Preliminary results of the Multiband Imager for the SELENE mission

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The Lunar Imager/SpectroMeter (LISM) is an instrument developed for the SELENE (KAGUYA) mission. SELENE was launched by an H-IIA Launch Vehicle on September 14, 2007, from Tanegashima Space Center. LISM consists of three subsystems, the Terrain Camera (TC), the Multiband Imager (MI), and the Spectral Profiler (SP).

The MI is a high-resolution multiband imaging camera consisting of visible and near-infrared sensors. It acquires push-broom imaging data by using selected lines of area arrays. The spectral band assignments are 415, 750, 900, 950 and 1000 nm for the visible spectrum and 1000, 1050, 1250 and 1550 nm for the near infrared spectrum. The spatial resolution of visible bands is 20 m, and that of near infrared bands is 62 m from the 100 km SELENE orbital altitude. One of the important scientific goals of MI is to investigate small but scientifically very important areas such as crater central peaks and crater walls. Investigations of such small areas will help answer current questions such as the existence, chemical composition, and source of olivine at the central peaks of some craters. One of the other important targets of MI is to search for the most primitive lunar crustal materials such as magnesian anorthosites suggested to be located on the lunar far side from recent lunar meteorite studies.

MI successfully took its first lunar images on November 3, 2007, using two orbits during SELENE's check-out period. The orbit of the SELENE main satellite on the day of the LISM-MI first check out already had been set to be nominal, which is polar orbit 100 km in altitude. The Sun elevation angle (incidence angle) of the first light was more than 32 degrees. During the first check out, MI took more than 3500 images (in nine bands) of the lunar surface. The first light data confirmed MI's performance to be as follows.

-We obtained very clear MI images, demonstrating that the MTF of MI is sufficient and had not been changed by launch. It also indicates the advantages of MI's high resolution for understanding detailed features of the crater.

-The dark current and flat field appears to be roughly the same as the pre-flight data, but detailed evaluations using in-flight dark current temperature dependence and flat field coefficient are under way. We adopted primary in-flight dark current temperature dependence and flat field coefficients made by using limited data sets acquired through the check out period.

-The MI response had not changed drastically compared to the pre-flight optical test data 1.5 months after the SELENE launch even though we need more precise calibration to estimate the response change quantitatively. No defective pixels have been found in either the VIS and NIR detector. Relative responses between different bands have also been preserved, and the color ratio composite successfully demonstrates heterogeneous distribution of ejecta near the crater rim.

-No stray light component (either spatial and spectral) has been identified.