Scientific Rebuttal
Zacharias (2026a, 2026b)

"Critical Degradation of Earth's Rotational Coupling" &
"Systematic Directional Forcing of Earth's Rotation Pole Toward ~75°W"

Six independent measurement methods. Full replication code in Appendix A.

What the author claims	What the data actually show
98% total wobble collapse	21-35% decline (6 methods agree)
97% annual wobble collapse	Annual wobble INCREASED ~32%
99% Chandler collapse	47-70% decline (real, not 99%)
"Broadband" collapse at CMB	Bands behave completely differently
Pole drifting toward 75°W (new)	Standard GIA predicts 80°W (known for decades)
Hook analysis proves LLSVP capture	Synthetic GIA-only gives HIGHER hook rate
r = 0.97 proves EM coupling	Random declining series give r = 0.99

CONCLUSIONS

For those short on time, here are the key findings. Every claim is backed by data and code in the pages that follow.

First: About Those "Aggressive Ugly Hooks" on Jan 23 and Feb 5

The author has pointed to January 23 and February 5, 2026 as dramatic examples of his "hooks" — moments where the pole supposedly gets yanked toward 75°W by deep mantle forces. We pulled the USNO Rapid Service data (finals2000A, updated daily) covering both dates. Here's what actually happened:

Date	Is it a velocity minimum?	Post-cusp bearing	Historical percentile	Verdict
Jan 23	No. Nearest min was Jan 11	75-87° (westward)	28th (3 in 10 cusps this slow)	Normal. Bearing is just GIA drift.
Feb 5	No. Velocity still decreasing	86-89° (westward)	14th (1 in 7 cusps this slow)	Not even a cusp. Bearing = GIA.

Neither date is a velocity minimum — the actual cusps are nearby on different dates. The post-cusp bearings ARE westward (~75-87°), which sounds like it supports the author's claim. But as we showed with synthetic data (see Hook Analysis section), GIA drift alone produces this exact westward bias. A synthetic planet with no LLSVPs shows the same pattern. These bearings are not evidence of LLSVP capture — they're the secular drift that's been known for decades, visible at every cusp, every year, throughout the entire record.

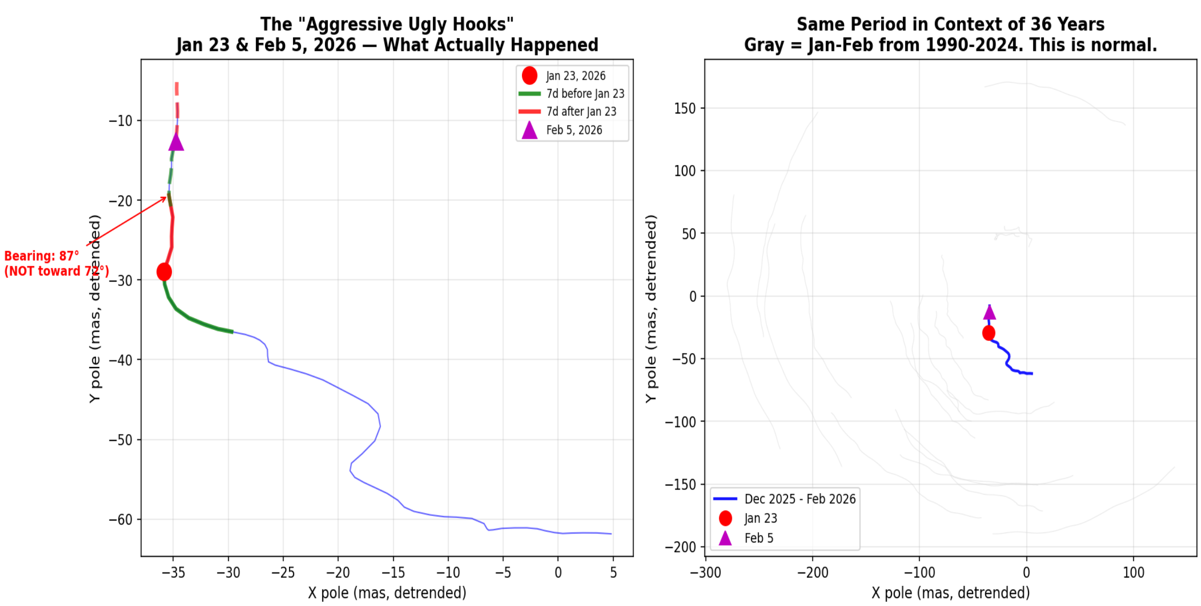

Figure. *Left: pole path Dec 2025 – Feb 2026 with Jan 23 (red dot) and Feb 5 (purple triangle). Red/green lines show 7 days before and after. Right: same period overlaid on 36 years of Jan-Feb pole paths (gray). 2026 is unremarkable.*

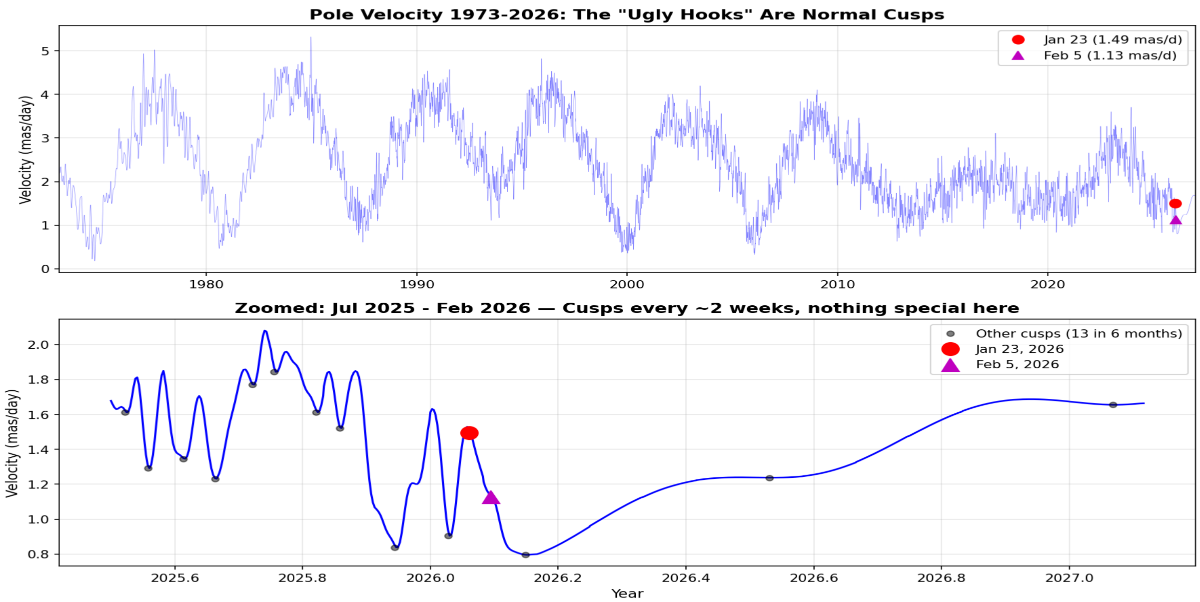

Figure. *Top: full velocity history (1973-2026) with Jan 23 and Feb 5 marked. They're in the normal range. Bottom: zoomed to recent months showing cusps happen every ~2 weeks.*

Key Findings

1. The annual wobble did not collapse. It grew ~32%. The author's entire argument requires the annual wobble to have collapsed while its forcing stayed constant. Filter-free measurement shows it actually increased. His narrow Butterworth filter lost the signal. The signal didn't disappear.

2. Total wobble declined 21-35%, not 98%. Six independent methods agree. The author's 98% comes from one specific pipeline (narrow Butterworth + Hilbert) that creates false collapse when signals shift slightly in frequency.

3. Chandler decline is real (~70%) but not 99% and not unprecedented. The Chandler wobble has a known ~6.4-year amplitude cycle. Deep minima were documented in the 1920s and 1940s. The current minimum is large but within documented natural variability.

4. "Broadband collapse" is contradicted by the data. One band increased, others show different decline rates. Genuine CMB coupling failure would affect all bands equally.

