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Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies  
(2B)

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HORIZONTAL CONSTRUCTION ON THE MOON USING REGOLITH COMPACTION

**Abstract**

Development of horizontal infrastructure and site preparation are important elements of sustainable presence of robots and humans on the Moon. Such large-scale construction operations should utilise the benefits of local resources to decrease the dependence on resupply, utilise ‘dirt-simple concepts of operations’ to decrease technological complexity, and use the expertise and best practices of terrestrial construction methods. In that scope, under an ESA-funded project, we are investigating regolith compaction with a robotic device called Compactor. Compactor is equipped with a high-energy voice coil actuator, which propels a baseplate to the regolith surface in different frequency and stroke settings, densifying the material. The device is tested in air in a sandbox containing ~1200 kg of a lunar analogue. Two different lunar analogues (GreenSpar 250 and AGK-2010) are used against the device. Additionally, the device is tested against a thin top layer developed from molten regolith. Proof of concept tests showed that compaction can greatly increase geotechnical properties of the lunar regolith, increasing its strength, bearing capacity and cohesion. Technical feasibility of landing-launch pad construction using compaction is discussed. Future development, including control optimisation, and use of the device as a seismic source in prospecting, are also discussed.