Fact-Checked Science

EVIDENCE REVIEW · MAGNETIC EXCURSIONS AND TODAY'S FIELD

When Earth's magnetic field falters

Every so often the geomagnetic field weakens sharply and its direction swings far from its usual axis, typically for a few centuries to several thousand years, before returning to its original polarity. These events are called excursions [1 p. 1][2 p. 1]. Here is what lava, sediments, cave formations and polar ice record about them, how today's field compares, and how recent solar storms rank. Popular "disaster cycle" accounts say excursions come every 6,000 years and that today's field is collapsing; the record supports neither.

By Fact-Checked Science · Published October 13, 2026

OUR ANALYSIS marks our own reasoning and calculations, and the verdicts are our assessment. Everything else comes from the numbered sources.

Real excursions, irregular timing, a modest decline today

OUR ASSESSMENT

12–17 excursions listed in recent reviews since the last full reversal, about 773,000 years ago; about 7 of them adequately or consistently recorded [3][4]

About 9% how much weaker Earth's axial dipole, the main part of the field, is than in 1840: about 5% per century [5 p. 5][6]

2–5% of today's strength, roughly: where the dipole bottomed out during the Laschamp excursion, about 41,000 years ago, in recent global field models [7 §3][8 §4.2][2 p. 7]

THE CLAIMS ABOUT EXCURSIONS AND TODAY'S FIELD

FALSE

"This is happening approximately every 6,000 years."

The Disaster Cycle video, 28:45 (our check) [V]

The record keeps no such rhythm. In the last 120,000 years the gaps between dated excursions run from about 5,000 to about 30,000 years, and a 2023 review counts only Laschamp and Blake from that period as reliably established [9 p. 45]. Mono Lake follows Laschamp by about 6,600 years, but Laschamp follows the Norwegian–Greenland Sea event by about 23,400 [10][11]. The six youngest candidates are unusually evenly spaced, about 6,800 years apart, but four of them are disputed, and our cycle test finds that a 6,000-year cycle doesn't fit the dates. See section 2.

FALSE

"The last one to officially be recognized is the one 6,000 years ago… There was a very strong confirmation that came out about a year and a half ago out of the Tiani region in China."

The Disaster Cycle video, 28:58–29:23; the transcript's "Tiani" is probably Tianchi [V]

No inventory of accepted excursions includes one 6,000 years ago; reviews put the youngest well-documented excursion at Mono Lake, about 34,000 years ago [12 p. 1][3]. The Tianchi lava was re-dated to 7,000 ± 900 years in a study published in December 2022, about three years before the video; its authors call it a "heretofore unrecognized" excursion that may have been local, or too brief for other records to catch [13 pp. 1, 5]. A 2025 study did find a weak field in pottery from southern China about 6,100 years ago, but its authors read it as a regional weak spot, not an excursion [14]. The dipole did dip in the mid-Holocene, but only to about 82% of its 1950 strength. See section 3.

FALSE

"We've now down to 1.5% total field loss according to the ESA Swarm mission. And the mission manager for Swarm came out and said, 'We've gone from losing 5% per century to 5% every decade.'"

The Disaster Cycle video, 38:44 (our check) [V]

Swarm launched in November 2013, too late to measure anything in 2010 [15]. ESA puts the loss at about 9% over 200 years [16], and over Swarm's first decade the dipole weakened by less than half a percent (our calculation from IGRF-14 [17]). The "5% per decade" comes from a 2014 news story, in the reporter's words, not the mission manager's, though the story does paraphrase him on a possible coming flip [18]. See section 4.

1 · THE LONG VIEW

Nearly 800,000 years without a full reversal

The field has kept its present polarity since the Matuyama–Brunhes reversal about 773,000 years ago [4]. Excursions are brief breaks in that long stretch: the field weakens sharply and its direction swings far from the usual axis, typically for a few centuries to several thousand years, then returns to its original polarity instead of settling into a reversed one [1 p. 1][2 p. 1].

