Compositional distribution of the lunar mare basalts derived from ALIS data

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The compositional distribution of the lunar mare basalts is important for understanding of the compositional distribution of the lunar interior and its evolution. Remotely sensed spectral data of the lunar surface are useful to investigate the composition of the mare basalts and their spatial distribution. Especially, continuous reflectance spectra allow us to know the detailed chemical composition of minerals such as pyroxenes and olivine. In this study, we used the spectral data of the lunar surface derived by Advanced Lunar Imaging Spectrometer (ALIS), and mapped mare basalts on the nearside of the Moon.

ALIS is a ground-based telescopic imaging spectrometer, which consists of a cassegrain telescope with 200 mm aperture and 800 mm focal length, and two spectroscopic cameras (VIS and NIR) (Saiki et al, 2004). It can obtain a hyper-spectral image cube of the lunar nearside covering the visible (380-1060 nm) and near-infrared (1000-1700 nm) regions at high spectral resolutions (VIS: 5 nm and NIR: 9 nm). It provides us not only the spectral images of the lunar surface, but also the continuous spectra of any points of the lunar nearside.

The spectral image cube data of the Moon used in this study was derived on September 30, 2004 at Tsukuba Space Center of JAXA. The data was calibrated by applying following corrections: (1) subtraction of dark current, which was derived for each measurement, (2) removal of non-uniformities of sensitivity across the detectors using the calibration data obtained by observing the integrating sphere (Tsukuba Space Center, JAXA), and (3) wavelength corrections. The wavelength correction coefficients were derived by observing the low-pressure Hg lamp. Using the calibrated ALIS data, we mapped the mare basalts on the lunar nearside.

We are currently mapping the mare basalts based on the abundance and compositional distribution of the pyroxene and olivine. These minerals cause a strong absorption near the 1-micrometer. Their composition and abundance appear on the spectral shape in this band. We examine the width, depth, and the peak wavelength of the spectra at 1-micrometer band and estimate the relative abundance or composition of these minerals. We will present the result of the spectral analysis, in addition to the result of the evaluation of the optical performance of ALIS.