

Performance Evaluation and Application of Advanced Lunar Imaging Spectrometer ALIS

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ALIS (Advanced Lunar Imaging Spectrometer) is a telescopic imaging spectrometer which we developed for Space Station Lunar Observatory project. A future purpose of this project is to establish the photometric model of the moon as a spectral radiance standard of space-borne imaging instruments by repeated observation of the moon with VIS/NIR (Visible and Near Infra-red light) from the International Space Station.

A ground-based model of ALIS has been developed through a Phase-IA research of 'Ground-based Research Announcement for Space Utilization' (PI: K. Saiki) promoted by Japan Space Forum. Within this near-term project, telescopic imaging spectrometers have been developed and examined through ground-based observation of the moon. Even by the ground-based observation, ALIS will enable us to study the photometric properties of the lunar surface after we complete the absolute radiometric calibration and to study the geological properties of the lunar surface by the calibrated lunar spectral images. These applications are in progress financially supported by the Japanese Ministry of Education, Culture, Sports, Science and Technology, Grant-in-Aid for Young Scientists (A), #16684016,2004 and in collaboration with ALIS users group. Most of the users are the member of SELENE-LISM(Lunar Imager and Spectrometer) Science team.

ALIS is ordinarily located in ALIS-Dome at Osaka Univ. ALIS is composed of a cassegrain-type telescope and two spectrometers; Visible (VIS:380-1060 nm with 5 nm resolution) one and Near Infrared (NIR:1000-1700 nm (2400nm in the future) with 9 nm resolution) one. The aperture size of the telescope is 200mm and the focal distance is 800 mm. Each spectrometer is composed of an imaging sensor and a prism-grating-prism unit named 'ImSpector' made by Specim corporation. VIS sensor is Spectra Video SV512 (Pixel Vision), and NIR sensor is SU320MS-1.7RT(Sensors Unlimited). These spectrometers take '1-line spatial resolution' x 'wavelength resolution' image as one shot. Line images are assembled by scanning image on a slit of the spectrometer with rotating mirror. The mirror is also used to switch VIS-system and NIR-system. Spatial resolution of ALIS-VIS is 6.188"/pixel and that of ALIS-NIR is 6.435"/pixel. The visible and Near Infrared imaging spectrometers of ALIS can be mounted on a microscope. For microscopic analysis, a sliding stage is used for scanning in place of rotating mirror.

Absolute radiometric calibration of ALIS has been conducted with a 1-meter integrating sphere at Institute of Space Technology and Aeronautics, JAXA with the help of Mr. Y. Yamamoto. This integrating sphere is routinely calibrated to the fixed-point blackbody sources at JAXA. Through the calibration, the pixel-to-pixel sensitivity variation and the deviation of wavelength linearity were evaluated. These problem can be solved by correction soft-ware.

We will discuss the accuracy of our observation and present progressing projects. This talk is also an introduction of the following talks on ALIS application.