Basaltic Compositional Variability of Crater Le Monnier Using Chandrayaan-1 HySI & M3 Data

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Crater Le Monnier ($25^0$51'N, $30^0$27'E), having a diameter of around 60 km, is an old impact crater on the eastern flank of Mare Serenitatis. The western part of its rim is missing, allowing it to be connected to Mare Serenitatis, forming a large bay. The crater is flooded with basalts ranging in age from Late Imbrian to Eratosthenian. This crater was exploration site for Lunakhod 2 robotic vehicle of erstwhile USSR in 1973. Abdrakhimov [2009] have reported TiO_2 estimates along the path of Lunakhod-2 rover using UVVIS data from Clementine mission to be within 4-6 % for mare regions and 0.5-2 % for highland regions. Another study have reported low TiO_2 wt% (~ 1-2 %) for the mare basalts on the floor of Le Monnier. In this study, we have used high spatial (~80 m) and spectral (~15nm) resolution Hyperspectral imager (HySI) data in 0.42-0.95 μm spectral range from Chandrayaan-1 mission to study compositional variability within a portion of the crater Le Monnier. On the basis of spectral reflectance curves derived for fresh craters on the Le Monnier crater floor and a titanium map prepared using UV/VIS ratio of 450/750nm bands, it has been inferred that three distinct types of basaltic units exist on the crater floor. These units differ slightly in titanium content and are superposed at certain locations as indicated by exposures of the older units (lower TiO_2) within small fresh craters on the younger units (higher TiO_2). This suggests that possibly they were deposited during different episodes of magma extrusion. Basaltic flows with maximum and intermediate TiO_2 concentration covers the central and southern regions (containing the Lunokhod traverse), whereas, the ones having least TiO_2 have been observed in the northern and eastern side of the portion studied. Additionally, it has been observed that numerous zones of mass wasting exist on the northern rim of crater Le Monnier exposing fresh surfaces. Spectral reflectance study of these regions reveals A (anorthositic) to slightly AN (Anorthositic Norite) behavior for these areas. 1 μm and 2μm absorption band depths of these basaltic layers have been studied using Moon Mineralogical Mapper (M3) data.