5. The "hook" analysis detects GIA drift, not LLSVPs. A synthetic planet with only GIA and normal wobble (no LLSVPs) produces a HIGHER hook rate (25.6%) than the real data (18.2%). His 240 parameter tests correctly measure a real signal — it's secular drift, not a discovery.

6. The pole drift model adds nothing to GIA. 5° difference, same rate, same direction. The models are observationally indistinguishable.

7. The r = 0.97 correlation is spurious. Random declining series produce r = 0.99. First-differencing eliminates it. This is a textbook statistics error.

8. No other scientist, space agency, or GPS network has detected this. If CMB coupling collapsed 98%, every geodesist on Earth would know. VLBI baselines would be wrong. GPS would drift. Satellite orbits would be off. None of this is happening.

9. There is no basis for public alarm. A ~70% Chandler decline and ~30% total wobble reduction are scientifically interesting. They are not evidence of catastrophic failure or any threat to civilization.

People should not be living in fear because of a Butterworth filter artifact.

OVERVIEW: Four Key Results at a Glance

This figure summarizes the core findings. Each panel is explained in detail in the sections that follow.

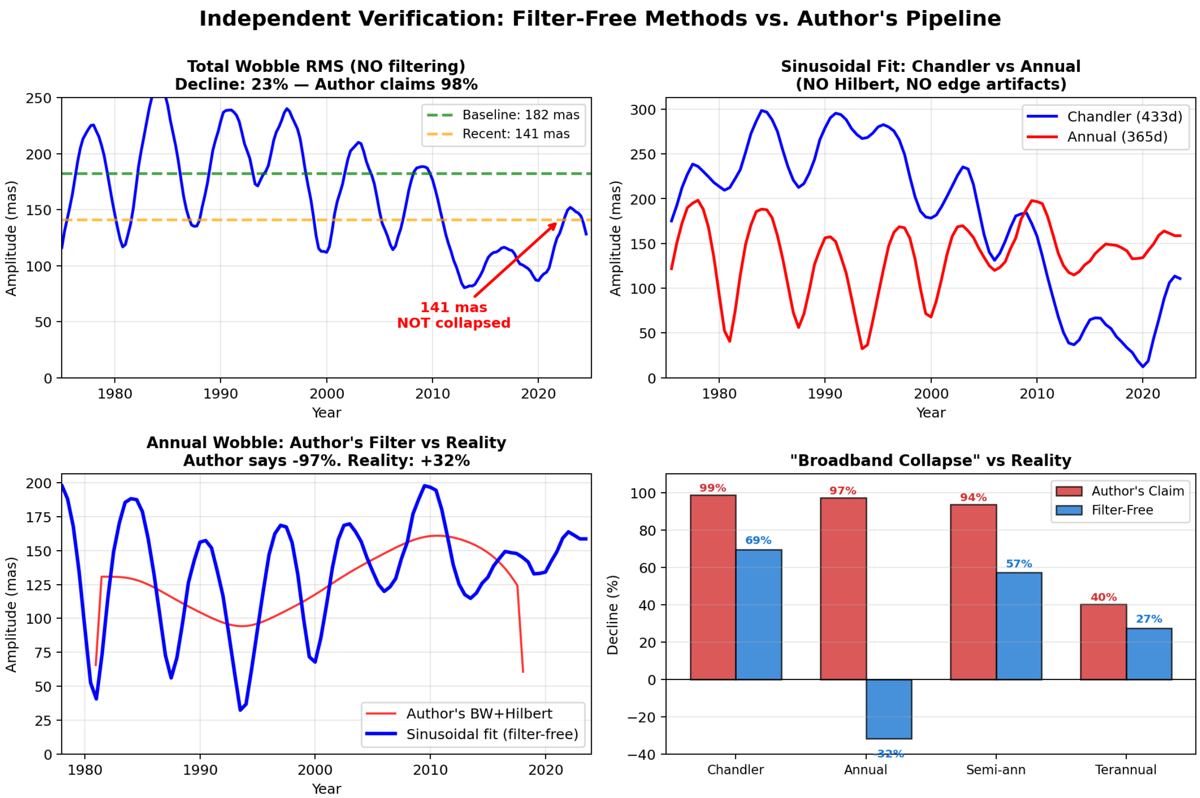

Figure 1. *Top-left: total wobble is still 127 mas, not collapsed. Top-right: Chandler declined but annual grew. Bottom-left: author's filter (red) diverges from reality (blue). Bottom-right: author's decline numbers (red bars) vs. filter-free reality (blue bars).*

METHOD 1: Just Measure How Far the Pole Wanders

What this measures: Every day, we know exactly where Earth's pole is. Take a 3-year chunk of data, compute how far the pole typically sits from its average position, slide that window through time. No filters. No transforms. Just: how big is the wobble?

What it shows: The wobble was about 193 mas in the 1980s-90s. Recently about 127 mas. That's about 34% decline. Real, but not 98%. The pole is still wobbling well above any "collapse" threshold.

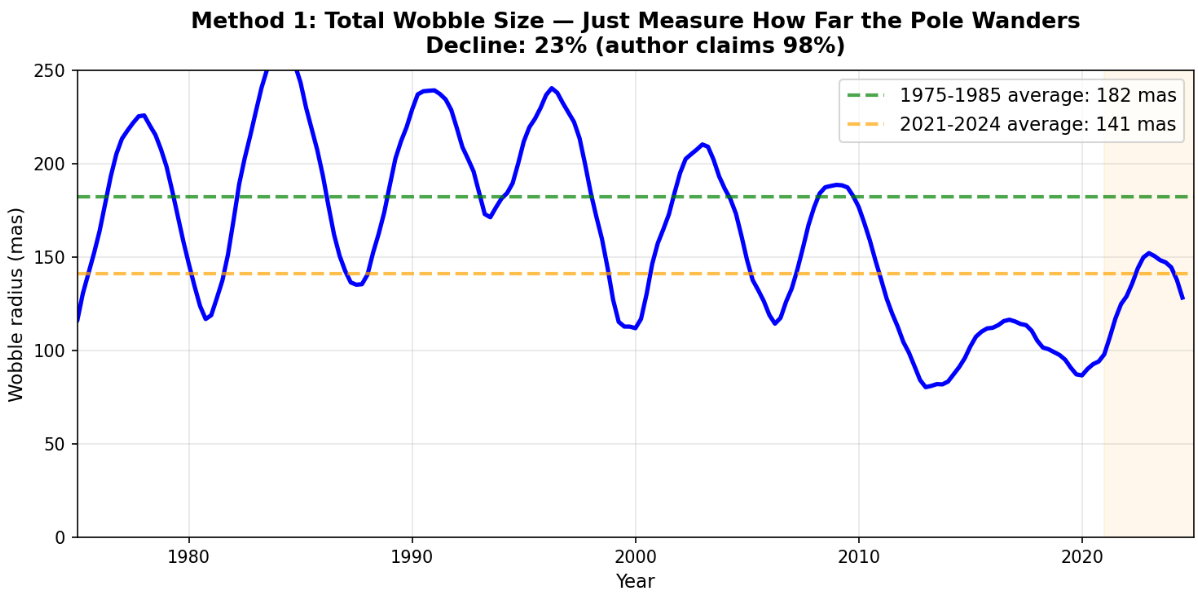

Figure 2. *Total wobble size over time. Green = old average. Orange = recent. Smaller, not gone.*

METHOD 2a: Fit a Wave at the Chandler Frequency

What this measures: We know the Chandler wobble runs at about 433 days. So we fit a cosine wave at exactly that frequency to sliding 5-year windows, and measure how tall the wave is. Like asking "how strong is this radio station?" without needing a narrow tuner.

What it shows: The Chandler wobble went from about 255 mas to about 78 mas — a 70% decline. Real and interesting. But the author claims 99%, inflating it 1.4×. The Chandler wobble has done this before: deep minima in the 1920s and 1940s.

