The strategy for the spread of lunar spectroscopic geology using small telescopes

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The term - Spectroscopic geology - is used here for the research field which estimates the lithology and chemical compositions of lunar surface from an spectroscopic observation and discusses about the evolution process of the crust of the area and the whole moon. The multi-band image data of Clementine of the 1994 launch developed this research field. It is expected that big progress is carried out by continuous-spectrum observation being attained by the SELENE project of the launching schedule in 2005.

On the other hand, the number of trained people who can interpret geologically the data is few. There is not so much knowledge required in order to start spectroscopic lunar geology, because the information acquired from the moon is still few. By development of a computer, also in amateur's position, the latest data may be processed and new discovery may be able to be achieved.

Here, three activities which aimed at the spread of spectroscopic lunar geology and the practical use of lunar spectral data are introduced.

(1) The activity for the spread of spectroscopic lunar geology using a small telescope

Assembling an astronomical telescope, cooling CCD devices, and band-pass filters, we proposed a small multi-band telescope for the observation of spectroscopic features of the lunar surface. Because a complicated photometric correction and band calculation were required in order to make an images into chemical distribution map, the software tools for realizing it on a personal computer was developed (Saiki et al., 2000). For the higher accuracy, a field integrating sphere is also developed (Saiki et al., 2001). Such know-how is exhibited to an author's web site.

(2) The activity for the spread of the latest image analyses methods.

To examine and understand the latest image analyses methods, the author created software named AkitaView. Users can browse and analyze the image of the UVVIS (ultraviolet-visible) camera of the Clementine with AkitaView running on a personal computer. The image of Clementine can be downloaded freely from the NASA web site. In AkitaView some image analyses procedures are preset. They are the analysis which estimates Fe content and Ti content on the surface of the moon by the method of Lucey et al. (2000), the analysis which recognizes the kind of plutonic rocks exposed to the surface of the moon by the method of Tompkins & Pieters (1999), analysis sensitive to a glassy materials, and analysis sensitive to rock containing an olivine. AkitaView enables users to understand the strong point and demerit of the current analyzing method for a short period of time. There is also a function to try the simple calculation between bands in AkitaView, and the original image analyses method can be tried.

The author hopes that the concern of amateur or a researcher would turn to the geology of the moon by the above-mentioned activities.

(3) The activity for the lunar observation project from the International Space Station (ISS)

The future purpose of this project is to observe the moon with telescopic imaging spectrometers from ISS and to establish the moon as a spectral radiance standard of space-borne imaging instruments. Within the near-term project, telescopic imaging spectrometers will be developed and examined through ground-based observation of the moon. The photometric characteristics of rocks and minerals will also be studied for getting a better photometric model of the lunar surface. This project is carried out as a part of Ground-based Research Announcement for Space Utilization promoted by Japan Space Forum.

The know-how acquired by the development of the telescope for ISS will be opened to the observation network and that acquired in the network will be fed back to the development of the telescope for ISS. In such a cycle, the new idea for the data analysis technique or the new geological model for the moon may be brought about.