Modeling Chandrayaan-1 Hyperspectral (HySI) Data for Mineral Mixing Analysis using Hapke's Bi-directional Reflectance Function

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Abstract: The radiative transfer model based on the radiative transfer equation which is used to estimate that how the electromagnetic wave behaves when it interacts with a particular medium. Radiative transfer models takes in to account not only mineralogy but also particle size, space weathering, temperature and other physical factors. The space weathering is the primary process involved on the lunar surface which has the strong influence on the reflectance properties because of the accumulation of small submicroscopic iron. To model the measured reflectance spectra of Chandrayaan-1 Hyperspectral Imager (HySI) data we have obtained an artificial reflectance spectrum using Bi-directional reflectance function (BRDF) based on the equation of radiative transfer proposed by Bruce Hapke in the series of his research papers [1-4]. For better prediction of the surface mineralogy with mass fraction along with the other parameters like grain size, porosity, phase function, degree of space weathering from the area under study by creating artificial reflectance spectra using pure end member spectra from RELAB.

The results obtained from modeling process shows the high mass fraction of clinopyroxne and low Orthopyroxene content for small fresh craters spread across the study area. The highland spectra shows high mass fraction for plagioclase. The mature spectra shows overall low reflectance and model return high iron content for such spectra with high agglutinates.

References:

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