Gaps mark selected excursions and are widened so they show; their width doesn't show how long each lasted. They are the seven a 2007 review judged adequately dated (Mono Lake, Laschamp, Blake, Iceland Basin, Pringle Falls, Big Lost and Stage 17) and three more from section 2 [1 p. 2][19]. Reviews list 12 to 17 excursions since the reversal, about 7 of them adequately or consistently recorded; several between 530,000 and 730,000 years ago are not shown [3][19].

Where excursions are recorded

In lava flows, which lock in the field's direction as they cool [20][19]; in lake and seafloor sediments [23 p. 12][26]; in cave formations dated by uranium and thorium [11][26]; and indirectly in polar ice, where a weak field lets more cosmic rays through to make chlorine-36 and beryllium-10 [9 p. 3][27].

How long they last

From about 300 years to 10,000 [1 p. 2]. Laschamp's main phase lasted about 700 years, within a longest possible span of about 2,550 [11 p. 14][; Blake lasted 4,500 to 6,500 years [26][28 §7].

Not a reversal

In an excursion "the poles may or may not change polarity. However, they always recover to the original polarity in contrast to the reversals" [2 p. 1]. Some records show fully reversed directions for centuries, one for more than about 3,000 years, without a full reversal following [11 p. 14][28 §8.2].

2 · THE LAST 120,000 YEARS

Two excursions are well established worldwide, and the spacing is irregular

Each bar spans an event's best-supported age range, and the rows sort the events by how firmly the evidence establishes them as worldwide excursions. Of the excursions reported in the 1960s and 1970s, a 2007 review says only Blake and Laschamp "have stood the test of time" [29 p. 376].

Bar width shows the best-supported age range; the shortest spans are drawn at a minimum width. Lake Mungo, Gothenburg and Hilina Pali are placed by our calibration of their radiocarbon ages [30][31]. All ages are calendar years before present, counted back from 1950. The rows are our reading of the evidence, not a published classification (see the box below).

The spacing is irregular. Mono Lake follows Laschamp by about 6,600 years, Laschamp follows the Norwegian–Greenland Sea event by about 23,400, and that event follows Skálamælifell by about 29,500.

OUR ANALYSIS

How we sorted the rows

The rows are our reading of the evidence. A 2007 review counted Mono Lake among the five best documented excursions [29 p. 378]; newer global field models find Mono Lake and the Norwegian–Greenland Sea event regional, with only "a moderate dipole moment decrease" [2 p. 12][8 p. 1]. The scientists who dated Post-Blake in lavas consider it global [19]; Iceland Basin, Pringle Falls and the older excursions on the band in section 1 fall outside this chart.

OUR ANALYSIS

Is there a rhythm?

We tested the dated excursions on this chart, except Lake Mungo, whose calendar age is too uncertain, plus Iceland Basin and Pringle Falls, against the proposed 6,000-year cycle and against every cycle length from 3,000 to 60,000 years (Hilina Pali at its best-dated record's 19,500 years). A 6,000-year cycle counted from today doesn't fit them, and no other length stands out from chance. The six youngest of them are unusually evenly spaced, about 6,800 years apart, but four of the six are disputed, adding Lake Mungo breaks the evenness, and the older excursions are dated too loosely to show whether it continues. The full test is on its own page: Is there a 6,000-12,000-year cycle?

3 · RECORD BY RECORD

What each record shows

Each excursion rests on a different mix of lava, sediment, cave and ice records, and on dates of very different quality.

WELL ESTABLISHED · ABOUT 41,100 YEARS AGO

Laschamp

The best-documented excursion: "the most studied geomagnetic event of its kind" [11 p. 139], with the lowest dipole moment of the period 15,000–70,000 years ago, and seen worldwide [2 p. 1]. Fully reversed directions lasted about 250–450 years in Black Sea sediments, depending on the record and its age model [4][18 p. 10][14 suppl.], and a few centuries in several other sediment records [11 p. 14]; one of those, at the Blake–Bahama Outer Ridge, reached only a partly reversed state [4a]. Global field models disagree on whether the dipole itself reversed: one finds it fell almost to zero without reversing [8 p. 1], another that it changed sign for about 300 years [2 p. 12]. A dated cave formation in Missouri puts the main phase at 41,100 ± 350 years ago [11 p. 139].

