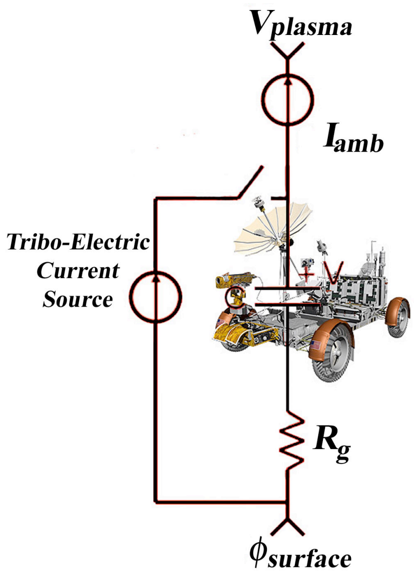
ROVER WHEEL CHARGING ON THE MOON AND THE EFFECTS OF ADHERING DUST. T. L. Jackson[1], W. M. Farrell[1], M. I. Zimmerman[2], [1]NASA Goddard Space Flight Center (Telana.L.Jackson@nasa.gov), Greenbelt, MD 20771, [2]Johns Hopkins Applied Physics Laboratory, Laurel, MD 20723.

Introduction: The environment at the moon is dynamic, with highly variable solar wind plasma conditions at the lunar dayside, terminator, and night side regions. A stationary object on the surface will develop an electric potential while the currents drawn from the surrounding environment attempt to balance. A rover, moving along the lunar surface, will charge more vigorously due to contact electrification (tribocharging). Tribocharging is represented by a closed switch in the figure.



The rover acts as a capacitor, while the ambient plasma is the path for charge dissipation. In areas such as lunar polar craters, this path is not an option, causing substantial amounts of charge to accumulate as well as increasing charge dissipation times. This creates a situation where ESD discharge is a concern. We aim to gain a fundamental understanding of an object's electrical interaction with the charged dusty surface and surrounding environmental plasma under varying conditions. In the process, we will also identify electrostatically challenging regions like those within polar craters.

Methodology: We present a model of a rover tire moving over regolith and immersed in a conductive plasma. This model is an adaptation of the astronaut stepping model [1] and is used to determine the dissipation times for a continuously tribocharging rover wheel to bleed off its excess charge into the surrounding plasma. This exercise is performed at the photoelectron-rich dayside of the Moon, electron-rich night side, the depleted plasma environment within a lunar polar crater, and the lunar terminator. A rover tire/regolith triboelectric generator expression is formulated along with an expression to account for the adhesion of lunar dust to the wheel. Wheel charging behavior is calculated while other parameters are varied, *i.e.,* regolith grain size, wheel type, wheel speed and sticking factor.

Conclusions: It is demonstrated that rover wheels will charge substantially while moving when located in plasma current-starved regions such as a polar crater or the lunar nightside due to grain-wheel tribocharging interactions. High potentials and charge dissipation times can possibly become an ESD hazard especially if an astronaut immediately comes in contact with the rover wheel after long traversals in shadowed regions. Dust sticking can limit the overall charge accumulated on the system.[2]

References:

[1] Jackson T. L. et al. (2011) *J. Spacecr. & Rock, 48,* 700. [2] Jackson T. L. et al. (2015) *ASR, (in print).*