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Lunar Floor-fractured crater: An indicator of shallow crustal magmatism on the Moon

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Crater Pitatus (29.8°S, 13.5°W) is a Pre-Nectarian aged class-6 lunar floor-fractured crater (FFC) with ~100 km diameter, located on the southern margin of Mare Nubium, to the north of Gauricus crater. FFCs are a typical lunar impact feature distinguished by a shallow fractured floor and other morphological features (viz. fault scrap, graven, moat, mare patches etc.) from its other counterparts on the lunar surface (1, 2). In this study, we have conducted a detailed analysis of the mineralogical diversity present in the area using high-resolution hyperspectral datasets from the Chandrayaan-1 Moon Mineralogy Mapper instrument and Kaguya's Multiband Imager (MI) mineral abundance map. Our studies show that the exposures from the central peak area bear the signatures of high-Ca pyroxene (HCP), whereas the crater floor and the rim area have the spectral signatures of HCPs and low-Ca pyroxenes (LCPs). The crater floor also exhibits some variable but well-distributed exposures of Ti-bearing basaltic deposits. Hence, it can be inferred that the Pitatus crater formed by a large-impact event after the formation of Mare Nubium. During impact, the deeper crustal mineralogies (like HCPs and LCPs) might have been excavated to the surface and deposited on and around the central peak region. However, the original crater floor composition that was produced during the impact event was covered by the subsequent mare-flooding. On the other hand, the varied composition of Ti in the basaltic deposits in the mare-filled crater floor suggests the occurrence of multiple episodes of volcanic eruptions. Some scattered spinel exposures in the southern rim might be re-excavated products of the preexisting spinel lithology that has been captured from the deeper part of the lunar crust during the basin-forming impact event. Therefore, this study proposes that the Pitatus crater has witnessed multiple episodes of magmatic activity since its formation, defining the active and dynamic nature of the lunar magmatic environment at the time.

References:

[1] Jozwiak, L. M., Head, J. W., Zuber, M. T., Smith, D. E., & Neumann, G. A. (2012). *Journal of Geophysical Research E: Planets*, *117*(11), 1–23.

[2] Schultz, P. H. (1976). *The Moon*, *15*(3–4), 241–273.