☑ Fact-Checked Science

PAPER CHECK · GEOMAGNETISM

Rikitake's dynamo gets a physical derivation, and its reversals come from inside the core

Two physicists in Hungary derived Rikitake's 1958 two-disc dynamo, a classic toy model of geomagnetic reversals, from the mean-field equations of the core's fluid, keeping just two magnetic patterns and one flow pattern [1 Summary][1 §2]. With their own estimates for Earth's outer core it gives no Earth-like reversals: those need a forcing at least thousands of times weaker, and they write that it "cannot reproduce the polarity reversals expected of the large-scale dynamics" [1 §3.1]. S0 News said the model reproduced reality, and that the new work showed a reversal in the galactic surroundings acting on the Sun's heliosphere and the planets [2 00:01:52–00:01:54][2 00:02:45–00:02:57]; nothing in the paper comes from outside the core, whose own feedbacks make the reversals "without the need to impose reversal events externally" [1 §5].

By Fact-Checked Science · Published October 26, 2026

OUR ANALYSIS marks our own reasoning and calculations, including our re-run of the paper's model, and the verdicts are our assessment. Everything else comes from the numbered sources. For the paper [1], which we read as the publisher's web version of record, § gives a section, eq. an equation and Fig. a figure or its caption, by the paper's own numbering; that version has no page numbers.

Real physics for a classic toy model, and no galaxy anywhere in it

OUR ASSESSMENT

54,000 years

the model's unit of time: the outer core's magnetic diffusion time, in the authors' scaling [1 eq. 68]

5,660 vs 1

the lowest forcing c the authors estimate for Earth, and the top of the range where their model reverses irregularly [1 eq. 63][1 eq. 64]; across the two ranges the gap is four to eight orders of magnitude, "an about five order of magnitude difference" in the authors' words [1 §3.1]

100×

how much the paper's conversion of model time into years shortens the Fig. 2 chrons it reports, by our analysis; it does not touch the derivation [1 §3.2]

THE CLAIMS

OVERSTATED

It reproduces reality

The presenter: "But when it's able to reproduce reality like they did here …" [2 00:01:52–00:01:54]

The model makes irregular reversals and long spells of one polarity [1 Summary], but only with a forcing at least thousands of times weaker than the authors' own estimate for Earth. With that estimate, they write, it "cannot reproduce the polarity reversals expected of the large-scale dynamics" [1 §3.1]. They say it is "not intended to provide a quantitatively realistic description of the geomagnetic field" [1 §2.1], and they test it against no polarity record. See section 2.

MISREAD

Shown acting on the heliosphere

The presenter: "With this new science, they have shown how taking such a local environmental magnetic reversal can begin its work on the heliosphere magnetic field …" [2 00:02:45–00:02:53]

Nothing in this paper comes from outside Earth's core. Its only driver is the push of buoyancy and pressure on the core's fluid [1 eq. 35][1 eq. 37], and its reversals emerge "without the need to impose reversal events externally" [1 §5]. It never mentions the galaxy, the heliosphere or the Sun's field. See section 4.

TRUE

Derived from mean-field MHD

The paper: "We report the first explicit derivation of the Rikitake dynamo as a direct approximation of mean-field magnetohydrodynamics (MHD)" [1 Summary]

The derivation holds as described, and our computer algebra reproduces the coefficients of its worked example [1 eq. 87]. It rests on deep simplifications that the authors list: two magnetic patterns and one flow pattern, coupled under constraints they call "a purely subjective choice" [1 §2.3][1 §5]. We did not check whether it is the first. See section 1.

PARTLY TRUE

Earth-like chron lengths

The paper: "we obtain characteristic amplitudes and timescales consistent with geophysical estimates, including observed chron durations" [1 Summary]

Its time unit, about 54,000 years, is of the right order [1 eq. 68], and its field strengths are ones the authors find comparable to the field at Earth's surface [1 §3.2]. But the runs that reverse use a forcing far from the Earth estimate [1 §3.1], and the longest chrons the text gives for Fig. 2 are 100 times too short, by our analysis: corrected, they run from about 1.6 million to 160 million years. Our own re-runs give chrons of about 0.1 million to nearly 90 million years, overlapping Earth's range [10 §1]. The authors' Conclusions are more cautious: the timescales are "not inconsistent with the shorter end of observed geomagnetic chron durations" [1 §5]. See section 3.

1 · THE PAPER

Rikitake's two discs, rebuilt from the equations of the core's fluid

Dániel Jánosi and Mátyás Herein, of the HUN-REN Institute of Earth Physics and Space Science in Sopron, Hungary, and, between them, of Eötvös Loránd University and the Budapest University of Technology and Economics, set out to derive a classic toy model of geomagnetic reversals from the physics of Earth's outer core [1]. Tsuneji Rikitake's 1958 model [4] is "a standard prototype for geomagnetic reversals", but its variables "describe an idealized electromechanical device, not magnetic and velocity fields obtained directly from the MHD equations" [1 §1]. The paper is a peer-reviewed research article in *Geophysical Journal International*, received on May 12 and accepted on September 21, 2026, and published on September 29 under CC BY 4.0 [1]; Hungary's National Research, Development and Innovation Office supported Jánosi [1 Acknowledgments].

