High-vacuum triboelectric charging of space materials

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In the high-vacuum environment of space and the surface of the moon, static electricity on surfaces lacks the atmospheric dissipation mechanisms found on earth. As a result, the ubiquitous triboelectric charging mechanism can lead to high levels of charge on surfaces. This static charge can result in damage to sensitive devices, interfere with communications, and electrostatic levitation of lunar dust. At the NASA Electrostatics and Surface Physics Laboratory (ESPL), we use different apparatuses and techniques to tribo-charge materials in high-vacuum (10-5 torr), including a tribo-robot and a triboelectric regolith-material stage (TRMS). The tribo-robot is used to rub two materials together, and fieldmeters and electrometers can be used to determine how much charge is on the materials. The TRMS is used to drag different materials onto a bed of lunar simulant. This system is used to characterize how materials may interact with lunar dust using fieldmeters, electrometers, and laser scattering. Using these methods, we are building a database of how different space materials charge when contacting each other at high-vacuum, and how materials triboelectrically interact with the lunar surface.