

# Geometric Angular Momentum Hypothesis for Mars Crustal Remanent Magnetism

A Phi Grid Framework Extension — Timestamp Record

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**Classification:** EXPLORATORY-CLEAN

**Status:** No pre-registration. Public data only. This record establishes priority of hypothesis prior to any data access or analysis. No Mars magnetic field data has been downloaded, examined, or analyzed at the time of this timestamp.

## 1. Context

This document timestamps a hypothesis extending the Project Phi Grid framework to Mars crustal remanent magnetism. The framework's prior published results are:

- **Earth paper** — DOI 10.5281/zenodo.19035389 ( $p = 0.0102$ , pre-registered Monte Carlo,  $N = 100,000$ )
- **Stellar Neighbourhood paper** — DOI 10.5281/zenodo.19241818 ( $p = 0.0285$ )
- **Gaia GCNS confirmatory test (honest null)** — DOI 10.5281/zenodo.19235599 ( $p = 0.176$ )
- **Phi Grid notebooks** — DOI 10.5281/zenodo.19267401

## 2. Hypothesis

The spatial arrangement of Mars's crustal remanent magnetic anomalies departs from spatial randomness in a manner consistent with  $\phi$ -ratio geometric organization, and that geometric arrangement constitutes an angular-momentum-bearing configuration in the sense established by Ahrens & Vinante (*Physical Review Letters* 136, 146703, 2026; DOI: 10.1103/hdh6-r1gy) for non-spinning levitated ferromagnets.

## 3. Falsifiable Predictions

**(1) Geometric test (primary, falsifiable on existing data).** A pre-registered  $\phi$ -shell or  $\phi$ -grid alignment test of strong Martian crustal magnetic anomalies ( $B$  above threshold at fixed altitude) anchored at a candidate geometric origin, evaluated against Monte Carlo null distributions over random anchors and random geometric progressions, using the same methodology as the Earth and stellar papers. Anchor specificity protocol ( $\geq 10$  anchors including Tharsis center, hemispheric dichotomy boundary midpoint, strongest single anomaly, weakest hemisphere centroid, and  $\geq 5$  arbitrary points) is required.

**(2) Dynamical prediction (secondary, observational).** If (1) survives at  $p < 0.05$ , the principal axis of the  $\phi$ -grid projected onto the Martian rotation axis should align preferentially with the documented true polar wander great circle, of whatever magnitude.

## 4. Mechanism Citation and Acknowledged Scale Gap

Ahrens & Vinante (2026) experimentally confirmed Maxwell's 160-year-old prediction that geometric magnetic order in a non-spinning body carries real angular-momentum properties manifesting as

gyroscopic coupling. The lab demonstration is at single-magnet scale. Translation to planetary scale assumes geometry is the operative scale-independent variable, consistent with the Phi Grid framework's standing claim. The claim made here is *not* that crustal-spin angular momentum dominates Martian rotational dynamics; the claim is that the geometric arrangement of remanent magnetization constitutes a configuration whose response to mass-redistribution forcing is constrained by its geometric symmetry class.

## 5. Data Sources (Public, None Accessed)

NASA Planetary Data System — MGS magnetometer (1997–2006); MGS Electron Reflectometer (1999–2006); MAVEN magnetometer (2014–present). Reference models: Langlais et al. 2019 (combined MGS+MAVEN); Gao et al. 2021 spherical harmonic model (DOI: 10.1029/2021EA001860); Mitchell et al. 2007 ER map (DOI: 10.1029/2005JE002564).

## 6. Pre-Registration Commitment

Before any Mars magnetic field data is downloaded or examined, an OSF pre-registration will specify: (a) anchor selection protocol; (b) B-threshold for anomaly inclusion; (c) tolerance for shell match (in km or degrees of arc); (d) Monte Carlo N; (e) treatment of the Martian crustal hemispheric dichotomy in the Monte Carlo null model. The dichotomy is a known geophysical asymmetry that will trivially break some isotropic null hypotheses, and the null model must either restrict to the magnetized southern hemisphere or use a null that preserves the dichotomy. This decision will be specified before any p-values are examined.

## 7. Falsification Conditions

- **Geometric test:**  $p > 0.05$  across multiple reasonable anchor choices.
- **Dynamical prediction:** no preferential alignment between principal  $\phi$ -grid axis and TPW great circle.

## 8. Statement of Priority

This record establishes priority of hypothesis only as of the date above. No data has been examined. No analysis has been performed. The hypothesis is stated in advance per the pre-registration discipline standing in the Phi Grid framework.