WELL ESTABLISHED · ABOUT 120,000–108,000 YEARS AGO

Blake

A uranium-dated stalagmite from Cobre Cave, Spain, records two reversed intervals between 116,500 ± 700 and 112,000 ± 1,900 years ago [26][19]. A stalagmite from southwest China, reported in 2026, spans about 119,100–108,800 years ago [32]. Some sediment records chart several thousand years earlier: 128,500–122,000 years ago off the US east coast, where it lasted about 6,500 years [28 §7][26]. It is commonly accepted as a global geomagnetic feature," though still "one of the most ambiguous" of the recent excursions [28 §2].

REAL, BUT WEAKER OR REGIONAL · ABOUT 34,500 YEARS AGO

Mono Lake

Dated to about 34,500 years ago in Black Sea and Drake Passage sediments [10][34]. Greenland ice cores record a peak in cosmogenic isotopes at about this time, seen in chlorine-36 and in beryllium-10, a sign of a weak field worldwide [27][40][9 p. 18]. The dipole weakened far less than at Laschamp [8 p. 9][10], and global models suggest a series of regional excursions between 36,000 and 30,000 years ago [8 p. 1]. The excursion first described at Mono Lake, California, has been redated to the Laschamp [40][47]; a 2026 conference report finds a smaller anomaly there about 33,000 years ago, so the type site's dating is still argued over [48][49].

REAL, BUT WEAKER OR REGIONAL · ABOUT 64,500 YEARS AGO

Norwegian–Greenland Sea

A deep intensity low appears in Black Sea cores, though the field's direction there stayed "within the range of normal secular variations" [10]. The excursional directions come from Norwegian–Greenland Sea and Arctic Ocean sediments [2 p. 2][50], which are hard to date and record false reversals [51 p. 279][28 §2]. A 2021 global model puts the dipole low at 1.87 × 10^{22} A m^2, roughly a quarter of today's, with excursional directions only regionally [2 pp. 1, 7].

REAL, BUT WEAKER OR REGIONAL · ABOUT 105,000–91,000 YEARS AGO

Post-Blake and Skálamælifell

Lavas in Italy and New Mexico date Post-Blake to about 105,000 years ago, and lavas in Iceland date Skálamælifell to about 94,000; their dates see one interval when "the magnetic field remained unstable between 105 and 94 ka" [19][32]. A Chinese stalagmite separates two phases, at 103,100–99,800 and 94,500–91,000 years ago [32].

REAL, BUT WEAKER OR REGIONAL · ABOUT 54,500 YEARS AGO

Skálamælifell

Dated to about 54,500 years ago in Black Sea and Drake Passage sediments [10][34]. Greenland ice cores record a peak in cosmogenic isotopes at about this time, seen in chlorine-36 and in beryllium-10, a sign of a weak field worldwide [27][40][9 p. 18]. The dipole weakened far less than at Laschamp [8 p. 9][10], and global models suggest a series of regional excursions between 36,000 and 30,000 years ago [8 p. 1]. The excursion first described at Mono Lake, California, has been redated to the Laschamp [40][47]; a 2026 conference report finds a smaller anomaly there about 33,000 years ago, so the type site's dating is still argued over [48][49].

SINGLE SITE · ABOUT 36,000–31,000 YEARS AGO

Lake Mungo

Baked earth and clay cooking stones from Aboriginal fireplaces at Lake Mungo, Australia, record the field swinging more than 120° from its present direction [35 p. 243][52][53]. The fireplaces' radiocarbon ages, about 27,500–30,800 years, calibrate to about 31,000–36,000 years ago

OUR ANALYSIS [39 pp. 246–247][31]:

thermoluminescence dating of the same fireplaces gave 33,500 ± 4,300 years [54 p. 194]. That overlaps Mono Lake, but during the main swing the fireplaces record a field about three times today's strength rather than a weak one (a second swing was weak, about a third of today's) [55][54 p. 193], and excursion records more than 45° apart around the globe shouldn't be matched [56], so whether they are the same event is unclear.

