



Analysis on establishing Chang'E-3 landing site as a reflectance calibration target

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Recent lunar orbital observations suggested that the surface reflectance calculated based on the Apollo 16 standard area and Apollo 16 sample laboratory measurement is significantly different from its true value [1-3], one reason is the composition and maturity differences between the 62231 sampling site and the Apollo 16 standard site existed, the other reason is the physical properties of the returned lunar sample, such as porosity, have been changed during the sampling operations. So more new standard targets on the Moon, besides the widely used Apollo 16 area, are needed for imaging spectrometers on lunar missions to improve their reflectance calibration accuracies. The Chang'E-3 VIS/NIR Imaging Spectrometer (VNIS), which is just fixed at the front of the Yutu rover [4], equipped with a white spectralon panel as reflectance calibration standard, can perform in situ multispectral observations around the Chang'E-3 landing site without altering the physical and mineralogical natures of lunar soils. Therefore, it provides an opportunity to establish a new reliable standard target for in-flight reflectance calibration.

The reflectance calibration target should be compositional homogeneous, the topography of which must be flat, and the reflectance should be identical with no nearby units of other different materials. As we have known, Chang'e-3 probe landed on the Mare Imbrium basin in the east part of Sinus Iridum, the landing site is relatively flat at a spatial coverage of $\sim 660\text{km}^2$, and this region belongs to Eratosthenian low-Ti/high-Ti mare basalts [5-6]. According to much higher resolution topography data, elemental data and reflectance data of Chang'E-2 and Chang'E-3[7-8], we preliminary analyse the possibility on establishing Chang'E-3 landing site as a reflectance calibration target. Firstly, the overall terrain of the $4\text{ km}\times 4\text{ km}$ area around the landing site is flat, but there are still three bigger craters existed. Secondly, the composition on Chang'E-3 landing site is homogeneous according to the two detection results of APXS on elements in lunar soil. At last, we compare and scale the four detection points' reflectance of VNIS, which demonstrate that the reflectance of the landing site are quite similar at the spectral range 450nm-1750nm, but differences still existed beyond 1750nm.

Future work is still needed, such as photometric calibration of VNIS data, and errors estimation on reflectance calculation. Besides, the location and spatial coverage of the reflectance calibration target should be determined and its calibration accuracy should be evaluated.

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