

Lunar Phase Function: Geological Dependence and Photometric Correction of Multi-band Images

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An accurate phase function is necessary for precise photometric correction of the Clementine lunar UVVIS images. Although several researchers have proposed photometric models for Clementine UVVIS images using empirical phase functions, additional work is required for correction of the data at small phase angle (0-20 degrees), because the phase function at small phase angle is significantly dependent on both the wavelengths and the geology. We propose the iterative method of photometric correction, in which automatic clustering of multi-band spectrum by Self-Organizing Map (SOM) method and determination of phase function for each spectral group are successively conducted. The result suggests that normalized phase curves of mare are steeper than the curve of highland at phase angles smaller than ~20 degrees. The difference between highland and mare increases up to 7.6 % at phase angle 6 degrees and at 950nm band. The variation of phase functions is also observed among the different mare, among which the cluster of the high Ti mare has the highest phase curves. The difference of phase curve between different maturity groups is smaller than the difference between compositionally different groups such as highland and mare. The result suggests that our new method significantly improves the accuracy of the resulting multispectrum and thus improves understanding lunar surface geology.