Estimation of Iron abundance around Apollo landing site using image-based sampling and absorption depth of Moon Mineralogy Mapper (M3) hyperspectral data

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Estimation of mineral abundance of moon has been conducted since Apollo mission succeeded in landing on moon and collecting rock samples. Previous studies are based on mineral content and spectroscopy data of lunar samples that NASA Reflectance Experiment Laboratory (ReLAB) provides. These data have been used to estimate abundance of some useful minerals, such as iron and titanium, and map it. The representative way of estimation is done by using multispectral image from Clementine sensor or hyperspectral image from Moon Mineralogy Mapper (M3) sensor. However, these methods compare spectroscopy from laboratory with satellite images, so it can cause errors due to the difference of environments between them. In this study, image-based sampling was used to reduce these kinds of errors. Iron abundance of one pixel of images is averaged from lunar samples. Correlation between spectral characteristics of this pixel and averaged iron abundance was analyzed with absorption depths of 970nm, 1190nm, and 2138nm of M3 data. By combining the absorption depth of these wavelengths, correlation between these absorption depth and iron abundance was observed. With this correlation, both iron estimation model by regression, and iron abundance map around Apollo landing sites were suggested. By comparing the iron map with the map from Lucey algorithm, it is concluded that the suggested algorithm show similar tendency.

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