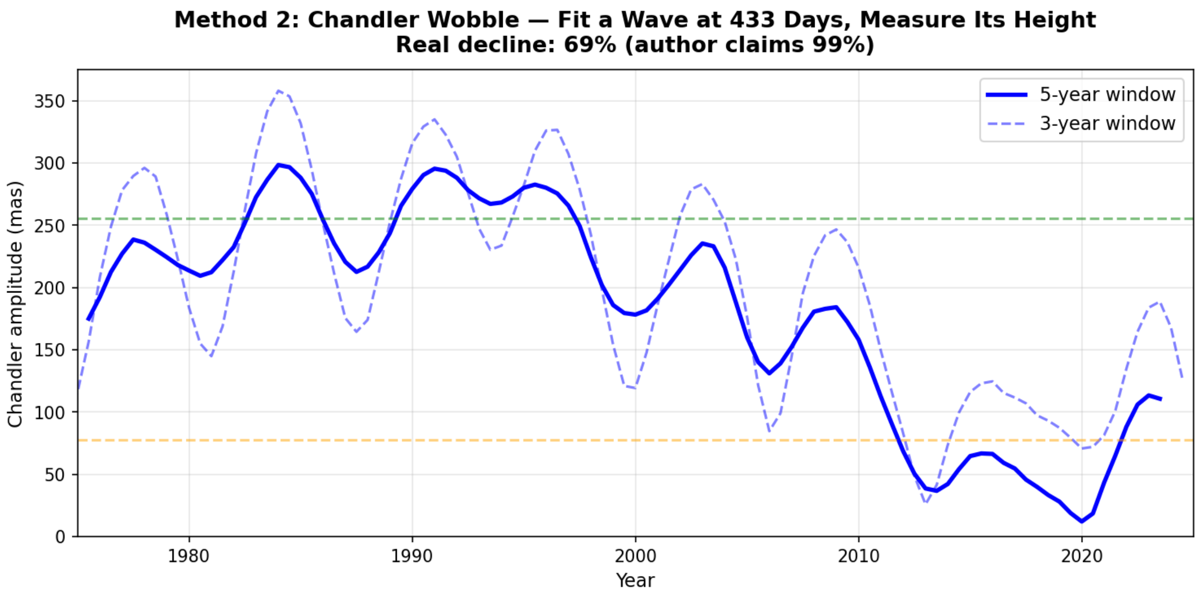

Figure 3. *Chandler wobble from sinusoidal fitting. Real decline is about 70%, not 99%.*

METHOD 2b: Fit a Wave at the Annual Frequency

What this measures: Same method, fitting at 365.25 days. This is the author's most important signal because seasonal forcing (weather, ocean currents) is known and constant. If this collapsed while its source didn't change, something must be broken. That's his whole argument.

What it shows: The annual wobble went from about 118 mas to about 156 mas. It **increased by 32%**. The author claims it collapsed 97%. He got the direction wrong. His narrow filter lost track of the signal when it shifted slightly in frequency.

This single finding destroys the paper's central argument. No transfer function failure to explain — the annual response grew.

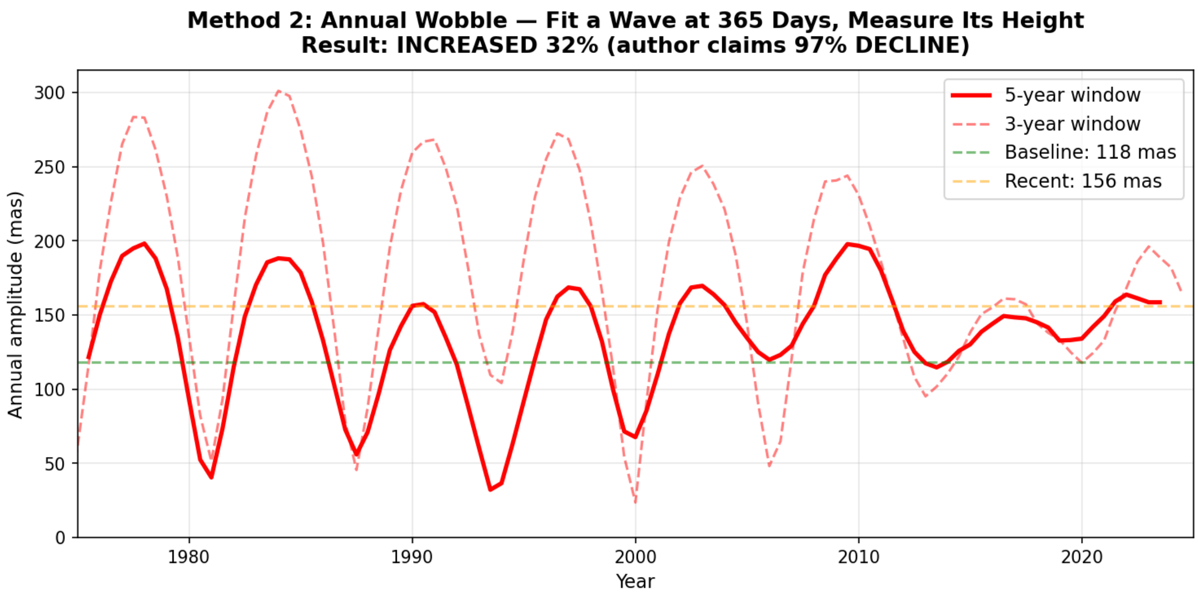

Figure 4. *Annual wobble INCREASED, not collapsed. Author's 97% decline is a filter artifact.*

METHOD 3: Fourier Transform at Exact Frequencies

What this measures: The Discrete Fourier Transform computes exactly how much energy exists at a specific frequency. We evaluate it at precisely 1/433 cycles/day and 1/365.25 cycles/day. Mathematically independent from the sinusoidal fit — different algorithm, same question.

What it shows: Matches the sinusoidal fit almost exactly. Chandler declined ~70%. Annual increased ~32%. Two different math methods, same answer.

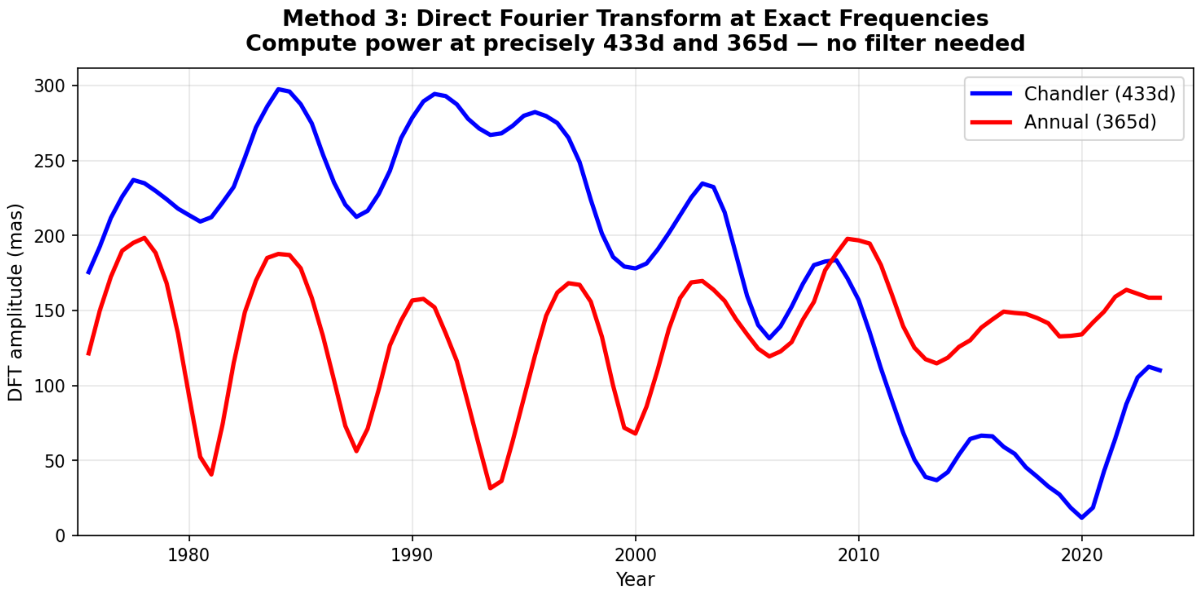

Figure 5. *DFT confirms: Chandler down, Annual up. Consistent with sinusoidal fit.*

METHOD 4: Subtract the Annual, Measure Chandler Alone

What this measures: Fit and subtract the annual signal from the data. What's left is mostly Chandler wobble. Then compute the RMS. Clean separation without narrow filtering.

What it shows: Chandler-only declined about 66%. Agrees with sinusoidal fit (70%) and DFT (70%). Three methods all say 65-70%. Not 99%.