STEP 1

Start from the core's large-scale field

The mean-field equations of magnetohydrodynamics, for the slowly varying, planet-scale field and flow, with the effect of small-scale turbulence summed up as an α-effect and a turbulent diffusivity [1 §2.1].

STEP 2

Keep three patterns

Two magnetic patterns and one flow pattern, "a severe Galerkin truncation" [1 §2.1]. Advection, viscosity and turbulent stresses are dropped, and the Coriolis force vanishes, but "only because of the chosen, quite restrictive Galerkin velocity mode" [1 §2.2].

STEP 3

Pick the couplings

Conditions on how the patterns interact turn the equations into Rikitake's; the authors call them "a purely subjective choice" [1 §2.3]. The result, the "canonical Rikitake model", has two numbers: a, induction against diffusion, and c, the forcing that drives the flow [1 eq. 42].

STEP 4

Build one and scale it

A worked example with sine and cosine patterns in a box: "Realistic outer core–mantle and outer–inner core boundary conditions are deliberately omitted" [1 §4]; then estimates of a and c from the outer core's size, magnetic diffusivity and flow speeds [1 §3.1].

The model in three lines

In its canonical form [1 eq. 41]:

$$x' = -x + yz \qquad y' = -y - ax + xz$$

$$z' = c - xy$$

x and y are the strengths of the two magnetic patterns and z that of the flow; a polarity reversal is a change of sign of x. Time is counted in units of the core's magnetic diffusion time, about 54,000 years in the authors' scaling [1 eq. 68]. With other scales, the same system is Rikitake's classical form [1 eq. 45].

OUR ANALYSIS

Checking the algebra

We redid the worked example of §4 with computer algebra (harmonic_basis_check.py). With the paper's patterns and constants, every coefficient in its eq. 87 comes out as printed, apart from the sign of two small terms it drops anyway, and the signs and zeros that give Rikitake's form hold [1 eq. 81][1 eq. 87]. One small inconsistency: the constants of eq. 84 do not give the patterns the unit size that the paper's own eq. 9 asks for; correcting them changes the coefficients by about 10%, not the form of the equations. As for "first", the authors write that such a derivation was, "to our knowledge, still absent" [1 §1]; we did not survey the older literature.

How the authors qualify it

Their own limits, in their words.

> *"However, this approximation is not intended to provide a quantitatively realistic description of the geomagnetic field."*
>
> Jánosi & Herein (2026) [1 §2.1]

> *"the canonical Rikitake model, with the elementary geophysical estimates (54), (61) and (62), cannot reproduce the polarity reversals expected of the large-scale dynamics."*
>
> Jánosi & Herein (2026) [1 §3.1]

> *"It should therefore be interpreted as a minimal large-scale, dipole-like analogue rather than as a quantitatively complete geodynamo model."*
>
> Jánosi & Herein (2026), of their sine-and-cosine example [1 §5]

2 · EARTH'S NUMBERS

With Earth's numbers, the model never reverses the way Earth does

The authors give the model numbers from the outer core: a thickness of 2,260 km, a density of 10,000 kg per cubic metre, a magnetic diffusivity of 3 m^2 per second and flows of 0.1–1 mm per second [1 §3.1]. They are order-of-magnitude estimates; of one coefficient, μ, they write that "here we can only speculate" [1 §3.1].

THE UNIT OF TIME

54,000 years

the outer core's magnetic diffusion time, 1/β [1 eq. 68]; a dipole decays on its own in a time "of order 40 kyr" [10 §1]

THE UNIT OF FIELD STRENGTH

2,500–8,000 nT

[1 eq. 76]; in reversing runs the field swings to a few times that, which the authors find "comparable to observed total field values on the surface" [1 §3.2]

THE FORCING, FOR EARTH

5,660–566,000

the value of c from the authors' estimates [1 eq. 63]; their model reverses irregularly for c "on the order" of 0.01–1 [1 eq. 64]

