from an Earth with a weaker or tilted dipole, read in full for our check of the paper. The numbers we give from it are that page's, from its readings of the paper's figures: the 39-fold and about 380-fold rises; about a quarter more escape for the dipole's weakening since 1840, a rough reading; and, set against measured escape, the 400 to 690 times between the model's present-day rate and the lowest measured escape and its reversal peak about 60 times below what Earth loses now on average. The box in section 5 gives them; the card for "Oxygen loss surges in reversals" gives the 39-fold rise and the authors' own figure for the gap; the limits say the paper was read in full. No verdict or label changed.

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.
MISREAD	Cites a real source but gets wrong what it says.
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

Nov 19, 2026	Revised after a later paper: on November 16, three days after this review, Wang and colleagues published a model of oxygen escape from an Earth with a weaker or tilted dipole, which we checked on its own page. It finds far more than the two- to threefold change we cited from later models: escape rises 39-fold along a simplified reversal path and about 380-fold at a tenth of the dipole. Its authors report that its present-day rate is 2 to 3 orders of magnitude below observational estimates (400 to 690 times below the lowest measured escape, by our check) and rest their case on the relative change. The box in section 5 now gives these numbers and the card for "Oxygen loss surges in reversals" the 39-fold rise, and the limits say we read the paper in full; the box's two points that hold whichever model is right now cover this model too, and its count of storms now matches section 3's. Overstated still fits: the models still disagree; this one, with one fixed solar wind and a pure dipole, is idealized, as its authors say; and no reversal has been observed. No verdict or label changed.
Nov 14, 2026	Revised the day after publication: the site's owner supplied the oxygen-ion paper as typeset and Gunell and colleagues' 2018 letter in full. We checked every quotation and locator from the first against the typeset text; all held, and we added its page numbers. We read the letter in full and checked every statement citing it, and Lingam's reading of its model, against its text and its Figure 2a; all held. In the table of later work we now call its 0.5–2 kg a second measured, as the letter does, and give its model's 1.4 kg a second for today's Earth and its escape peaks of two to three times the unmagnetised rate; we added the estimate it cites, that the present outflow removes less than 1% of the atmosphere in a billion years, and now count two of the nine later studies as read in full. Where we had said the field changes escape about twofold, we now say two- to threefold, or about 2.4-fold on Lingam's reading. No verdict or label changed.
Nov 13, 2026	Published on factchecked.science after a full check against the sources. Built from S0 News of November 13, 2026, through its automatic transcript; the Schumann paper it links, read in full; the 2014 paper on oxygen escape during reversals; nine later studies of the field's role in escape; NASA's and the USGS's water figures; and our checks of the oxygen-ion paper, the ozone release, the glossary and research note 001, read on November 13, 2026. A fresh review the same day led to two verdict changes before publication, "Oxygen loss surges in reversals" from Unconfirmed to Overstated and "All predictions have come due" from Misleading to False, and to a new label, "Leaking oxygen makes floodwater", for what our rules rated; it also led us to credit two ozone quotations to the copy of the release that has them, to describe the Schumann paper's suggested mechanism and its comparison with solar-wind catalogues, to rest the water verdict on the amount, as our rules framed it, and to make about thirty smaller fixes.

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