Spectral variations across Apollo basin on the Moon

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Studies, e.g. (Ohtake et al., 2014, Moriarty and Pieters, 2018), reveal that the South-Pole Aitken (SPA) basin is unique, particularly because it is the deepest basin on the Moon and might be expected to expose the lunar mantle (Dhingra et al., 2018). The innermost part of SPA is rich in high Ca-pyroxenes, except for some central crater peaks, where low Ca-pyroxenes dominate. No extensive olivine-rich areas are observed, implying a mantle rich in low Ca-pyroxenes instead of olivine (Ohtake et al., 2014, Dhingra et al., 2018, Melosh et al., 2018). Furthermore, thorium anomalies have been discovered in two craters within Aitken basin (Lawrence et al., 2000). Here, we focus on the spectral analysis of one of the most interesting impact crater inside SPA, the Apollo basin. Recently, Ivanov et al., (2018) published a detailed geological map of the area surrounding Apollo basin (35.69°S, 151.48°W; D~524 km), using morphology, stratigraphy, crater size-frequency distribution measurements, and Clementine spectral data to define the unit. Our work explores data from the M3 imaging spectrometer onboard Chandrayaan-1 (Pieters et al., 2009) for this region. A preliminary analysis of Apollo basin emphasizes a spectral variability between the smooth terrains within the floor and rest of the crater. The smooth terrains appear darker and show a clear compositional variation with respect to the surroundings regions, indicating the presence of other mineralogical phases mixed with pyronexes, and/or a different geological context.
These study is part of the PLANMAP project, and the integration of the spectroscopical information with the results from Ivanov, et al., (2018) will permit to produce highly informative geological maps of the Moon (https://www.planmap.eu/).

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