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Mineralogy of the far-side lunar surface explored by Chang'E-4 with visible and near-infrared reflectance spectra

Gen Ito¹, Jessica Flahaut¹, and Jun Huang²

¹Centre de Recherche Pétrographiques et Géochimiques CNRS, Vandoeuvre-lès-Nancy, France (gen.ito@univ-lorraine.fr)

²Planetary Science Institute, China University of Geosciences, Wuhan, China

The far side of the Moon, which has generally been less frequently targeted by robotic and human missions in the past, has become more available for compositional analyses with measurements made by the Chang'E-4 mission that landed in South Pole-Aitken Basin in 2019. The rover of the mission, Yutu-2, has traversed over 500 m now and acquired more than 100 measurements of visible and near-infrared (VNIR) reflectance spectra. In this study, we analyze the full set of VNIR reflectance spectra collected so far in order to better understand the geology of the Von Karman mare. We compute spectral parameters to quantize major features of spectra and infer mineralogy, e.g., pyroxene composition analysis using the relationship between spectral band depths at 1 μm and 2 μm . Many of Chang'E-4 spectra do not have a detectable spectral band at 2 μm in which case we use spectral parameters for the band at 1 μm to make classifications and infer the presence of other minerals. Pyroxene composition inferred from Chang'E-4 spectra are midway between orthopyroxene and clinopyroxene, showing noticeably unique grouping when compared with 1 μm and 2 μm band depth data available from past studies. For spectra without detectable band at 2 μm , initial classification efforts based solely on spectral parameters of the 1 μm band seem to indicate that at least two distinct groups exist. We are further investigating these preliminary findings, such as through comparisons to data from Moon Mineralogy Mapper, to better understand the mineralogy of the measured materials and the geology of the region explored by Yutu-2 rover.