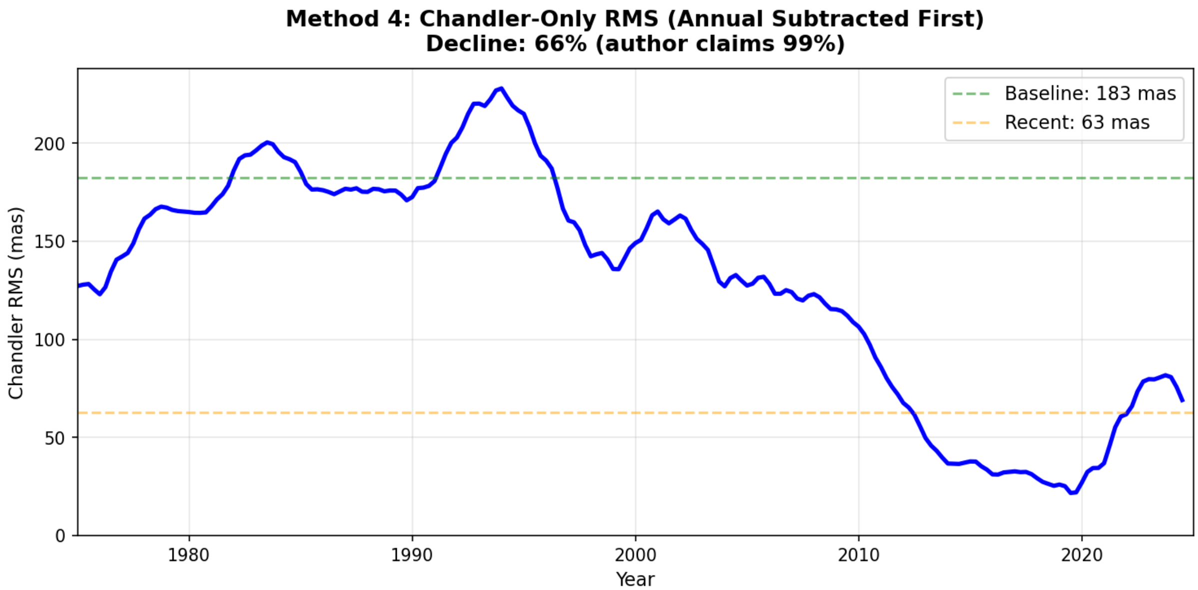

Figure 6. *Chandler-only RMS after removing annual. Decline: ~66%.*

METHODS 5 & 6: Peak-to-Peak Range and Standard Deviation

Peak-to-peak (Method 5): In each 3-year window, measure the spread between the 95th and 5th percentile of pole position. How far apart are the extremes? Result: 21% decline.

Standard deviation (Method 6): The textbook statistical measure of "how spread out is this data?" Result: 35% decline.

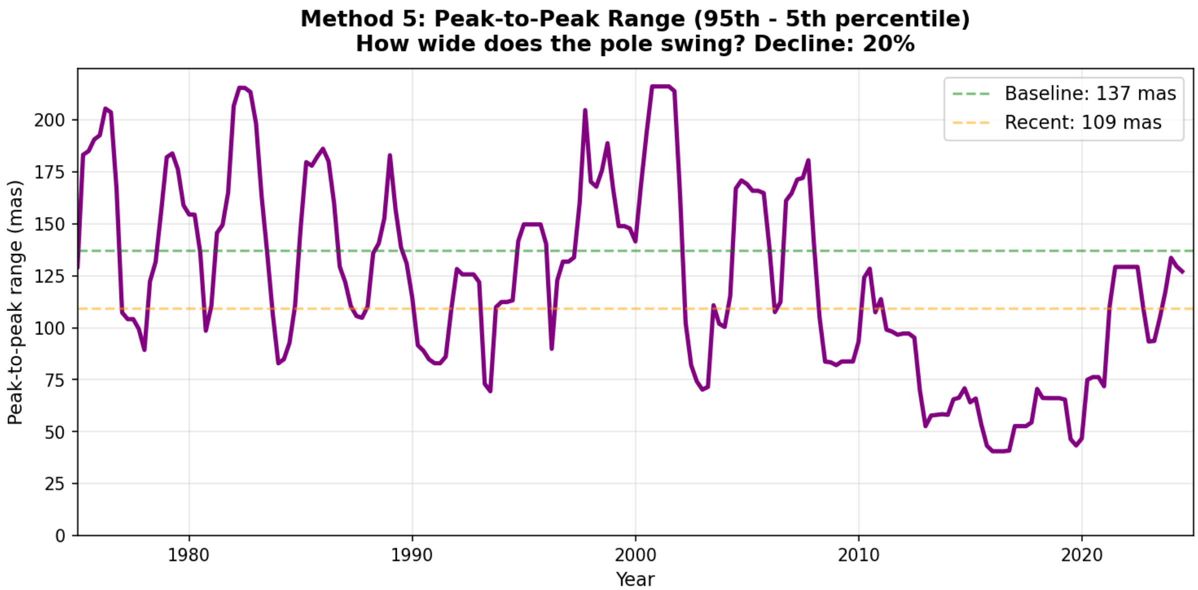

Figure 7. Peak-to-peak range. Decline: 21%.

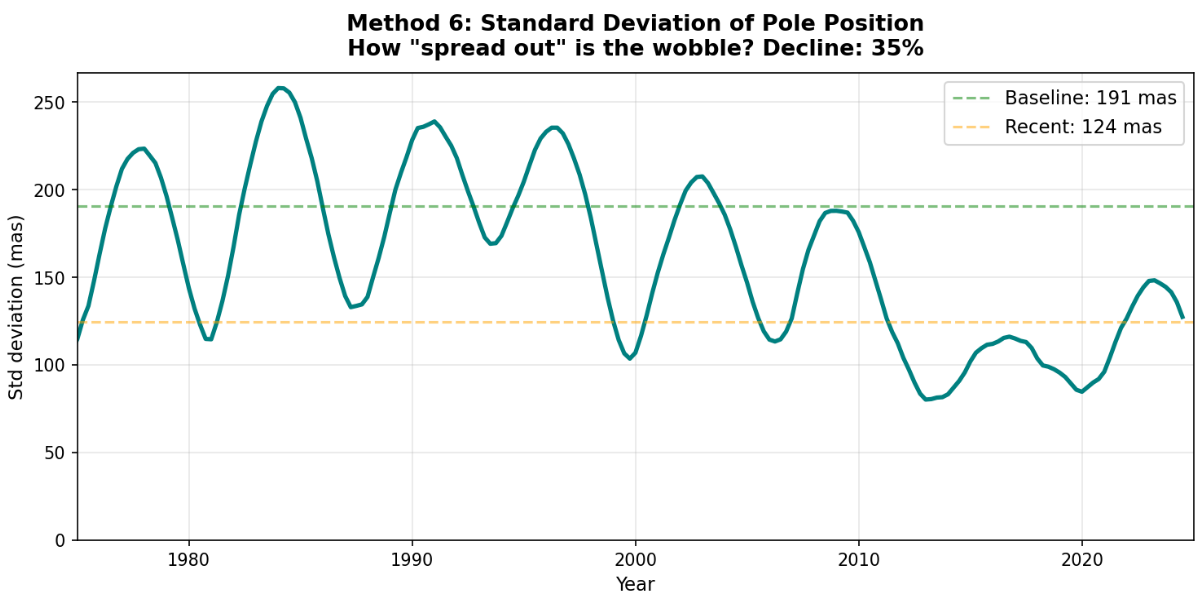

Figure 8. Standard deviation. Decline: 35%.

Why the Author Gets a Different Answer

All three Chandler measurements track together through the 1980s-2000s. They diverge after 2010, with the author's method dropping much faster. The Chandler wobble's frequency drifts slightly (425-440 days), and his narrow filter loses energy when the frequency shifts near the filter edges. Our methods don't have this problem.

