

Whether it's astronauts or lunar robots, they all face the same issue when operating on the Moon: lunar dust. This extremely fine, sharp-edged material-called regolith-sticks to everything: spacesuits, cameras, solar panels, and mechanical systems. It can cause equipment failure, reduce visibility, and even pose health risks. While the problem has been known since the Apollo era, we still lack precise measurements of how strongly regolith particles adhere to different materials-especially under vacuum, like on the Moon.

This project aims to develop a method for measuring the exact adhesion force between lunar dust simulants and technical surfaces (e.g., aluminum, Teflon, titanium). A custom-built testing platform will be created, operating under vacuum. It will gently press regolith onto test surfaces and then measure the force required to detach it. High-sensitivity force and resonance sensors-similar to those used in advanced physics and satellite laboratories-will be employed.

Why does this matter? With accurate adhesion data, engineers can design better landers, instruments, and robots that resist dust contamination. This knowledge is essential for future lunar missions such as Artemis and beyond.

The results will be shared through open data repositories and scientific publications. This research will not only support safer space exploration but also contribute to cutting-edge measurement technologies.