OPTIMIZING OF THE PHOTOMETRIC FUNCTION BY USING STATISTICAL PROCESSING OF CLEMENTINE UVVIS IMAGES

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Introduction: The surface brightness of the Moon depends on viewing geometry which is specified by the position of the Sun, the Moon, and a spacecraft. The Clementine UV-VIS images are normalized to the reflectance expected at an incident angle and phase angle of 30 degrees and an emission angle of 0 degrees. The spectral feature of the surface materials depend on their physical properties (such as the size distribution of the regolith, packing, etc.) and chemical properties (lithologies). Clementine's photometric correction parameters are not adjusted depending on these properties [1]. Even in some lithologically homogeneous regions, the reflectance changes with phase angle and it means that Clementine's photometric correction parameters are not perfect.

Analyzing method: Using Clementine UV-VIS images, we classified the lunar surface according to abundance of FeO derived by Lucey's algorithm [2] and obtained histograms of the reflectance for every phase angle in the low-FeO (< 10 wt%) region. We checked phase angle dependence of the mode of reflectance in the low-FeO region on both near and far side of the Moon separately. Next, we optimized parameters of phase function to reduce phase angle dependence of the mode of reflectance. And using optimized parameters, we recalculated the abundance of FeO.

Result: In the low-FeO region on the far side of the Moon, the mode of the reflectance is almost constant, and has no phase angle dependence. In this area, Clementine's photometric correction parameters work well. On the near side, however, the mode of reflectance has phase angle dependence and increases with phase angle. On the near side, the mode of FeO content recalculated by using optimized parameters is 5.1 wt%. This result is smaller than 5.9 wt% using Clementine's photometric correction parameters.

Discussion: Spectroscopic behavior of the surface materials in the highland on the near side of the Moon is different from that on the far side. However, recalculated FeO content on the near side is close in value to 4.1 wt%; the mode of FeO content on the far side. The previous study [3] suggested that FeO content of highland on the near side of the Moon is different from that on the far side. Our result indicates that within the highland, the surface materials on the near side of the Moon are lithologically similar to that on the far side. On the other hand, spectroscopic behavior of the surface materials indicates the difference of physical properties between the near side and the far side.

References: [1] McEwen A.S. et al., 1998. Abstract #1466. 29th Lunar & Planetary Science Conference. [2] Lucey P. G. and Blewett D. T. 2000. *Journal of Geophysical Research* Vol. 105, pp. 20,297-20,305. [3] Lucey P. G. 1996. *Journal of Geophysical Research* Vol. 103, pp. 3,679-3,699.