At Earth's numbers

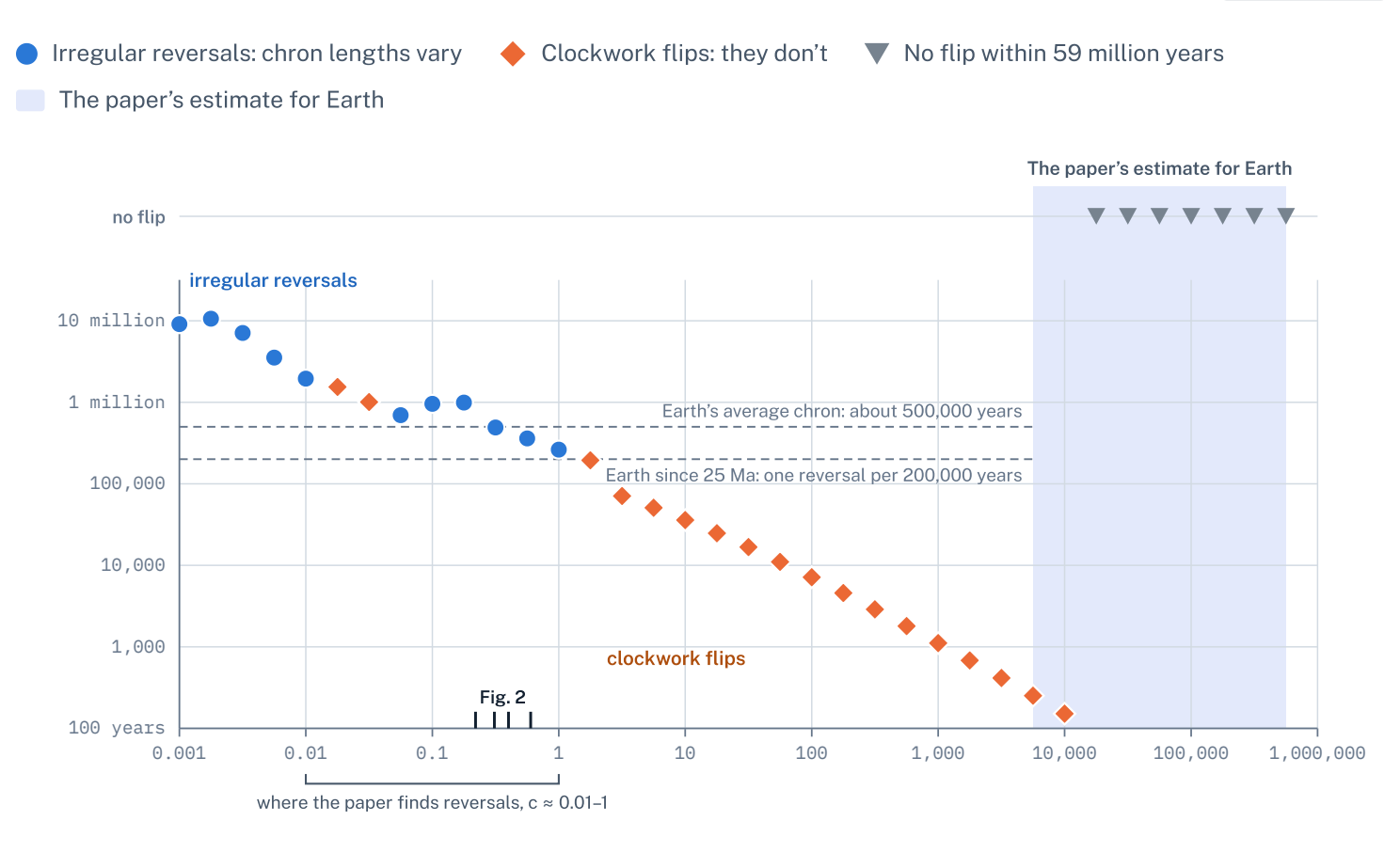
With a = 10 and c = 10,000, the model "converges after a short transient to a quasi-periodic oscillatory state": a sustained, oscillating field of one polarity [1 §3.1][1 Fig. 1]. To reverse irregularly, c would have to be at least thousands of times smaller, which would need flows of 10^{-7}–10^{-6} m per second, "far from typical convective velocities" [1 §3.1]. The worked example does better, c′ ≈ 10–1,000, but that is "not small enough for reversal solutions" [1 eq. 99][1 §4].

Where it does reverse

At a = 8 and c = 0.22–0.6, the runs of its Fig. 2, the model shows "complicated motion and polarity reversals, with different lengths of chrons", very long ones among them [1 §3.1]. The authors draw the conclusion themselves: its reversing solutions "are indeed truly large-scale approximations", and "more complicated basis functions" than their simple sines and cosines are needed to reach them from the core's physics [1 §4].

How often the model flips, at each value of the forcing c

OUR ANALYSIS



The forcing c, on a logarithmic scale (a = 8, as in the paper's Fig. 2); upwards, the median time between flips

Our re-run of the paper's eq. 41 from its starting point, x = 1, y = 0, z = a [1 eq. 41][1 Fig. 1]. Each mark is one run of 1,100–2,100 time units, judged after the first 100: irregular if the lengths of its chrons vary (a coefficient of variation of 0.2 or more), clockwork if they don't; two narrow clockwork windows sit among the irregular runs, near c = 0.018 and 0.032. Model time is converted at the paper's 54,000 years a unit [1 eq. 68]. The paper's Earth range is its eq. 63 and its reversing range its eq. 64 [1 eq. 63][1 eq. 64]. Earth's average chron over the Phanerozoic and its recent rate of about five reversals per million years are from Olson and Amit [10 §1][10 §5]; they are averages, the marks medians. Nothing here is redrawn from the paper.

