

Extension of the lunar Web-GIS “GEKKO” : Toward statistical analyses of the lunar spectral data

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The Spectral Profiler (SP) is one of the 14 kinds of observation equipments onboard the Japanese lunar orbiter Kaguya. The spectra of lunar minerals generally have characteristic absorption bands in the observed wavelengths by the SP. By comparing the observed SP spectra with the absorption bands of the known minerals measured in laboratories, we can identify the minerals distributed at the observation spots on the Moon.

A lunar Web-GIS named GEKKO [Hayashi et al, 2016] (Moonlight in Japanese) is a visualization system for the SP data. The GEKKO displays SP observation footprints on the overall images of the Moon on the GIS screen. The users can view the SP spectra observed at the exact spots and download the data very easily just by clicking in the GEKKO system.

Sugimoto et al. [2014] focused on developing a framework for implementing analysis functions to the GEKKO. A few limited functions were implemented for the simplest and preliminary analyses in their study which are not so practical though.

The goal of this study is to extend the framework of Sugimoto et al. [2014] for further implementation of practical analysis functions in the GEKKO. We aim to implement new analysis functions practically used for the VIS-NIR spectral analysis and statistical data analysis. We prepared the extended new framework and succeed in implementing the functions of principal component analysis (PCA) and clustering analysis. Both analysis methods are very major in multivariable data analysis. They are useful for the spectral analyses to understand the distribution of the lunar minerals based on the globally observed data. In the new framework, the analysis programs are modularized. So the provider can quickly and easily implement various kinds of analysis functions according to the users' requests. Once such analysis functions are installed, selection or combination out of various kinds of analysis functions are very flexible and completely up to the users. The users see the analysis results quickly on the web site and can get back to check the original SP spectra very easily, too.

The analysis of SP data is essential for the mineral mapping of the Moon. The new framework and implementation of various kinds of analysis functions to the GEKKO is an important step for statistical analyses of the lunar spectral data toward global mapping of the mineral distribution.

References:

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