

Preparing for the ICAPS-IMPACT facility: optical and mechanical properties of simulated regolith

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ICAPS (Interactions in Cosmic and Atmospheric Particle Systems) is an ESA-supported multi-year scientific programme to simulate cosmic and atmospheric particle systems, to be accommodated on board the International Space Station. The ICAPS-IMPACT facility will allow building simulated regoliths to study their physical/mechanical (tensile strength, electrical and thermal conductivities, compressibility and porosity, impact behaviour) and optical properties. In the context of the related preparatory work laboratory experiments are carried out to better characterise the optical and mechanical properties of regolith. In particular polarisation imaging and tensile strength measurements have been undertaken on various regolith simulants built on Earth.

Polarisation imaging is a technique that permits to investigate the full (vectorial) optical response of a regolith sample, i.e. a usually highly inhomogeneous medium. It consists in retrieving 16 images forming the so-called Mueller image from which various properties can be extracted. For example, polarizance and diattenuation are easily obtained from the first column and the first row of the Mueller matrix. Of course, the angle of the local rotator can also be computed through a polar decomposition of the measured Mueller matrix. A remarkable result concerning the response of the artificial regoliths to a circular polarisation has been observed.

As far as tensile strength is concerned, a rotating disc with variable speed has been set-up. It permits to observe the dislocation of the sample due to centrifugal forces; a simple model is then built in order to relate the speed of rotation to the force responsible for the break-down.

We will report on our first findings in these two domains.