OUR ANALYSIS

What a longer run shows

The paper shows two short runs at its Earth estimate, Figs 1 and 3 [1 Fig. 1][1 Fig. 3]; Fig. 1's run lasts ten time units [1 §3.2]. Run for longer, the Fig. 1 oscillation turns out to be a long transient. At a = 10 and c = 10,000 the field holds one polarity for 836 units, 45 million years at the paper's scale, then flips back and forth like clockwork about every 150 years; at c = 5,660, the low end of the paper's range, with a = 7.49 or 0.749, the switch comes after 30–56 million years, to a flip every 250–325 years. At a = 8, for c above about 18,000 we saw no flip at all within 59 million years, and at the worked example's c′ = 10–1,000 the field flips like clockwork every 30 to 2,500 years or so [1 eq. 99][1 eq. 100]. None of this resembles Earth's record, which combines "short-term randomness and long-term order" [10 §1] and has lately reversed about five times per million years [10 §5]. So the authors' own conclusion stands: their Earth numbers give no Earth-like reversals [1 §3.1].

3 · OUR RE-RUN

In years, the paper's Fig. 2 chrons are 100 times too short

No code came with the paper, whose data are available "on reasonable request" [1 Data availability]. We wrote our own integration of its eq. 41 from its starting point and re-ran its figures; the script is hosted below, in section 7.

OUR ANALYSIS

A slip in converting model time to years

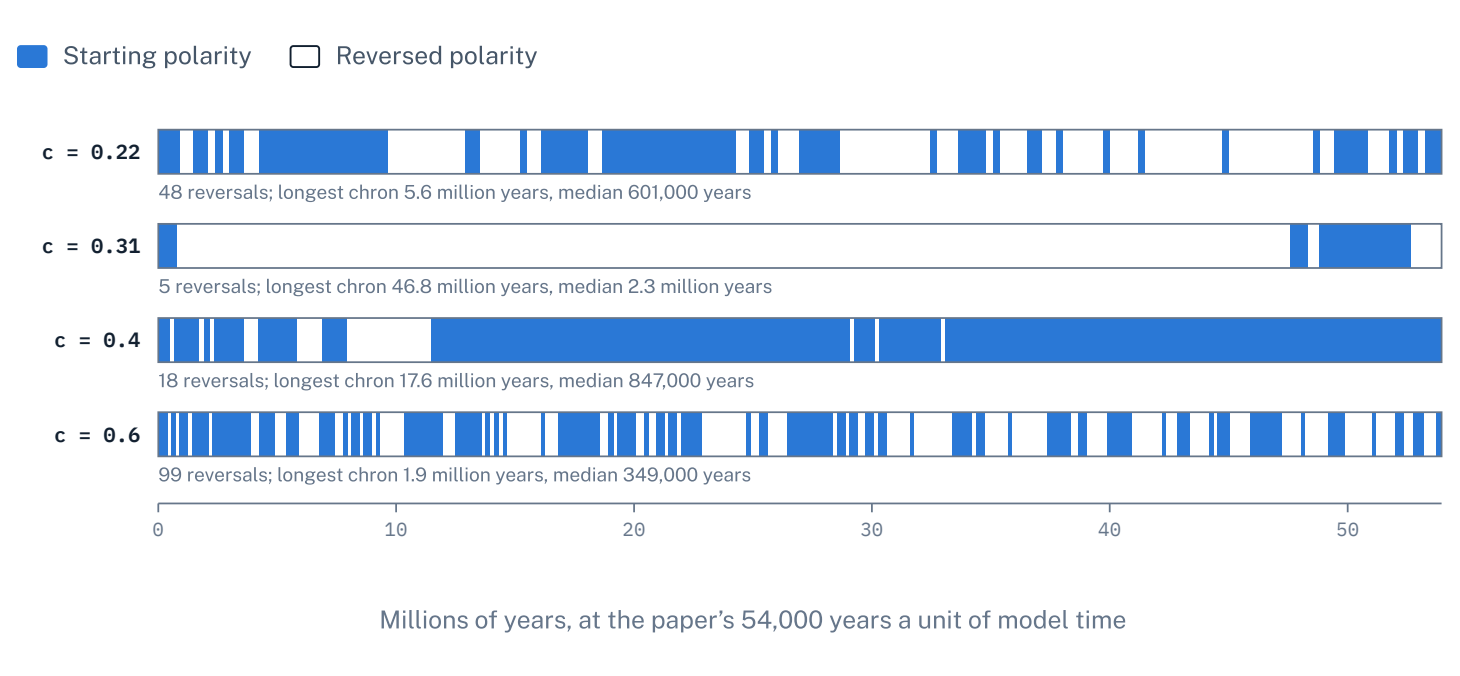
The paper runs its model in steps of "dt = t0/100", a hundredth of its 54,000-year unit, so 540 years a step [1 §3.2][1 eq. 68]. By that arithmetic Fig. 1's run of 10^3 steps lasts 540,000 years, not the "5.4 kyr" printed, and Fig. 2's runs of 10^5 and 10^6 steps last 54 and 540 million years, not "540 kyr and 5.4 Myr" [1 §3.2]. Two checks settle which number is wrong, and a third agrees:

