The GOES-16 MAG Inboard data is corrected for the solar Beta angle, which changes with the time of year. The corrections are performed for the Inboard Mag measurements in the E and P coordinates only, as the N-component of the EPN frame did not need any correction. The corrected variable in the data file is named "b_epn_ib_sa_corrected", and rest of the variables are the same as the original L2 files. Please see Table 1 below for version control.

NOTE:
Please use the Inboard MAG data for scientific research with caution. Contacting Dr. Fadil Inceoglu (fadil.inceoglu@noaa,gov), Dr. Paul Loto'aniu (paul.lotoaniu@noaa.gov), or Dr. Alessandra Abe Pacini first is recommended.

For more information, please go to: https://doi.org/10.1029/2021SW002892

Title:
"Using Unsupervised and Supervised Machine Learning Methods to Correct Offset Anomalies in the GOES-16 Magnetometer Data"

Abstract:
This study uses supervised and unsupervised machine learning (ML) methods to correct unwanted offsets observed in the NOAA GOES-16 magnetometer data. All GOES satellites have an inboard and outboard magnetometer sensor mounted along a long boom. Post-launch testing of the GOES-16 magnetometers found that the inboard sensor suffers significant thermally induced magnetic contamination and currently only the outboard sensor is used in NOAA operations. The contamination varies both diurnally and seasonally making it very difficult to correct using basic statistical methods. For simplicity in explaining the offsets we are trying to correct, and methods used, we focus on correcting only one of the inboard vector components, the E-component (Earthward). We start by applying the unsupervised k-Shape method to the magnetic field vector E-component outboard minus inboard sensor time series, ΔE, resulting in four clusters that are closely related to the time of year and the solar β angle, which is a measure of the amount of time that a satellite is in direct sunlight. We then utilized LSTM networks as regressors to correct the offsets observed in GOES-16 inboard sensor E-component data. We trained our LSTMs using GOES-17 magnetometer data, which we show to exhibit much less variability compared with the GOES-16 data. The correction results reduced the offsets in the clusters from between 3–5 nT and 0–2 nT standard deviations. The combining of unsupervised and supervised ML methods is a powerful technique that can be applied to space-based instruments that produce time series data.

Table 1. Science-quality L2 data versions.

Version	Platform	Release Date	Revisions
0-0-1	G16	8 February 2024	new variable added: b_epn_ib_sa_corrected, inboard magnetometer data in ENP coordinates corrected for thermal variability due to solar beta angle variations.