GOES-R MAG Level 2 (L2)
Quiet Field Magnetic Model Products
Read-Me for Data Users
May 15, 2025

The quiet field model product provides a model representation of the Earth's magnetic field at the GOES-R spacecraft location in geosynchronous orbit (GEO) for quiet time conditions. Output provides quiet time estimates at a one minute cadence in several coordinate systems following the GOES-R MAG Level-2 1-min average data structure. This GOES-R MAG quiet field model includes both internal and external components of the Earth's magnetic field at GEO, coupling the most recent International Geomagnetic Reference Field (IGRF) internal model and the Olson-Pfitzer 1977 (OP-77) external model.

The OP-77 field model is based on the work of Olson and Pfitzer (1977) and Olson and Pfitzer (1974). The model includes contributions from the magnetopause currents, and current distributed throughout the magnetosphere (the tail and ring currents). It is valid for all tilt angles of the Earth's dipole axis and is valid during quiet magnetic conditions. The model is semi-empirical, based on both physical principles and several data sets that quantitatively describe the structure of the magnetospheric magnetic field. A generalized least squares method was employed to fit coefficients of a power series (including exponential terms) through fourth order in space and third order in tilt angle. This expansion was optimized for the near earth region and is valid to 15 earth radii. For the inner magnetosphere, the earth's internal field dominates below about two earth radii and these variations are not sufficiently expressed by the OP-77 model.

The most recent IGRF is the standard main field model adopted by the International Association of Geomagnetism and Aeronomy (IAGA) and updated spherical harmonic coefficients are released every 5 years. For dates between the model epochs, coefficient values are given by linear extrapolation. For more information on the IGRF and IAGA, visit the IAGA Working Group V-MOD Web site at:
http://www.ngdc.noaa.gov/IAGA/vmod/

This model does not take into account external contributions to the magnetic field strength at the GOES-R location during active periods, e.g. negative solar wind Bz and solar wind velocity. Significant differences between the quiet time modeled and observed magnetic field values (available from :
https://www.ncei.noaa.gov/products/goes-r-magnetometer) may suggest enhanced space weather activity.

Data inquiries can be submitted to swx.mag@noaa.gov. Please contact NCEI personal below for specific information on the GOES L2 data :

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GOES-R MAG09 Comparison To Quiet Fields ATBD V1.3

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