- Fig. 1's caption describes an oscillation "with an amplitude of about 150 units around the value 450" after "around 3 units" [1 Fig. 1]. A transient of three units cannot fit in a run a tenth of a unit long. Our run matches the caption over ten units, a mean of 441 and a half-range of 155; over a tenth of a unit it has not settled (a mean of 215).
- The longest chrons the paper gives for c = 0.22, 0.4 and 0.6, 54 kyr, 54 kyr and 16.2 kyr, are 1, 1 and 0.3 units of model time [1 §3.2]. In our runs no chron at c = 0.22 is shorter than 5.2 units, none at 0.4 shorter than 3.7 and none at 0.6 shorter than 1.8; at 100 times the printed lengths the paper's chrons fit our runs.
- Read the other way, its 10^5-step panels would last 10 units. In our runs, at c = 0.22 and 0.31 that ends before the first reversal, and at 0.4 and 0.6 it allows one, not the "polarity reversals, with different lengths of chrons" the paper describes [1 §3.1]. The first reversal comes at the same time, 7.1–16.6 units, at every step size we tried.

Corrected, its longest chrons are about 5 million years (c = 0.22 and 0.4), 160 million (c = 0.31) and 1.6 million (c = 0.6). This does not touch the derivation or what the runs show. It changes their years, and it supports the paper's remark that the model allows superchrons [1 Summary] better than its own numbers do: Earth's superchrons typically lasted "25–40 Myr" [10 §1].

Our re-runs of the paper's four Fig. 2 settings, in years: the polarity of x over 54 million years

OUR ANALYSIS



Our re-run of the paper's eq. 41 at a = 8 and the four values of c in its Fig. 2, over 1,000 time units, the length of its 10^5-step runs [1 §3.2], converted at its 54,000 years a unit [1 eq. 68]. The model is chaotic, so our runs match the paper's in kind, not reversal by reversal; nothing is redrawn from its Fig. 2 [1 Fig. 2].

The longest chrons, as the paper prints them and in our re-run

OUR ANALYSIS

C	THE PAPER PRINTS	THE PRINTED YEARS, IN MODEL TIME	OUR LONGEST, 1,000 UNITS	OUR LONGEST, 10,000 UNITS	OUR SHORTEST, 10,000 UNITS
0.22	54 kyr	1.0	5.6 Myr	6.7 Myr	279 kyr
0.31	1.62 Myr	30.0	46.8 Myr	86.7 Myr	231 kyr
0.4	54 kyr	1.0	17.6 Myr	23.6 Myr	201 kyr
0.6	16.2 kyr	0.3	1.9 Myr	1.9 Myr	98 kyr

"The paper prints" quotes its "Rudimentary observations for the longest chrons" [1 §3.2]; it does not say which panels are 10^5 steps and which 10^6. Our runs: 1,000 and 10,000 units, at 54,000 years a unit; 48, 5, 18 and 99 reversals in the first 1,000 units, and 428, 117, 325 and 999 in 10,000, with median chrons of 346,000–601,000 years.

OUR ANALYSIS

Earth's record, for scale

Over the Phanerozoic, Earth's chrons have averaged "around 0.5 Myr", and its superchrons typically lasted "25–40 Myr" [10 §1]; since about 25 million years ago the field has reversed about five times per million years [10 §5]. Over 10,000 units, our re-runs of Fig. 2 reverse 0.2–1.9 times per million years, with median chrons of 0.35–0.6 million years and the longest from 1.9 million to 87 million. That overlaps Earth's broad range, with fewer reversals than Earth has had lately, and at forcing values the authors' Earth estimate rules out [1 §3.1]. The paper itself compares its chrons with no polarity record; it calls its estimates "Rudimentary observations" [1 §3.2].

4 · THE EPISODE

What the episode said, beside the paper

S0 News of October 26, 2026, titled "Galactic Magnetic Reversal Flipping Earth Field", listed the paper in its description under the label "Rikitake", the first of two links under it [2]. It came after a "super release at the end of last year", which the presenter took to show that the Earth's disaster cycle follows a galactic magnetic reversal [2 00:01:19–00:01:34]. That December 2025 paper [11], as our video check found, drove a simple dynamo model with an outside current whose sign changes were synchronized with the real paleomagnetic data, so the match was built in; the check rated the claim built on it Overstated ("A 2025 model of pole flips", extra x7).

The episode's statements about the paper

THE EPISODE SAID	THE PAPER	OUR VERDICT
"Today we've got this. I only check JGI once a month. So I'm a bit late here." [2 00:01:43–00:01:48]	Published on September 29, 2026, 27 days before the episode, in the journal's December issue [1].	Not rated
"The only problem with Rickotaki's modeling has been the oversimplification. But when it's able to reproduce reality like they did here, maybe the energetic signature of the universe is a simple word just written in messy cursive." [2 00:01:48–00:02:02]	Keeps the simplification and gives it a derivation; at its Earth estimates the model "cannot reproduce the polarity reversals expected" [1 §3.1], and it is not meant as a realistic description [1 §2.1].	Overstated
"With this new science, they have shown how taking such a local environmental magnetic reversal can begin its work on the heliosphere magnetic field around the whole solar system, slowly impacting each of the items inside the planets." [2 00:02:45–00:02:57]	Nothing outside the core: reversals come "without the need to impose reversal events externally" [1 §5]. No galaxy, heliosphere or solar field.	Misread
"Most importantly, the way we imagined it 5 years ago is what the top scientists are saying today." [2 00:03:13–00:03:20]	These authors say nothing about a galactic reversal; the paper's reversals are internal [1 §5]. The sentence is rated on our review of the episode.	See that page

Quotations are from the episode's automatically generated transcript [2]. Its "JGI" is GJI, *Geophysical Journal International*; "Rickotaki's" is Rikitake's; and "enduring", quoted below, is probably "during".

