

# **SEDIMENTOLOGICAL ANALYSIS OF IN SITU LUNAR REGOLITH FROM APOLLO 17 DOUBLE DRIVE TUBE 73001/2 USING X-RAY COMPUTED TOMOGRAPHY**

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## **ABSTRACT**

In 1972, the Apollo 17 crew collected double drive tube cores 73001/2 at Station 3 about 50 m east of the Lara crater rim in the Taurus-Littrow Valley, on a lunar landslide known as the Light Mantle deposit. The upper section (73002) and lower section (73001) are aluminum drive tubes 35 cm in length with an inner diameter of 4.12 cm. Combined, the core sampled lunar regolith to a depth of about 70 cm. However, an unknown but significant amount of material fell out of 73002 during core separation before it was capped. As part of the Apollo Next Generation Sample Analysis (ANGSA) Program, the core was imaged at the University of Texas High-Resolution X-Ray Computed Tomography (UTCT) Facility. The whole-core datasets of 73001/2 provide insight into in situ regolith from a lunar landslide. We present a sedimentological analysis of the regolith by observing changes in the density profile with depth and determining shape characteristics of distinct lithologies. Lunar peds, or cohesive aggregates of soil, found within the unconsolidated regolith in 73002 slice images remained intact and represent the true state of the regolith before the disruption caused by material loss during capping. These 73002 peds and undisturbed regolith from 73001 revealed that density decreases with depth down the core. The lithologies measured within the core include high-Ti basalts, regolith breccias, and impact melt breccias. Each lithology was segmented using machine learning models and exported into Blob3D software to extract measurements of individual particles. The distribution of calculated shape parameters such as axis ratios  $b/a$  and  $c/b$  with grain size show distinct shape characteristics for individual lithologies. Particle shapes show signals of both fragmentation and rounding. Rounding is an unexpected feature for the lunar surface given the lack of water and atmosphere, and is likely to have taken place during the landslide, which had a runout distance of 10 km.



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