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The implications of Chang'e-3 VIS/NIR Imaging Spectrometer in-situ analysis data

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The study of mineralogy helps in understanding the geologic evolution of the lunar mare and the resource of the basalt. The Visible and Near-infrared Imaging Spectrometer (VNIS) as a part of the Chang'e-3 mission is fixed at the front of the rover, which is the first time that VNIS has been developed for in-situ analysis on the lunar surface. According to the spectral feature analysis [1], the landing site could be enriched in olivine which is consistent with the results of Thiessen[2]. Olivine is important to understand the comppsitional and structural evolution of the lunar because it is a main material of the lunar mantle. About the origin of the olivine-rich material, there are two possible scenarios are proposed by Yamamoto et al[3]. One is that the olivine-rich exposures originated in the upper mantle, and the other is in the mafic-rich lower crust. The olivine-rich locations are mostly located along the maria boundaries [3,4]. The geology map of the CE-3 landing site shows that it is within the border of two basalt strata, and the landing site is in the Eratoshenian basalt stratum[5,6].This can be explained that each basin formation could have blasted away the upper crust, excavating and redistributing deep-seated olivine-rich matrrial to the rim[3,4]. A global survey of the lunar surface was conducted using the Spectral profiler onboard the lunar explorer SELENE/Kaguya[3]. It shows that most of the olivine-rich sites are located around impact basins. And around Imbrium, the terrace in the Sinus Iridum is one of the olivine-rich site. The rediative transfer modeling supports the concept that materials in the olvine rich sites originated in the upper mantle[3]. The space weathering could have influence on the mineral spectra, thus the method based on the spectral absorption position can only identify the freshly-exposed minerals. Although further work is required to improve the quality of the VNIS data, and the mineral quantification need to be performed, we believe that at least the identification of the minerals gives us valuable imformation about the landing site.

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