The episode's sentences about "the extra step of modeling the electric current change of enduring the outside system reversal" and "the much simpler Bullard model" [2 00:02:02–00:02:17] describe its other link, not this paper, which has no outside current and no Bullard model; they are checked on our check of that paper.

5 · TOY DYNAMOS

Toy dynamos can flip by themselves, and they are only toys

Rikitake's model couples two self-exciting disc dynamos of the kind Edward Bullard analysed [4 Abstract][7 Abstract]. Models this simple show that reversals can arise inside a dynamo with no outside trigger, which is this paper's point too [1 §5]; in a companion paper, the same authors say that such results are not meant as conclusions about the paleomagnetic record [3 Conclusions].

One disc, then two

Edward Bullard analysed a single self-exciting disc in 1955: with no friction at its axle and no electrical load in parallel with its field coil, it oscillates about a steady state, and friction on the axle settles it to steady motion [5 Abstract]. Rikitake coupled two such discs in 1958 and found reversals of current and field, "unlike the case of a single disk dynamo" [4 Abstract]. Cook and Roberts later showed that his system's reversals happen on a bounded surface in its space of states, and that with weak dissipation they become nearly periodic [6 Abstract].

OUR ANALYSIS

Why Bullard's disc cannot flip by itself

In the equations of Bullard's disc, the coil current I changes at a rate proportional to I itself: $L\,dI/dt = (M\Omega - R)\,I$, with Ω the disc's spin, L the coil's inductance, R the circuit's resistance and M the mutual inductance. I can shrink towards zero but never cross it, so the polarity the disc starts with is the one it keeps; that is the contrast Rikitake drew [4 Abstract]. A flip in Bullard's model must therefore come from something added to it, such as an imposed outside current, which matters for the episode's other link (section 4). Other disc designs do reverse by themselves: Robbins analysed a reversing disc dynamo in 1977, and Knobloch found chaos in the segmented disc dynamo in 1981 [12 Abstract][13]. And in the paper's scaling a large c means weak dissipation, since its classical form has $b_R = 1/\sqrt{c}$ [1 eq. 48]: where Cook and Roberts found nearly periodic reversals, our sweep finds clockwork.

The limits of toy models

Raymond Hide showed in 1995 that adding mechanical friction, which the classic analyses left out, can make the Rikitake dynamo unable to behave chaotically, and urged work on models whose behaviour depends less on how they start [7 Abstract]. This paper's authors make the same kind of point: "Of course, the scope of such Rikitake-like conceptual models is quite restrictive" [1 §5]. In a companion paper this year they wrote that the Rikitake system "is a highly oversimplified dynamo model, thus these results cannot be compared to, and are not meant to give any conclusion about, the paleomagnetic observations" [3 Conclusions].

The real geodynamo

In 1995 Gary Glatzmaier and Paul Roberts published a three-dimensional, self-consistent computer simulation of a geomagnetic reversal [8]. In such simulations the reversals come from the convecting core itself: stronger convection, slower rotation and lower electrical conductivity make them likelier, and polarity can last about a million years between them [9 Abstract]. Over geological time, changes in the reversal rate may follow the heat flowing from the core into the mantle: Olson and Amit use numerical dynamos to quantify that hypothesis, superchrons included [10 Abstract].

The authors' companion paper

In *Scientific Reports* this year, Herein, Kuslits and Jánosi let the Rikitake model's coupling change with time, "mimicking the onset and strengthening of the geodynamo through long-term variations affecting the thermal convection in the Earth's outer core" [3 Introduction]. The "external" influences they mention concern the Earth itself and its tides: "a steadily cooling inner core, tidal deceleration or a change in core-mantle boundary heat flux" [3 Conclusions]. Neither paper involves the galaxy. The only galactic current sheet our video check found in the literature is a 1978 speculation (stop 14, Unsupported); the site's guide to the weakening field sets out what the reversal record shows.

6 · LIMITS

A careful theory paper, with its limits stated

The limits below are our reading; the first three the paper states itself.

A conceptual model, by design

"a minimal conceptual model that isolates generic dynamical mechanisms … rather than … a geophysically complete model of the Earth's magnetic field" [1 §2.1].

Constraints chosen to get Rikitake

The couplings that give Rikitake's form are "a purely subjective choice"; other choices give other models [1 §2.3].

