

Mons Malapert: A Potential Site for Lunar Outpost

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Polar regions of Moon are going to be the main targets to be explored in near future with several planned landing and orbiter missions. The main objective of exploring the polar regions is to detect exact nature, extent and origin of volatile exposures. The Permanent Shadow Regions(PSRs) from poles are main reservoirs of water/volatiles (Sanin et al., 2012, Li et al., 2018). A recent study by Flahaut et al., 2019 describes fourteen potential regions of interest (ROI) from south pole that can be considered by future missions for combined volatile and geologic investigations. The selected ROIs falls under the range of solar illumination from 24-37% which is a main constraint to be considered for solar-powered lander/rover missions. In this study, we propose Mons Malapert (MM, ~30×50 km mountain) as a potential site to be considered for lander/rover missions. The site is located on rim of South Pole Aitken(SPA) basin and receives constant illumination condition (87 to 91% of year), constant visibility from Earth, and proximity of PSRs (Basilevsky et al., 2019). Our main focus is to understand morphology and mineralogy of MM region and examine access to nearby PSRs; Cabeus, Haworth, and Shoemaker. For this work, we used the reflectance data obtained from Moon Mineralogy Mapper(M³) instrument (Pieters et al., 2009) onboard Chandrayaan-1 (Goswami and Annadurai, 2009) which operated in VIS-NIR (0.54 μm- 2.97 μm) with 140 m/pixel resolution. We generated a mosaic from fourteen M³ data for extracting mineralogical information from fresh craters. Our spectral analysis suggests that few of fresh craters from study area have mafic mineral exposures. Apart from various technical challenges involved, missions proposed for future lunar landing at this site should be supported by a well-defined context for their feasibility and scientific exploration. For this purpose, we have also carried out analysis of its surface topography and surface/sub-surface thermophysical properties. The region exhibits steep slopes in the range ~20 to 30° on summit which could be a limitation to be considered for future mission planning. We will present complete characterization of MM region and surroundings by combining spectral and morphological studies along with thermophysical behaviour at this site.

References:

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