

# PRELIMINARY STUDY ON A NOVEL CORING SYSTEM FOR PLANETARY SURFACE SAMPLING

**S. PIRROTTA\***

*Italian Space Agency, viale Liegi 26 00198 Roma (Italy)  
e-mail: [assegnoricerca4.osu@est.asi.it](mailto:assegnoricerca4.osu@est.asi.it)*

## ABSTRACT

The upcoming phase of planetary exploration, after the on-orbit remote sensing and in-situ analyses by instruments on lander and rover, is the collecting of surface terrain samples with the final purpose to send them back to the Earth for accurate analyses; in fact, the so called sample-return missions are included in the long-term programs of every international agency. This paper illustrates the investigation and conceptual development of a coring system (Pyramidal Sampling System - PSS) with original geometry and an initial study for its actuation system. After the general description of the sampling mechanism, the validation of the novel principle of operation is highlighted together with the advantages of preserved stratigraphy and flexibility. Then, a sensitive analysis of the penetrating capability with respect to geometrical and structural features for different soils that can be encountered on planetary surfaces is included. When identified the force/power requirements, the actuator system solution is investigated, with a particular reference to ultrasonic/piezoelectric technology that allows to obtain the requested hammering action at very high frequency on the coring mechanism with a limited energy absorption. This preliminary analysis demonstrate the feasibility of the system, so that the proposed PSS can be considered as a promising novel concept for the easy and accurate sampling on different kind of planetary surfaces during future space exploration missions.

