On calibration of the KAGUYA Lunar Magnetometer

Futoshi Takahashi[1]; Hisayoshi Shimizu[2]; Masaki Matsushima[3]; Hidetoshi Shibuya[4]; Ayako Matsuoka[5]; Hideo Tsunakawa[6]; TSUNAKAWA, Hideo KAGUYA MAP-LMAG Team[7]
[1] Tokyo Tech; [2] ERI, Univ. of Tokyo; [3] Dept. Earth Planet. Sci., Tokyo Tech; [4] Dep't Earth Sci., Kumamoto Univ.; [5] ISAS/JAXA; [6] Dept. Earth Planet. Sci., Tokyo TECH; [7] -

Since the insertion of KAGUYA into a polar orbit around the Moon at 100 km altitude October 2007, the Lunar Magnetometer (LMAG) had made continuous magnetic field measurements, just before KAGUYA went home on June 10, 2009. The LMAG observes the lunar crustal fields (magnetic anomalies), and the induced magnetic field responding to temporal variation of the external field observed as the IMF (Interplanetary Magnetic Field). Also, the electron reflectometry (ER) using the in-situ magnetic field data observes the magnetic anomaly on the lunar surface. The scientific objectives of LMAG observation are to clarify the origin of lunar magnetic anomalies and the lunar electrical conductivity structure, as well as the electromagnetic environment around the Moon. For these purposes, it is essential to suitably calibrate the instrument. Here, we summarize calibration results of the LMAG before launch and during the constancy phase (from December, 2007 to October, 2008). Calibration of LMAG data is carried out based on ground experiment results and in-orbit data. Sensitivity of the LMAG fluxgate sensor and its temperature dependence are investigated in the ground test. Alignment calibration is performed in-orbit by measuring the artificial magnetic field generated by SAM-C (Sensor Alignment Monitor Coil). The sensor offset is estimated using the modified version of the Davis-Smith method. Calibration of the LMAG is stably carried out with a precision appropriate to achieve LMAG scientific objectives. As a result, we have successfully obtained a global magnetic anomaly map. In addition, we find some interesting data in time-series such as magnetic field modulation above magnetic anomalies excited by the interaction of crustal magnetic field with the solar wind. Such a phenomenon can thoroughly be examined using magnetic field data by LMAG and plasma data by PACE (Plasma energy Angle and Composition Experiment) together. The LMAG database for the constancy phase will be opened to public for scientific use since November 2009.