

## Intergrating morpho-stratigraphic and spectral units on Apollo basin on the Moon.

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Apollo basin (10°–60°S, 125°–175°W, 492 km diameter) lies within the northeastern edge of the ~2500 km South Pole-Aitken (SPA) basin [1]. Because it is one of the largest and deepest basins within SPA that postdates the formation of SPA, it has been selected as a region of interest for the PLANetary MAPping (PLANMAP - H2020 n°776276) project [2]. Apollo basin has also been investigated as a candidate landing region for robotic and human exploration [3]. GRAIL gravity data reveal an average crustal thickness on the floor of SPA of ~20 km and within the Apollo basin of only ~5 km, meaning that mantle material may be exposed there [4,5]. However unlike the Earth, SPA is not dominated by olivine, but rather by low calcium pyroxenes, suggesting a different composition of the Moon upper mantle [6]. Crater size-frequency distribution studies indicate that Apollo basin is one of the youngest pre-Nectarian basins, with an estimated age of ~3.98 Ga according to [2] and 4.14 Ga following [7]. Models and observational data suggest that the basin was created by an impactor of ~40 km in diameter traveling at 15 km/s into 20–40 km thick crustal material [8]. A morpho-stratigraphic analysis of this region reveals the presence of two main units: cratered terrains and plains-forming materials created by deposition of both volcanic flows and impact melt breccias [2]. To complement this analysis, here, we study the Apollo area from the spectral stand point. We consider the Chandrayaan-1/M3 data to produce hyperspectral maps of the Apollo region to derive proper spectral parameters (e.g. albedo, center and depth of the absorption bands and spectral slopes), useful for identifying spectral units that can augment and improve the morpho-stratigraphic ones defined in [2]. This work is essential not only to identify more detailed geological units – linking compositional and morpho-stratigraphic information – but in a broader view to better understand the origin of this intriguing region of the Moon.

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