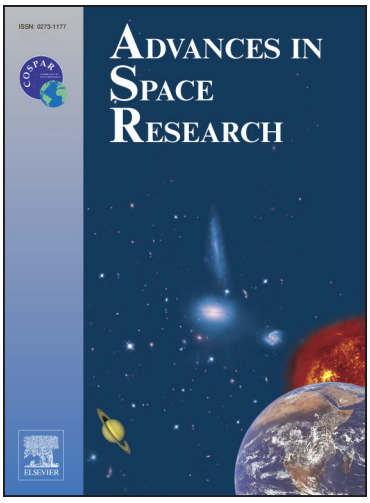

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Investigating the Soil Removal Characteristics of Flexible Tube Coring Method for Lunar Exploration

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Abstract

Compared with other technical solutions, sampling the planetary soil and returning it back to Earth may be the most direct method to seek the evidence of extraterrestrial life. To keep sample's stratification for further analyzing, a novel sampling method called flexible tube coring has been adopted for China future lunar explorations. Given the uncertain physical properties of lunar regolith, proper drilling parameters should be adjusted immediately in piercing process. Otherwise, only a small amount of core could be sampled and overload drilling faults could occur correspondingly. Due to the fact that the removed soil is inevitably connected with the cored soil, soil removal characteristics may have a great influence on both drilling loads and coring results. To comprehend the soil removal characteristics, a non-contact measurement was proposed and verified to acquire the coring and removal results accurately. Herein, further more experiments in one homogenous lunar regolith simulant were conducted, revealing that there exists a sudden core failure during the sampling process and the final coring results are determined by the penetration per revolution index. Due to the core failure, both drilling loads and soil's removal states are also affected thereby.

Keywords: Lunar exploration; Flexible tube coring; Soil removal

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