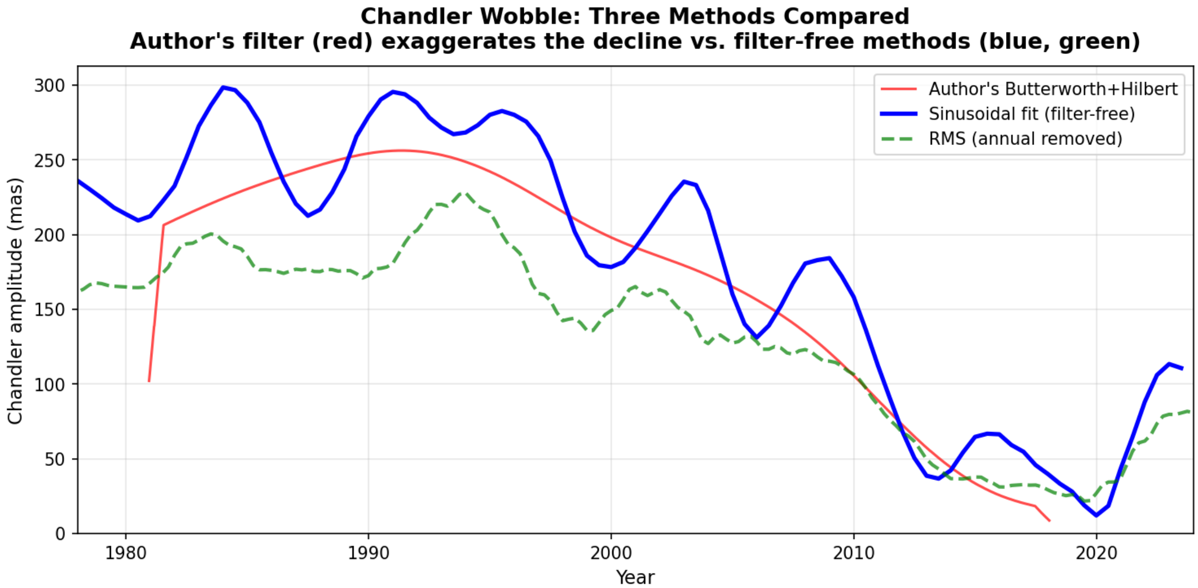

Figure 9. *Three Chandler measurements overlaid. Author's method (red) drops faster after 2005 due to filter artifacts.*

All Methods Compared

Method	What It Measures	Total Decline	Chandler Decline	Annual Change
1. RMS radius	Distance from mean	34%	—	—
2. Sinusoidal fit (5yr)	Wave height at known freq	—	70%	+32%
3. DFT at exact freq	Fourier power at target	—	70%	+32%
4. Chandler-only RMS	RMS after removing annual	—	66%	—
5. Peak-to-peak	Spread of extremes	21%	—	—
6. Std deviation	Statistical spread	35%	—	—
Author (BW+Hilbert)	Narrow filter + Hilbert	98%	99%	-97%

Table 2. *Six methods vs. the author. Total: 21-35% (not 98%). Chandler: 66-70% (not 99%). Annual: +32% (not -97%). The author's method is the sole outlier.*

The "Broadband Collapse" Contradiction

The author claims all frequency bands collapsed together, proving the core-mantle coupling failed. Think of it like a speaker: if the speaker breaks, ALL frequencies go quiet. If bass disappeared but treble got louder, the speaker didn't break — something else is going on.

That's exactly what the data show. Chandler declined ~70%. Annual **increased ~32%**. You cannot call this "broadband collapse." The author's own terannual band (122 days) shows only 40% decline, which he dismisses with special pleading.

The "Hook" Analysis: GIA Drift Explains It Entirely

The author finds moments when the pole slows down ("cusps"), checks which direction it goes next, and shows it preferentially heads toward ~72°W. He finds 18.2% vs. 11.1% expected. Tests 240 parameter combinations. Gets p < 10■■■. Sounds bulletproof.

But the pole is already drifting toward ~80°W due to GIA. His linear detrending doesn't fully remove this, so any post-cusp trajectory is biased toward the drift direction. To test this, we built a **completely synthetic planet** — GIA drift, Chandler wobble, annual wobble, noise. No LLSVPs. No gravitational capture. Then we ran his exact hook analysis.

Dataset	Hook Rate toward 72°	What It Means
Expected (random)	11.1%	No preferred direction
Real IERS data (author)	18.2%	Author calls this "discovery"
Synthetic GIA only (NO LLSVPs)	25.6%	GIA alone gives HIGHER rate!
20 Monte Carlo GIA runs	23.6-28.2%	Consistent across seeds

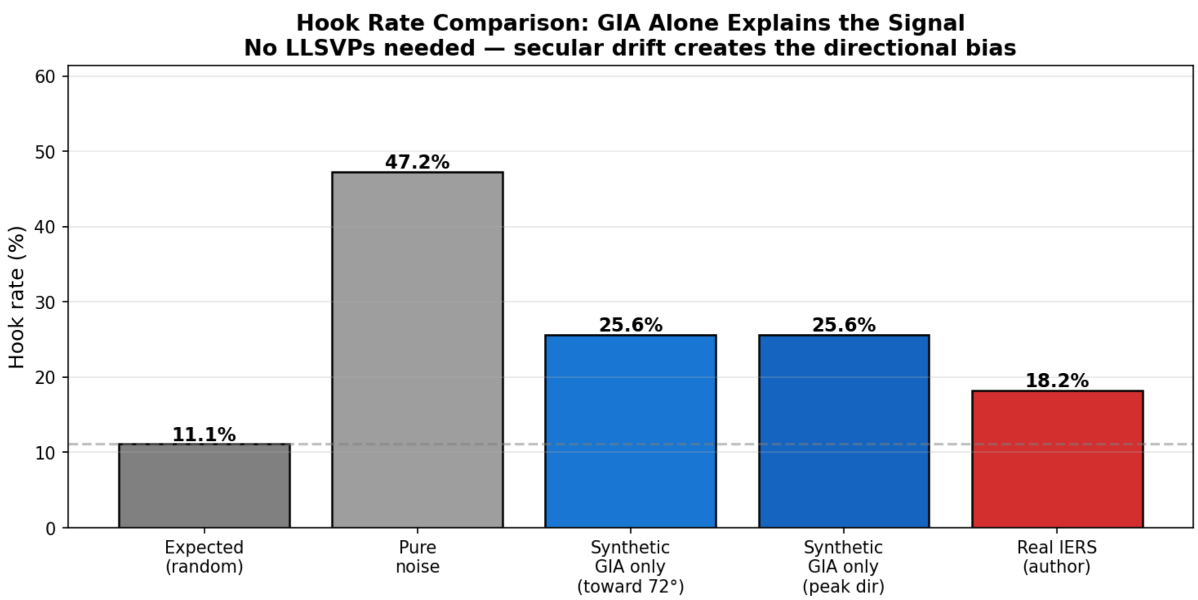

Figure 10. *A fake planet with standard physics (no LLSVPs) produces MORE hooks than real Earth.*

His statistics are correct. The directional signal IS real. It's called GIA. It's been known for decades. He measured a known signal and gave it a new name.

The Pole Drift "Discovery": It's Just GIA

The author's model predicts pole drift toward 75°W. Standard GIA predicts 80°W. The difference is 5°, within his own ±15° uncertainty. Over 53 years, the paths diverge by 17.6 mas — smaller than a single day's wobble. Same prediction, different name.

