

Unsupervised Classification of the Moon's Surface Reflectance Spectra and Geological Significance (1)

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Great successes of recent lunar missions provide vast amount of varieties of remote sensing data. Analysis of those new data provide some new key evidences, such as pure-plagioclase rocks (e.g., Ohtake et al., 2009) and olivine rich rocks (e.g., Yamamoto et al., 2010), for studying solidification process of the Lunar Magma Ocean (LMO) and following lunar evolutions. Those key evidences require us to reconsider the LMO solidification process. One approach to study this problem is requiring following step, reconstruction of compositions and structures for primitive crust by removing influences of volcanisms, impact cratering, and other geological effects. For reconstructing primitive crust, we have to generate a global geological map covers recent findings, so we started a project to build a new lunar geological map to reconstruct structures and composition of the lunar primitive crust. Because of huge volume of recent data set, fully manual classify by expert researchers is not realistic, and then, we have been trying to use some data mining methods for basic unit candidate estimation.

In this study, we show some classification results of SELENE Multiband Imager (MI) data and Spectral Profiler (SP) data applied data mining methods, and compare them with a fully manual classification result for a limited area. Our classification procedure consists of two steps; Independent Component Analysis (ICA) and Iterative Self-Organizing Data Analysis (ISO-DATA). Detail strategy of our procedure is presented by Hareyama et al. in this meeting.

Our procedure generally works well. The classification results in mare region indicate that could detect some types of mare basalt flows. Especially high-Ti basalt in Oceanus Procellarum and the Mare Tranquillitatis are clearly identified. Ejecta deposits of fresh ray craters are also clearly identified. In addition, we compare classification results our procedure around the Aristarchus region with that of fully manual classification result by a researcher (M.O.). These two agrees each other generally. Then, we consider our procedure capture the lunar geological context and useful for the first step of building lunar geological map.

Keywords: Moon, Geological Map, Unsupervised Classification