Order-of-magnitude numbers

Of μ, "here we can only speculate"; their estimate of the Lorentz coefficient "provides only an order-of-magnitude scaling" [1 §3.1][1 §3.2].

No comparison with the record

Chron lengths come from "Rudimentary observations" of a few runs, and no polarity timescale is cited [1 §3.2].

Our re-run is not theirs

The model is chaotic and the paper names no integrator, so our runs match its figures in kind; the 100× rests on its own arithmetic and on checks that chaos cannot move [1 §3.2].

Read on the web, not the PDF

We read the publisher's web version of record; its PDF sits behind a bot check for our tools, and we could not see the figures themselves, only their captions [1].

What would change these verdicts

01

For "It reproduces reality": a version of the model that reverses irregularly at parameters estimated for Earth and is tested against the statistics of the polarity record. The authors suggest richer patterns might get there [1 §5].

02

For "Earth-like chron lengths": a correction of the year conversions in §3.2, or chron statistics compared with a polarity timescale. Corrected, the longest chrons it gives already overlap Earth's range, as do our re-runs; the forcing would still be the problem [1 §3.1].

03

For "Shown acting on the heliosphere": nothing could change it for this paper, which has no outside field [1 §5]. For the claim itself, it would take an independent record of a field from outside the Earth that reaches the core and paces its reversals; a model in which an imposed current does so builds the result in, as our video check found (extra x7, Overstated).

7 · REPEAT OUR RE-RUN

Two scripts, and no data to download

Every re-run number and both charts on this page come from the first script; the second checks the algebra of §4.

PY **rikitake_rerun.py**

Integrates the paper's eq. 41 from its starting point and prints the paper's scalings recomputed, its time conversions, Fig. 1's settled oscillation, Fig. 2's reversals and chrons, and the sweep of c; standard library only · 15 KB

PY **harmonic_basis_check.py**

Recomputes the coefficients of the worked example (eqs 81–87) and checks its normalization; needs SymPy · 5 KB

Run it

Run `python3 rikitake_rerun.py` for parts 1–4, about a minute on a laptop with eight cores, or `python3 rikitake_rerun.py --large` for the whole sweep and the long runs at the paper's Earth settings, five minutes or more: its longest run, 4 × 10^8 steps, cannot be split across cores. Add `--json out.json` to save the chart data. For the algebra, install SymPy (`pip install sympy`) and run `python3 harmonic_basis_check.py`, a few seconds.

How we checked it

The script uses the classical Runge–Kutta method with fixed steps. The time of the first reversal in each Fig. 2 run agrees to about 0.01 units at three step sizes, and a separate check with SciPy's adaptive integrators (DOP853 and LSODA) gave the same times; a compiled version of the same method gave the same sweep. The long transients at large c end at the same time, to four figures, at half and a quarter of the step. Our scalings match the paper's to rounding, apart from two slips that change nothing here [1 eq. 77][1 eq. 79].

Related checks

- OVERSTATED A 2025 model of pole flips The Disaster Cycle, Fact-Checked
- UNSUPPORTED The galactic current sheet The Disaster Cycle, Fact-Checked
- MISREAD "Nova energy" and the galaxy's magnetic wave The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list. For the paper [1], which we read as the publisher's web version of record, without page numbers, § gives a section, eq. an equation and Fig. a figure or its caption, by the paper's own numbering; Summary is its abstract, and Acknowledgments and Data availability are its closing statements. For the episode [2], times are positions in the video (hours:minutes:seconds), from the first to the last transcript line of each quotation. For the other sources, § gives a numbered section, and Abstract, Introduction and Conclusions name those parts of a source; where only an abstract or a record was read, the entry says so. Links checked October 26, 2026.

1 Jánosi, D., and Herein, M. (2026). Grounding Rikitake-like conceptual dynamos in mean-field MHD: the derivation and geophysical scaling of the most basic reversal dynamo model. *Geophysical Journal International* 247(3), ggag390. Received May 12, 2026, revised September 7, accepted September 21, published September 29; corrected and typeset October 10, 2026. Open access, CC BY 4.0. We read the full text of the publisher's version of record on its web page, in a browser; the PDF was behind a bot check for our tools, and we did not see the four figures themselves, only their captions.

2 SpaceWeatherNews (S0) (October 26, 2026). Galactic Magnetic Reversal Flipping Earth Field | S0 News Oct.26.2026. YouTube video, https://www.youtube.com/watch?v=n5rwUyx_AHA. Quoted from the automatically generated transcript; times are positions in the video. The video's description lists the paper under the label "Rikitake", the first of two links under it; the "(1)" in our records is our numbering.

3 Herein, M., Kuslits, L., and Jánosi, D. (2026). Effect of time-dependent forcing on pole reversals in a conceptual dynamo model. *Scientific Reports* 16, 18981. CC BY 4.0. The same group's earlier paper; we read the full text (Europe PMC, PMC13276039).

4 Rikitake, T. (1958). Oscillations of a system of disk dynamos. *Mathematical Proceedings of the Cambridge Philosophical Society* 54(1), 89–105. We read the abstract.