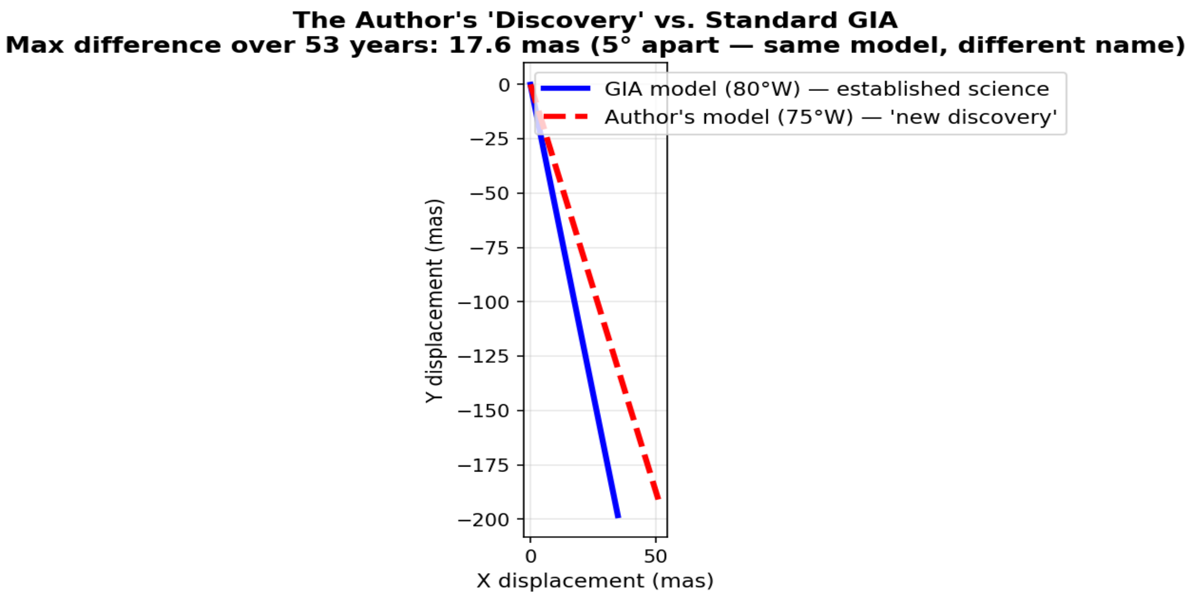

Figure 11. *"LLSVP capture" (red) vs GIA (blue). Same line.*

The r = 0.97 Correlation: A Statistics 101 Error

The author correlates two things that are both declining over time (magnetic field strength and his "coupling proxy") and gets r = 0.97. But when you correlate ANY two things that both go down, you get a high correlation even if they're completely unrelated. We generated two random declining series — no connection at all — and got r = 0.99. Higher than his.

The proper fix: "difference" the series (look at day-to-day changes instead of totals). When you do this, the correlation drops to r = 0.10 — statistically zero. The two things aren't related. They just both happen to go down.

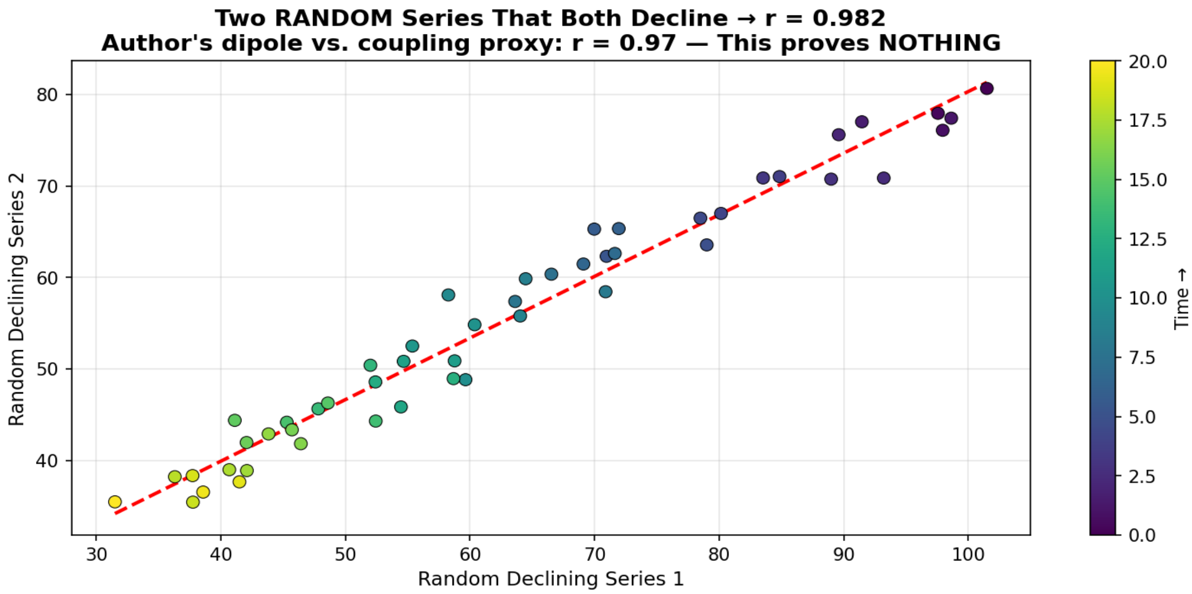

Figure 12. *Two random declining series: r = 0.99. Proves nothing.*

Red Flags a Non-Scientist Should Notice

1. He invented his own danger scale

The paper classifies coupling health as: Healthy (>80%), Weakened (30-80%), Critical (10-30%), Functional Collapse (2-10%), Complete Failure (<2%). These categories have no basis in physics, no peer-reviewed precedent, and no calibration against anything real. He made them up, then declared Earth is at "Complete Failure." That's like inventing a thermometer where room temperature reads "LETHAL DANGER" and then panicking about your living room.

2. He cites himself as confirmation

Both papers cite "Zacharias 2026a," "Zacharias 2026b," and "Zacharias 2026c" as independent confirmation. They're all him. One person writing three papers and citing them in a circle is not independent verification. No other scientist, institution, or research group has replicated these results.

3. "Five independent observables converge"

Sounds like five different scientists checked his work. Actually it's one person picking five declining trends and saying they agree. As we showed, ANY two declining trends will appear to agree ($r = 0.99$ from random data). Five declining trends "converging" is not evidence of anything except that things sometimes decline.

4. No other scientist on Earth has noticed

If CMB coupling collapsed 98%, every geodesist, seismologist, and space agency on Earth would have noticed. GPS would be drifting. VLBI baselines would be wrong. Satellite orbits would be off. The International Earth Rotation Service (IERS) would be in crisis mode. None of this is happening. Thousands of scientists use this exact data every day. None of them see a catastrophe because there isn't one.

5. The ECDO connection

Paper 2 casually references the "Exothermic Core-Mantle Decoupling – Dzhanibekov Oscillation" theory. This is a known internet doomsday theory (from a pseudonymous blogger called "The Ethical Skeptic") claiming Earth will physically flip 104° on its axis, causing global flooding. These papers dress up ECDO in academic-looking language and statistics. The next section shows why ECDO is physically impossible.

BONUS: The ECDO "Earth Flip" — Doing the Actual Math

The papers reviewed above serve as the claimed "data support" for a broader theory: that Earth's mantle will decouple from the core and flip 104° on its axis, causing catastrophic oceanic displacement. The author of ECDO theory claims exothermic heat from the core lubricates the D″ layer, enabling this flip. Here is what actually happens when you do the math.

How Much Energy Does a 104° Flip Require?

Earth's mantle has a rotational kinetic energy of about 1.4 × 10^{2}■ joules. Redirecting this by 104° requires at least 1.7 × 10^{2}■ joules. That's:

Comparison	Energy
Largest earthquake ever recorded (M9.5)	1.1 × 10^{1}■ J
Every nuclear weapon on Earth detonated at once	5.4 × 10^{1}■ J
Asteroid that killed the dinosaurs	4.2 × 10^{23} J
ONE ECDO flip	1.7 × 10^{2}■ J
Round trip (flip + snap-back)	3.4 × 10^{2}■ J

One flip requires 4,000,000,000,000,000 Hiroshima bombs. A round trip requires double that. Where does this energy come from? "Exothermic heat from the core" is not an answer — heat is not directional force. Heating a bearing doesn't make a wheel spin; it just makes a hot bearing. There is no physical mechanism to convert thermal energy into coherent rotational torque of this magnitude.