SINGLE RECORD · ABOUT 26,500 YEARS AGO

Rockall

An apparent excursion about 26,500 years ago, lasting about 350 years, found so far in a single sediment core from the Rockall Trough in the northeast Atlantic [36 p. 1827]. Its discoverers call it "another potential excursion" in a "confusing picture" of possible excursions after Laschamp [36 p. 1837].

DISPUTED · ABOUT 22,000–19,000 YEARS AGO

Hilina Pali

First seen in Hawaiian lavas about 18,000 radiocarbon years old, as a weak field with an unusually shallow inclination [38][37 p. 94]; calibrated, about 21,000–22,000 years ago

OUR ANALYSIS [30]. Since found in the sediments of Lake Chala in East Africa and of two lakes in the Polar Urals of Arctic Russia [37][12]. In the best-dated record, from Arctic Russia, the pole stayed above about 55° N, so there it looks like extreme secular variation rather than a true excursion [12 p6]; a Black Sea record is similar [38]. At Lake Chala, though, directions briefly reversed, and the Russian study's authors conclude that Hilina Pali was a worldwide weakening of the dipole [12 pp. 17, 19].

DISPUTED · ABOUT 14,500 YEARS AGO AT ITS TYPE SECTION

Gothenburg

First reported in 1971 from a sediment core in Gothenburg, Sweden [39]. In 1976 a study of Swedish late-glacial sediments found no reversal or excursion and called the earlier result an example of the "reinforcement syndrome" [40]: its discoverer defended it [39]. The type section's "flip" is dated to 12,400–12,350 radiocarbon years, about 14,500 calendar years [OUR ANALYSIS][30][38]. Records from eastern China, the Barents Sea and the Black Sea have since claimed it, the Chinese one about 13,100–12,500 years ago [40][41][42]. It is not among the excursions accepted in international reviews, and a 2023 review calls the question unresolved [3][9 pp. 40–41].

DISPUTED, POSSIBLY LOCAL · ABOUT 7,000 YEARS AGO

Tianchi

Recorded in a lava flow from Changbaishan (Tianchi) volcano on the China–North Korea border [13]. First linked to an excursion about 123,000 years ago, the lava was dated in 2014 to about 17,000 years [43][13 p. 5], then re-dated in 2022 to 7,000 ± 900 years [13 p. 4]. No matching excursion directions have been found elsewhere, so its dialers suggest it may have been local, or too brief for other records to catch [13 p. 5].

A · FOR REFERENCE · 73,900 YEARS AGO

Toba

A supereruption in Sumatra 73,880 ± 320 years ago, not a magnetic event [41]. Two archaeological sites in South Africa and one in Ethiopia show people living through it [44][45].

No excursion 6,000 years ago

What the inventories list

A 2012 conference summary lists the Mono Lake and Laschamp excursions as well documented and notes candidates at 17,000 and 25,000 years ago, and nothing younger [3]. A 2025 study, citing a 2020 review, says the youngest is "the one first discovered at Mono Lake, which occurred about 34 ka ago" [12 p. 1]. In the international lists collected by a 2023 review, the youngest candidate is Tianchi; an excursion at 6,000 years, "Solovki," appears only in work by Russian authors, in a 2004 compilation that also lists one at 2,800 years, "Etrusia"; the review counts neither as reliably established [9 pp. 40, 45].

