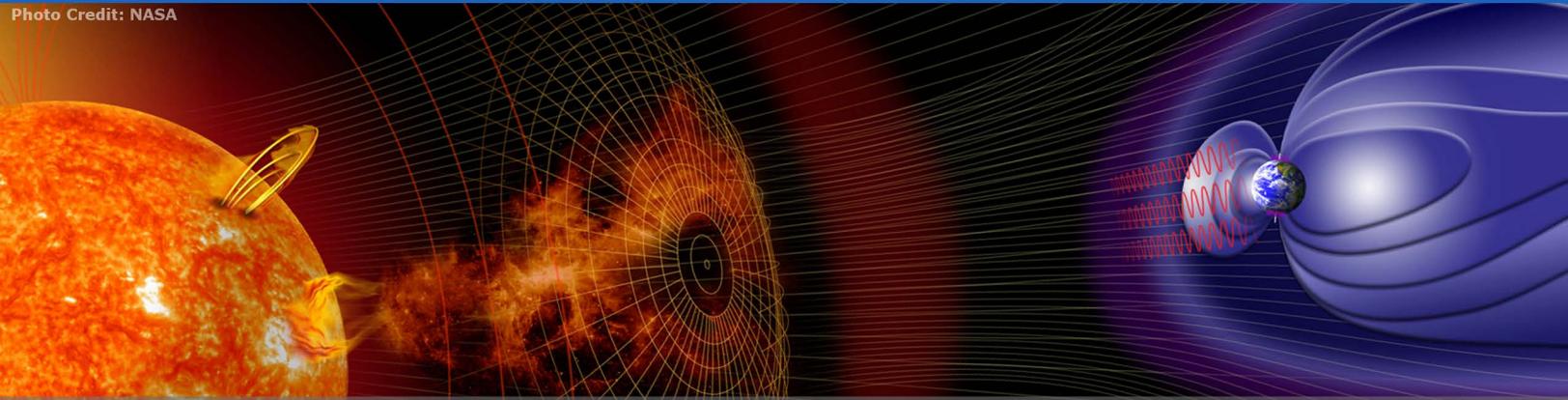


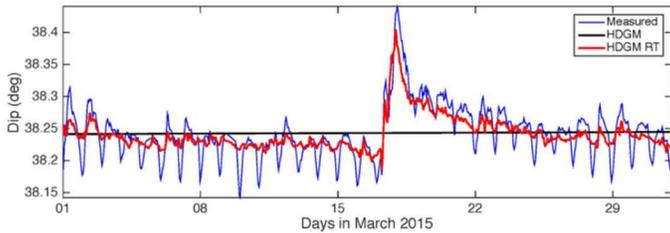
Photo Credit: NASA



High Definition Geomagnetic Model (HDGM-RT) Real-Time Disturbance Calculator

HDGM - RT

The US National Oceanic and Atmospheric Administration (NOAA), in partnership with industry and the University of Colorado have developed a real-time component for NOAA's High Definition Geomagnetic Model. HDGM-RT improves the HDGM by accurately modeling the magnetic fields originating in the Earth's magnetosphere in real-time using a combination of observing satellites situated between Earth and Sun and geomagnetic observatories on the Earth's surface. HDGM-RT saves rig-time and reduces drilling cost by enabling improved drill string interference correction during adverse space weather conditions.



Magnetic Model	Strength (F)	Dip	Azimuth
HDGM RT	87 nT	0.23°	0.17°
HDGM	109 nT	0.26°	0.18°

Figure 2: HDGM-RT (red) compared to observations at the Honolulu observatory (blue) during a geomagnetic storm, and the constant value provided by HDGM (black).

Table 1: Global 1-sigma errors at low-latitude observatories (magnetic latitude < 50°) and during magnetically active time (3-hourly ap index > 80).

Storm Time Modeling

Disturbances created by solar wind interaction with Earth's magnetic field can be quite significant, especially in low latitude regions, as shown by Figure 1. Figure 2 shows the improvement of magnetic field predictions due to HDGM-RT compared with the non real-time HDGM during such a geomagnetic storm. Errors of HDGM and HDGM-RT against global observatory data set during 2014-2015 can be seen in Table 1, above.

ngdc.noaa.gov/geomag/hdgm/hdgm_rt

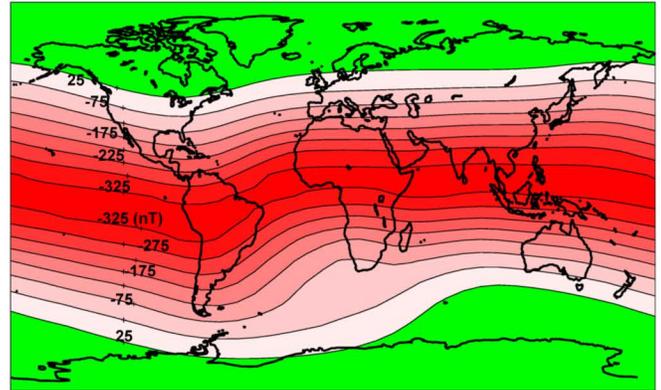


Figure 1: Magnetic disturbance field strength (nT) at the Earth's surface predicted by HDGM-RT during a magnetic storm in October 2003.

Measurement While Drilling (MWD)

HDGM-RT produces a significant advantage by providing a time-varying reference data for Measurement While Drilling (MWD) data processing. Figure 3 shows data from a site off the coast of Brazil during a geomagnetic storm in March 2015. Raw magnetic MWD survey data (top panel, blue) initially exceeded the quality acceptance limits (red) at several depths for Dip data. But data processed when referenced to the time varying HDGM-RT improves drill string interference correction (bottom panel). The initial acceptance criteria were based on local magnetic field values provided by HDGM (green).

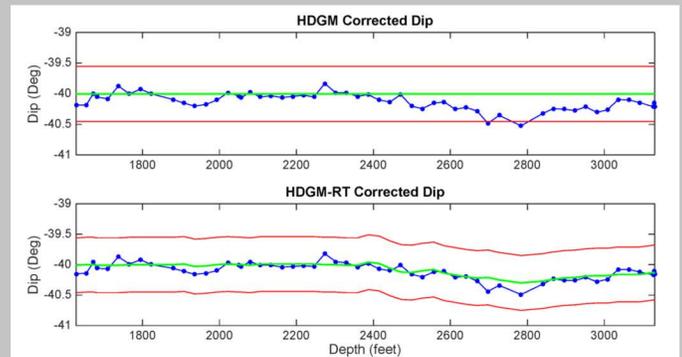


Figure 3: Measurement While Drilling Data during geomagnetic storm. Figure provided by Schlumberger.