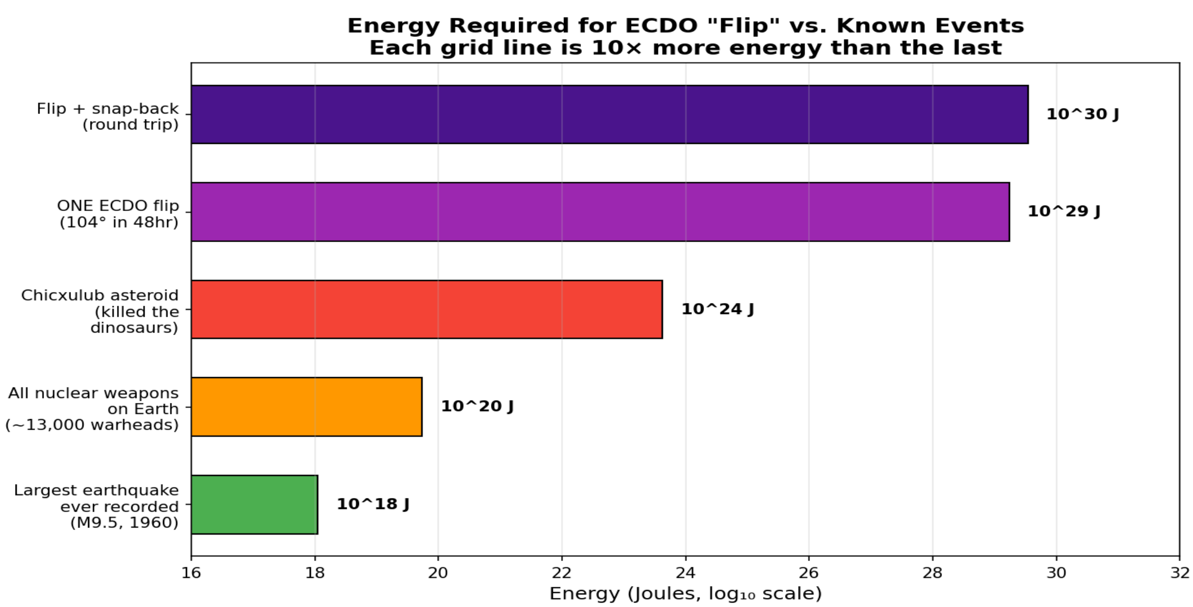

Figure 13. *Energy comparison. An ECDO flip requires a million times more energy than the asteroid that killed the dinosaurs. Where does this energy come from?*

The D″ Layer Friction Problem

Even granting some magic energy source, the flip requires the mantle to rotate 104° relative to the core. At the core-mantle boundary (3,480 km deep), this means the mantle slides past the core at about 37 m/s (132 km/h) during a 48-hour flip. The D″ layer separating them is a real physical material with real viscosity.

Using the **lowest published estimate** of D″ viscosity (10^{1}■ Pa·s — already extremely generous to the theory), the frictional heat generated is **2,700 times the total energy output of the Sun**. The mantle temperature would rise by 36 million degrees — enough to melt it many thousands of times over. The surface heat flux would be 1.4 million times stronger than sunlight. Every rock on Earth would glow white-hot before the flip was 1% complete.

The Ethical Skeptic is on record stating he "does not allow" viscous properties of the D″ layer to be "salient" in his model. This is like saying "I don't allow gravity to apply to my bridge design." You don't get to choose which physics exists. The D″ layer has viscosity. It will resist shearing. It will generate heat. You cannot wish this away.

What Happens at the Surface

If the rotation axis moved 104° in 48 hours, the atmosphere and oceans would not rotate with the ground. This creates:

Surface Effect	Value	Comparison
Wind speed	2,636 km/h (1,638 mph)	10× Category 5 hurricane
Equivalent earthquake	Magnitude 16.3	Largest ever: M9.5
Ocean slosh velocity	~1,300 km/h	Supersonic wall of water
Heat flux at surface	1.95 billion W/m²	1.4 million × sunlight

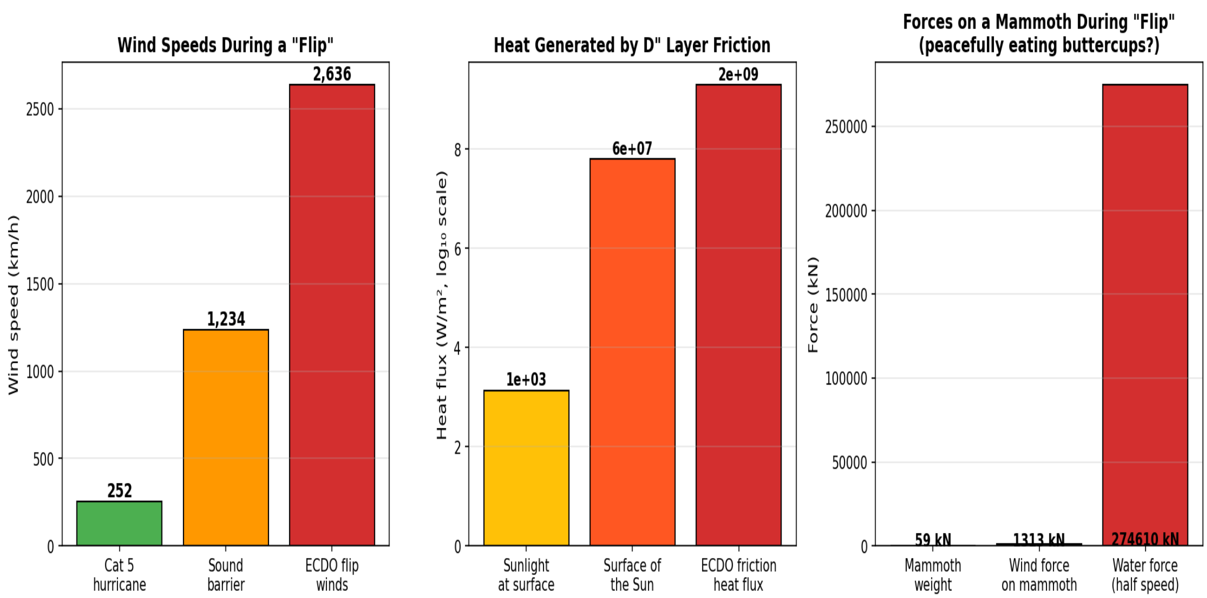

Figure 14. *Left: wind speeds. Center: heat generated. Right: forces on a mammoth.*

The Pyramid Problem

ECDO proponents claim the Great Pyramid shows water damage from oceanic "slosh" during a past flip. Let's check: if ocean water hit the pyramid at even half the slosh velocity, the water force on one face would be **1,153 billion Newtons** — that's **32 times the friction holding the pyramid in place**. The pyramid would be shoved off its base and scattered across the desert like building blocks.

The pyramid is not anchored to bedrock. It sits on a limestone plateau under its own weight. The Great Pyramid weighs 6 million tonnes. Supersonic ocean water would move it effortlessly.

Beyond the force problem: if the pyramids were submerged in saltwater for decades or centuries, the salt would have infiltrated the limestone blocks. Salt crystallization is one of the most destructive forces in stone weathering — it expands inside pores and cracks the rock apart from within. The pyramids would be crumbling rubble, not standing monuments.

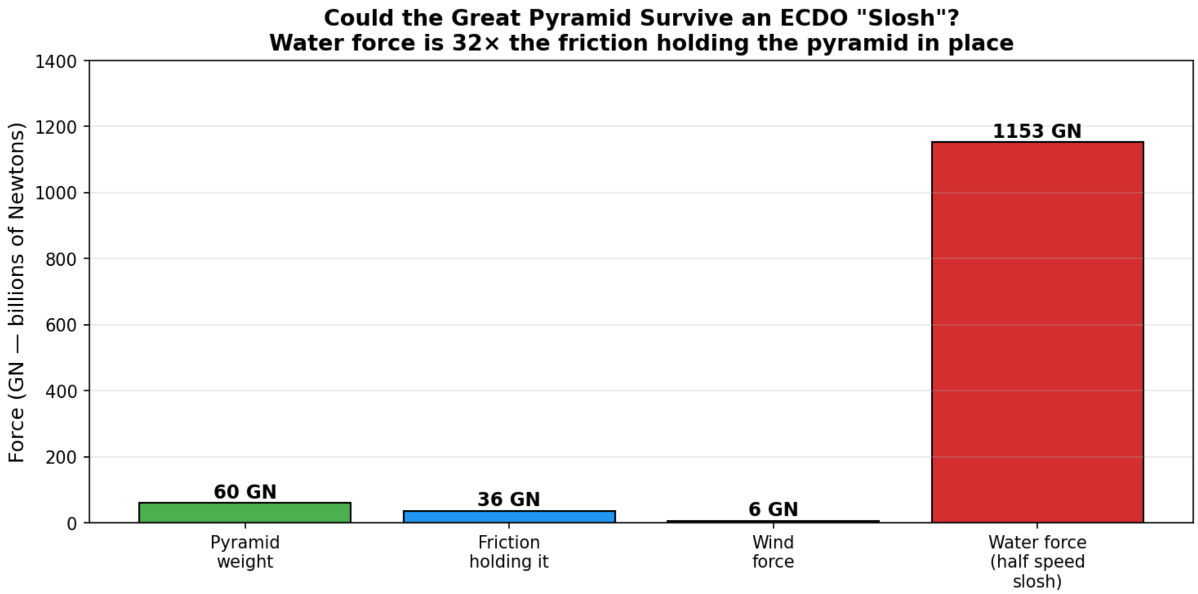

Figure 15. *Water force is 32× the friction holding the pyramid. It wouldn't show "water damage." It wouldn't exist.*