5 Bullard, E. (1955). The stability of a homopolar dynamo. *Mathematical Proceedings of the Cambridge Philosophical Society* 51(4), 744–760. We read the abstract.

6 Cook, A. E., and Roberts, P. H. (1970). The Rikitake two-disc dynamo system. *Mathematical Proceedings of the Cambridge Philosophical Society* 68(2), 547–569. We read the abstract.

7 Hide, R. (1995). Structural instability of the Rikitake disk dynamo. *Geophysical Research Letters* 22(9), 1057–1059. We read the abstract.

8 Glatzmaier, G. A., and Roberts, P. H. (1995). A three-dimensional self-consistent computer simulation of a geomagnetic field reversal. *Nature* 377, 203–209. We read its record only; cited for what its title says.

9 Amit, H., Leonhardt, R., and Wicht, J. (2010). Polarity reversals from paleomagnetic observations and numerical dynamo simulations. *Space Science Reviews* 155, 293–335. A review; we read the abstract.

10 Olson, P., and Amit, H. (2015). Mantle superplumes induce geomagnetic superchrons. *Frontiers in Earth Science* 3, 38. CC BY 4.0. We read the full text, as for our guide to the weakening field.

11 Kharshiladze, O. A., Tsulukidze, L. K., Kezua, L. B., and Zilpimiani, D. O. (2025). Control of Inversions of the Earth's Magnetic Field with Rikitake's Model. *Journals of Georgian Geophysical Society* 28(2), published December 23, 2025. Not read for this page; described as checked in our video check, The Disaster Cycle, Fact-Checked (extra x7).

12 Robbins, K. A. (1977). A new approach to subcritical instability and turbulent transitions in a simple dynamo. *Mathematical Proceedings of the Cambridge Philosophical Society* 82(2), 309–325. We read the abstract.

13 Knobloch, E. (1981). Chaos in the segmented disc dynamo. *Physics Letters A* 82(9), 439–440. We read its record only; cited for what its title says.

METHOD

How this was checked

On October 26, 2026, we checked every statement, number and quotation on this page against its source. The paper's publisher showed our tools a bot check, which we did not bypass; we read its full text, every equation and the captions of its four figures, in the publisher's web version of record, opened in a browser, and its Crossref and OpenAlex records; we found no preprint or repository copy. We checked the episode's statements against its automatically generated transcript [2]. We also read the authors' companion paper [3] and a paper on the reversal record and the mantle [10] in full, four papers on disc dynamos and a review of numerical dynamos in abstract, and one simulation paper and the December 2025 paper behind the episode's frame as records or as checked on our earlier pages: about 200 statements, numbers and quotations in all.

After the page was built, a fresh reviewer re-ran both scripts, which reproduced every number and both charts byte for byte, and checked every quotation, locator and source. The changes that followed: the verdict panel's corrected chron lengths are now the paper's own, 1.6–160 million years, kept apart from our re-runs' range; "doesn't reverse" became "no Earth-like reversals", since at Earth's settings our runs do flip, like clockwork; the forcing gap is given as four to eight orders of magnitude; the single-disc point is limited to Bullard's disc; one check of the time conversion is restated; and about twenty smaller fixes of wording and attribution.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources. They include our re-run of the paper's model: its Fig. 1 and Fig. 2 runs, the chron lengths in years, the sweep of the forcing c and the long runs at the paper's Earth settings; the finding that the paper's conversions of model time into years in its §3.2 are 100 times too small, from its own arithmetic and from three checks on our runs; our computer-algebra check of its worked example; and our note on why a single disc dynamo keeps its polarity.

We recomputed every scaling in the paper's §3 from its stated inputs, which match its printed values to rounding apart from two small slips that change nothing on this page, and re-ran its model with our own script, written from its equations; no code came with the paper. The model is chaotic and the paper names no integrator, so our runs match its figures in kind, not reversal by reversal; the numbers we give are from our runs. The times of the first reversals were checked at three step sizes and against SciPy's adaptive integrators; the chron statistics come from runs at one step size. We could not see the paper's figures, only their captions, and could not check that the derivation is the first of its kind.

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

The verdicts on this page

OVERSTATED	Has some basis but claims much more than the evidence supports.
MISREAD	Cites a real source but gets wrong what it says.
PARTLY TRUE	Part of the claim holds up and part doesn't.
TRUE	The evidence supports the claim.

All ten verdicts, and how we check

CORRECTIONS

Corrections and changes

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

Change log

Oct 26, 2026	Published on factchecked.science after a full check against the sources. Built from the paper's full text (CC BY 4.0), the S0 News episode of October 26, 2026 and our own re-run of the paper's model, whose script is hosted on the page: four claims rated on the site's scale, two of them the episode's and two the paper's own; both charts are drawn from our re-run, not from the paper's figures. A fresh review the same day left the verdicts unchanged; it corrected the panel's chron numbers, the wording on reversals at Earth's settings, the forcing gap and the single-disc point, and some twenty details.

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

Last updated Oct 26, 2026