GLOBAL GEOMAGNETIC REFERENCE FOR DIRECTIONAL DRILLING

HDGM2027

High Definition Geomagnetic Model

A new degree-2160 global crustal-field model and survey-informed location-dependent uncertainty, delivered with familiar HDGM software interfaces.

2160
Maximum crustal-model degree
More than twice HDGM2026

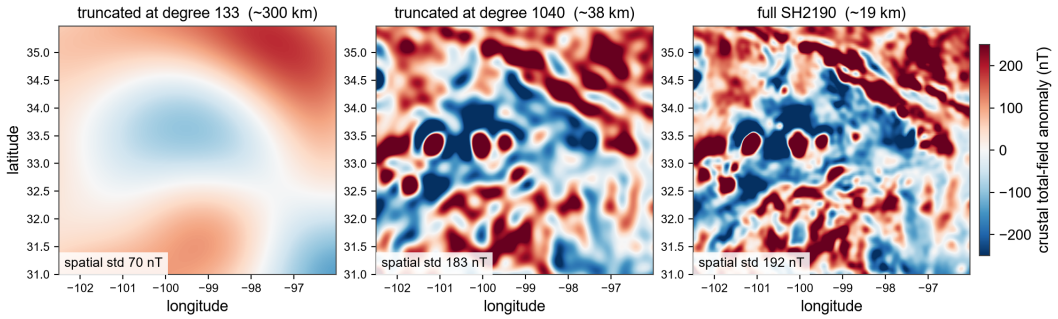
10 arcmin
Spatial resolution
About 9 km half-wavelength at the equator

Location-dependent
Reference-field uncertainty
Informed by source magnetic surveys and geomagnetic activity

THE SCIENTIFIC ADVANCES

Extending the resolution of global geomagnetic models

Built using ellipsoidal harmonics to degree 2160, HDGM2027 represents shorter-wavelength crustal magnetic structure than earlier global reference models. Its 10 arcmin resolution brings finer geographic detail to established HDGM workflows.

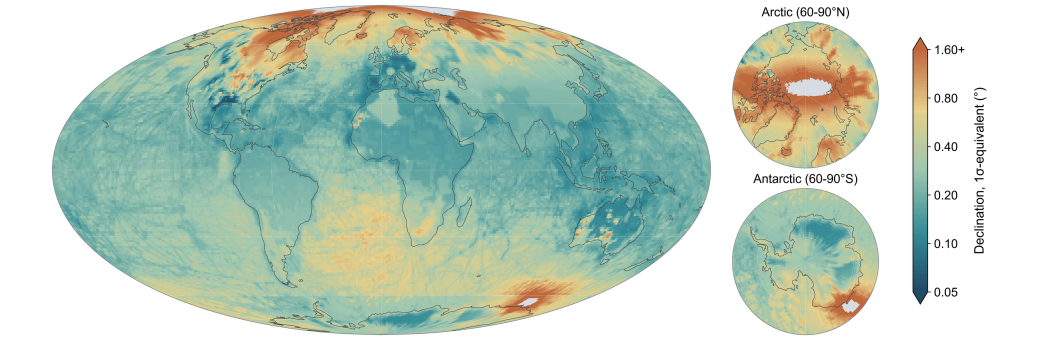


Texas–Oklahoma crustal field. HDGM2027 truncated to degrees 133 (SRGM) and 1040 (HDGM2026 resolution), compared with full SH2190. Distances indicate approximate full wavelengths at the equator.

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Survey-informed local uncertainty

The new uncertainty model accounts for magnetic survey coverage and errors to estimate unresolved crustal detail by location. Combined with main-field and geomagnetic-activity-dependent external-field terms, it connects the model's resolution to usable reference-field information for drilling.



Mapped crustal declination uncertainty. Shared crustal contribution at the surface (sea level offshore), from CH, OH and OI terms (1σ equivalent).

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ENGINEERING REFERENCE

Specifications & integration

Specification	HDGM2027
Geographic coverage	Global magnetic-field reference for above- and below-surface evaluations within the licensed software's supported domain.
Crustal model	**EH2160:** ellipsoidal-harmonic model to degree 2160; **10 arcmin** full-wavelength resolution (about 9 km half-wavelength at the equator).
Coefficient delivery	**SH2190:** spherical-harmonic coefficient representation to degree 2190, maximum order 2160. Additional representation degrees preserve the EH2160 field; they do not increase resolved spatial detail.
Field components	Updated core (main) field and secular variation from satellite observations, including Swarm; global crustal field; updated mean external field.
Field outputs	Vector components (X, Y, Z), total field intensity (F), horizontal intensity (H), declination (D) and inclination/dip (I).
Uncertainty model	Includes main-field uncertainty, survey-informed crustal uncertainty (individual airborne/marine magnetic survey errors and unresolved structure) and location-dependent external-field contributions.
Uncertainty delivery	Location-dependent ISCWSA **Revision 4 and Revision 5** CSV lookup tables; geomagnetic activity cases **G0–G4** and **all conditions**. Field-uncertainty components support D, I and F.
Interfaces & access	Windows app/Excel; console, DLL, Web API and coefficients. HDGM support documented for Well Seeker, KellyDown, WellArchitect and Aspen Sysdrill; COMPASS guidance from Monarch.
Model validity	Released **November 1, 2026**. Main field and secular variation span **January 1, 1900 through December 31, 2027 (inclusive)**. Updated annually.

HDGM2027 in drilling operations

- **Reference field:** Use D, I and F values for well planning, MWD surveys and magnetic-field quality checks.
- **Survey uncertainty:** Apply location- and activity-conditioned ISCWSA tables in the wellbore survey error model.
- **Local refinement:** Where magnetic survey data are available, IFR1 provides higher-resolution crustal-field corrections.
- **Time-varying fields:** SWC provides corrections for magnetic-field changes during operations.

Integration and model scope

- **Reference elevation:** Uncertainty tables are surface-referenced (sea level offshore), not depth-dependent.
- **Local magnetic effects:** The global model does not resolve all short-wavelength crustal anomalies or interference from nearby magnetic objects.
- **Direct coefficient readers:** The SH2190 file is larger than HDGM2026's; check array sizing and performance. The DLL and console workflows are unchanged.

Licensing and support

HDGM2027 is available under license directly from Monarch Magnetics. For pricing, model access or technical questions, contact **contact@monarchmag.com** or **+1 720-340-1287**. HDGM2026 remains valid through December 31, 2026.