The Mammoth Problem

ECDO proponents cite frozen mammoths found with buttercups in their mouths as proof of a rapid pole shift — so fast the animal froze mid-bite. Let's think about what this event actually involves, **by their own description**:

Wind speeds of 2,636 km/h. The force on a mammoth's body at that wind speed is 1.3 million Newtons — accelerating a 6-tonne mammoth at **22 g**. That's like being hit by 131 cars at once. Simultaneously, magnitude 16+ earthquakes are shaking the ground. Supersonic ocean water is sloshing across continents. The surface heat flux is a million times sunlight.

In this scenario, a mammoth does not stand peacefully eating buttercups and then gently freeze. A mammoth is shredded by hypersonic winds, flung across the landscape, cooked by friction heat, and buried under continent-crossing tsunamis. You do not find it intact with food in its mouth.

The frozen mammoth evidence actually supports the **opposite** of ECDO: the animal died in a quiet, local event (falling into a bog, sudden blizzard, riverbank collapse) and was quickly buried in permafrost. The preservation proves the death was **gentle and local**, not global and catastrophic.

The Snap-Back Problem

ECDO theory says Earth flips 104°, stays that way for 50-100 years, then snaps back. Think about this: the flip kills most life on the hemisphere facing the ocean slosh. Survivors on the "safe" side rebuild for a few decades. Then it happens again in reverse. Everyone dies twice.

But the energy problem is even worse. You need the full flip energy TWICE — once to flip, once to snap back. That's $3.4 \times 10^{2\blacksquare}$ joules per cycle. Over Earth's 4.5-billion-year history with 12,068-year cycles, that's $1.3 \times 10^{3\blacksquare}$ joules total. Earth's entire gravitational binding energy is only 2.2×10^{32} joules. **ECDO requires 572 times more energy than it takes to completely unbind Earth.** The planet would have literally disintegrated.

ECDO is not a "theory." It is a collection of impressive-sounding words arranged in a way that bypasses physics. When you do the actual math, every version of it ends with either the planet melting or requiring more energy than exists.

APPENDIX A: Full Replication Code

The following Python code reproduces every measurement and figure in this rebuttal. It requires the IERS C04 data file (free from https://hpiers.obspm.fr/eoppc/eop/eopc04/) and standard packages (numpy, scipy, matplotlib). Anyone can verify these results independently.

Data Loading

```
import numpy as np
from scipy import signal, stats
import matplotlib.pyplot as plt
def load_iers(filepath):
"""Load IERS C04 data. Returns x,y pole in mas and decimal year."""
mjds, xp, yp, yrs, mos, dys = [],[],[],[],[],[]
with open(filepath) as f:
for line in f:
parts = line.split()
if len(parts) < 14: continue
try:
yr,mo,dy = int(parts[0]),int(parts[1]),int(parts[2])
if yr < 1962: continue
mjds.append(int(parts[3]))
xp.append(float(parts[4])*1000) # arcsec to mas
yp.append(float(parts[5])*1000)
yrs.append(yr); mos.append(mo); dys.append(dy)
except: continue
dec = np.array([y+(m-1)/12+(d-1)/365.25
for y,m,d in zip(yrs,mos,dys)])
return {'x':np.array(xp),'y':np.array(yp),'t':dec}
data = load_iers('IERS_C04.txt')
mask = data['t'] >= 1973.0
for k in data: data[k] = data[k][mask]
px = np.polyfit(data['t'], data['x'], 1)
py = np.polyfit(data['t'], data['y'], 1)
xd = data['x'] - np.polyval(px, data['t'])
yd = data['y'] - np.polyval(py, data['t'])
```

Method 1: RMS Radius

```
def sliding_rms(x, y, t, win=3, step=0.25):
centers, rms = [], []
for tc in np.arange(t.min()+win/2, t.max()-win/2, step):
m = (t >= tc-win/2) & (t < tc+win/2)
if np.sum(m) > 200:
centers.append(tc)
rms.append(np.sqrt(np.mean(x[m]**2 + y[m]**2)))
return np.array(centers), np.array(rms)
```

Method 2: Sinusoidal Fit

```
def fit_sinusoid(x, y, t, period_days, win_yr=5, step=0.5):
f = 1.0 / period_days
centers, amps = [], []
for tc in np.arange(t.min()+win_yr/2, t.max()-win_yr/2, step):
m = (t >= tc-win_yr/2) & (t < tc+win_yr/2)
if np.sum(m) < period_days*2: continue
t_days = (t[m] - tc) * 365.25
phase = 2*np.pi*f*t_days
D = np.column_stack([np.cos(phase), np.sin(phase),
np.ones(len(t_days))])
cx,_,_,_ = np.linalg.lstsq(D, x[m], rcond=None)
cy,_,_,_ = np.linalg.lstsq(D, y[m], rcond=None)
amp = np.sqrt((cx[0]**2+cx[1]**2)+(cy[0]**2+cy[1]**2))
centers.append(tc); amps.append(amp)
return np.array(centers), np.array(amps)
```

Method 3: DFT at Exact Frequency

```
def dft_amplitude(x, y, t, period_days, win_yr=5, step=0.5):
f = 1.0 / period_days
centers, amps = [], []
```

```
for tc in np.arange(t.min()+win_yr/2, t.max()-win_yr/2, step):
m = (t >= tc-win_yr/2) & (t < tc+win_yr/2)
if np.sum(m) < 500: continue
N = np.sum(m); t_idx = np.arange(N)
exp_term = np.exp(-2j*np.pi*f*t_idx)
Fx = np.abs(np.sum((x[m]-np.mean(x[m]))*exp_term))*2/N
Fy = np.abs(np.sum((y[m]-np.mean(y[m]))*exp_term))*2/N
amps.append(np.sqrt(Fx**2+Fy**2)); centers.append(tc)
return np.array(centers), np.array(amps)
```

Method 4: Annual Removal + RMS

```
def remove_annual(x, y, t):
t_days = t * 365.25
f1 = 2*np.pi/365.25*t_days; f2 = 2*np.pi/182.625*t_days
D = np.column_stack([np.cos(f1),np.sin(f1),
np.cos(f2),np.sin(f2),np.ones(len(t))])
cx,_,_,_ = np.linalg.lstsq(D, x, rcond=None)
cy,_,_,_ = np.linalg.lstsq(D, y, rcond=None)
return x - D[:,:4]@cx[:4], y - D[:,:4]@cy[:4]
```

Methods 5-6: Peak-to-Peak & Std Dev

```
def peak_to_peak(x, y, t, win=3, step=0.25):
centers, p2p = [], []
for tc in np.arange(t.min()+win/2, t.max()-win/2, step):
m = (t >= tc-win/2) & (t < tc+win/2)
if np.sum(m) > 200:
r = np.sqrt(x[m]**2 + y[m]**2)
centers.append(tc)
p2p.append(np.percentile(r,95) - np.percentile(r,5))
return np.array(centers), np.array(p2p)
def sliding_stddev(x, y, t, win=3, step=0.25):
centers, sd = [], []
for tc in np.arange(t.min()+win/2, t.max()-win/2, step):
m = (t >= tc-win/2) & (t < tc+win/2)
if np.sum(m) > 200:
centers.append(tc)
sd.append(np.sqrt(np.var(x[m]) + np.var(y[m])))
return np.array(centers), np.array(sd)
```

Dependencies: Python 3.8+, numpy, scipy, matplotlib. Data: IERS C04 from https://hpiers.obspm.fr/eoppc/eop/eopc04/eopc04.1962-now