In-Flight Calibration Processes for the MMS Fluxgate Magnetometers

Abstract

The calibration effort for the Magnetospheric Multiscale Mission (MMS) Analog Rocker (AR) and Digital Rocker (DR) magnetometers is a coordinated effort between three primary institutions: University of California, Los Angeles (UCLA), Space Research Laboratories, Inc., and Goddard Space Flight Center (GSFC). Since the successful deployment of AR magnetometers on 17 March 2015, the efforts to configure and update the ground calibrations has been underway during the MMS commissioning phase. This in-flight calibration process involves lengthy procedures to determine the absolute gains, and adjust the gain correction for the spin axis. The gain correction for the spin axis, as a function of sensor and electronics temperatures.

Method For Determining Offsets

1. Gain correction for the spin axis
2. Orthogonalization
3. Alignment to Spin Axis
4. Alignment to spin phase

Gain

- G_SA, alias, gain correction for the spin axis sensor gain.
- G_P12, alias, gain correction for the spin phase sensor gain.

Thetas

- Theta, alias, the sensor orientation relative to the orthogonal magnetometer system (degrees).
- Phi, alias, the sensor orientation relative to the Earth field direction (degrees).

Proposed solution

- Offsets: Orthogonalization, Alignment, Spin Axis, Spin Phase
- Gains: G_SA, G_P12
- Theta, Phi

Variation of Offset over 1 week

Dg_sp and Phi12

- Significant temperature dependence, but a single fit to the full orbit – using our statistical methods – gives values that have a good fit for the ROI.

Spin_x and Spin_y

- Significant temperature dependence, but a single fit to the full orbit – using our statistical methods – gives values that have a good fit for the ROI.

References