OUR ANALYSIS

A shallow dip, not an excursion

Two global field models of the last 10,000 years show the dipole sagging to about 82% of each model's 1950 strength at the lowest, and below 90% between about 8,250 and 6,250 years ago, then recovering by 6,000 years ago [46][47]. The study that re-dated Tianchi puts the Holocene's weakest field around 7,000 years ago, about 20% below today's [13 p. 5]. Excursions and reversals happen below about 4 × 10^{22} A m^2, roughly half today's dipole [46]; the mid-Holocene low stayed well above that. The Tianchi lava, re-dated in a study published in December 2022, is 7,000 ± 900 years old, and no other record matches it [13 pp. 4-5].

4 · THE FIELD TODAY

About 9% weaker since 1840, and far from Laschamp's low

Earth's axial dipole, the main part of the field, is about 9% weaker than it was in 1840 [5 p. 1], a loss of about 5% per century on average [6][69], though the pace varies: around 1980 it was twice as fast as in the 2010s [5 p. 2]. At Laschamp's low the dipole fell to about 5% of today's strength [8 §4.2][7 §3].

Strength of Earth's dipole compared with today

1840: **about 110%**

Today (2025): **100%**

Laschamp's low, about 41,000 years ago: **about 2–5%**

The 1840 bar follows from the roughly 9% decline since then [5 p. 1]. Laschamp's low is the dipole in the LSMOD.2 global field model, built from sediment and lava records 0.37–0.39 × 10^{22} A m^2, against 77 × 10^{22} today [8 §4.2][7 §3][70]; other recent models go lower, to about 2% of today's [8 §4.2][2 p. 7]. A single Black Sea record shows about 6% of today's dipole during the switch into reversed polarity, and an average of about 28% in the short reversed interval [4 p. 851, suppl.:142]. At the surface the field was weak everywhere, below 1 μT in places, about 22–67 μT today [8 §4.4] OUR ANALYSIS [37].

About 9% weaker than in 1840 [5 p. 1]. ESA puts the loss at about 9% over 200 years [16]. The change is uneven: since 2014 the field has weakened over Canada and the South Atlantic and strengthened over Siberia [33][71].

About 2,500 km wide. Earth's size here: how much the South Atlantic Anomaly, where the field is weakest (below 25,000 nT), has grown since 1840, an area roughly half the yearly positions [72]. It began up from at most a few hundred km a year in the early 2000s, satellites passing over it a year, which the British Geological Survey calls the biggest deceleration on record [33][72].

0.9% of today's strength, which can damage their hardware [33][73].

OUR ANALYSIS

How fast the field moves

The field's dipole moment has been falling since 1840 [5 p. 1], with the fastest decline in the 1970s and 1980s and the slowest in the 2010s [5 p. 2]. At Laschamp's low the dipole fell to about 5% of today's strength [8 §4.2][7 §3].

"The magnetic field changes in a chaotic manner, and we do not know why it changes in the way it does nor how it will evolve in the future."

NASA Earth Observatory (2014) [74]

"There is no periodic behavior, and it is therefore rather difficult, if not impossible, to predict how the magnetic field evolves over time."

NASA Earth Observatory (2014) [74]

"15% gone, ten times faster"?

The video's timeline, against the record

THE VIDEO SAYS (38:04–39:01)	WHAT THE RECORD SHOWS
By 2000 the north magnetic pole "was moving at 20 kilometers a year."	About 22 km a year in the early 1990s, but nearly 50 km a year by 2000 OUR ANALYSIS [72]; it accelerated between 1990 and 2005 [73].
"We had lost 10% of Earth's magnetic field in only about 150 years."	About 8% from 1840 to 2000 OUR ANALYSIS [5 p. 2][17]; about 5% per century [6].
In 2006, "we go from 5% loss per century to 5% per decade."	The dipole lost about half a percent per decade between 2000 and 2020 OUR ANALYSIS [37], slower than around 1980 [5 p. 2].
The pole was then "racing at about 40 kilometers a year."	It moved 54–55 km a year in 2005–2007 [72], after accelerating between 1990 and 2005 [73].
By 2010, "15% total field loss according to the ESA Swarm mission."	Swarm launched on November 22, 2013 [15], with first results in June 2014 [16]. ESA's figure is about 9% over 200 years [16].
The Swarm mission manager said, "We've gone from losing 5% per century to 5% every decade."	ESA's 2014 release quotes the mission manager, Rune Floberghagen, only on the satellites' performance [16]. A *Live Science* story paraphrases him as saying the poles may be getting ready to flip and the field is weakening faster, but its "5 percent per decade, or 10 times faster than thought" is the reporter's narration, not a quotation [18]. NASA's write-up of the same results says about 5% over the past century [17].

Over Swarm's first decade, 2014–2024, the dipole moment weakened by about 0.5%, the axial dipole by about 0.3% and the average field at the surface by about 0.3% OUR ANALYSIS [17]. Pole speeds are great-circle distances between NOAA's yearly positions [72].

5 · SIX LANDMARK STORMS SINCE 1859

May 2024's storm was the strongest in two decades, and about half the size of 1859's

Storm strength is measured by the Dst index: the average magnetic disturbance at four low-latitude observatories, Hermanus, Kakioka, Honolulu and San Juan, scaled to the magnetic equator. It runs negative, in nanotesla (nT), and its record starts in 1957 [79 §2][80]. Earlier storms are reconstructed from historical records.

Minimum hourly Dst. 1859: Cliver and Dietrich's working estimate, with the range of empirical hourly estimates; newer estimates run from about −870 to −980 nT (later [82 p.3][100][104 §4]). 1921: the published t [105]. 1989 and 2003: final values; 2024: provisional, −412 nT in the real-time data [98][106][101].

The Colaba reading

A single 1859 reading at Colaba, in Bombay, India, showed the field dropping by about 1,600 nT [107][102 §2.2.1]; the often-quoted −1,760 nT is a storm size estimated from how fast the solar eruption reached Earth, which its authors judged consistent with the Colaba dip; it is not a reading [107][102 §2.2.1]. Most studies think auroral or other local currents added to that dip, and some suspect a recording problem, so the hourly estimates are shown [104 §1][108][103]. Its first interpreters still argue for the ring current, the source Dst measures [109].

How May 2024 ranks

By Dst, the May 2024 storm ranks sixth since 1957, behind March 1989 (−589 nT), July 1959 (−429), September 1957 (−427), February 1958 (−426) and November 2003 (−422) [80][101 §9]. The 1859 and 1921 storms, reconstructed from historical records, were about twice as strong [102 §2.2.1][105].

6 · LIMITS

What this page can and can't settle

The rows are a judgment

No published classification sorts excursions into our three rows. They follow reviews and global models [29 pp. 376, 378][2 p. 1][8 p. 1], and a reader could defend moving Mono Lake up or the Norwegian–Greenland Sea event down.

Ages carry real uncertainty

Lake Mungo, Gothenburg and the Hawaiian Hilina Pali lavas rest on radiocarbon ages from the 1960s and 1970s, which we calibrated [30][31]. If Gothenburg's dates came from marine shells, a reservoir correction would make it about 13,800 years old OUR ANALYSIS.

Some sources read in part

Several papers were behind paywalls, so we used their abstracts, later papers that quote them, or the authors' own conference abstracts; the verification log lists each. None of the verdicts rests on those alone.

What would change these verdicts

01 Excursions found at regular intervals in well-dated records from several regions, rather than in a short recent run of disputed events.

02 A well-dated excursion about 6,000 years ago in several independent records, or new evidence that Tianchi's was worldwide.

03 Measurements showing the dipole weakening several times faster than its roughly 5% per century since 1840.

Related checks

FALSE Every 6,000 years? The Disaster Cycle, Fact-Checked

FALSE 15% gone, ten times faster? The Disaster Cycle, Fact-Checked

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

FALSE The 2025 model already failing? The Disaster Cycle, Fact-Checked

FALSE 55% of the field gone? The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list: p. and pp. give pages (the journal's own page numbers), § gives a section, and Abstract, Fig., Table and suppl. (supplementary material) name the part of a work we used. [V] is the video we checked. Links checked October 13, 2026.

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