CHARGING AND SUBSEQUENT DISSIPATION OF A ROVER WHEEL IN THE LUNAR POLAR REGIONS. T. L. Jackson[1,2] ,W. M. Farrell[1,2] , T. J. Stubbs[1,2,3] , [1] *Solar System Exploration Division, NASA Goddard Space Flight Center, Greenbelt, MD, USA,* [2] *NASA Lunar Science Institute, NASA Ames Research Center, Moffett Field, California, USA,* [3] *Goddard Earth Sciences and Technology Center, University of Maryland Baltimore County, Baltimore, Maryland, USA,.*

Introduction: As a roving vehicle moves along the lunar surface, electric charge will build up through tribo-charging. This charge collected by the roving object will have a dissipative path to either the surface or the ambient plasma, depending upon which path is most conductive. At the lunar terminator region and into nightside regions, the surface is very cold and becomes a very poor conductor, leaving the plasma as the dominant remediating current for dissipation. However, within lunar craters, even plasma currents become substantially reduced which then greatly increases electric dissipation times. This work will involve the advancement of the stepping astronaut charge model [1], by considering the charging and plasma dissipation of a rolling rover wheel .

The objective of this work is to determine the nature of charging and discharging for a rover wheel as it rolls along the cold, plasma-starved lunar polar regions. The rotating wheel accumulates charge via contact electrification (tribo-charging) with the lunar regolith. This tribo-charging is dependent on the composition of the objects in contact, with insulators and conductors charging differently. Given the environmental plasma in the region, we then determine the dissipation time for the wheel to bleed off its excess charge into the surrounding plasma. A model of the rover wheel rotating continuously over a surface regolith within a polar crater has been applied. The environmental plasma has been described previously [2]. We define a new tribo-charging term specifically for the rotating system, with charge levels defined as a function of the wheel size, area in contact with the regolith, regolith particle size distribution, as well as the velocity at which the wheel is turning.

We recognize that as charged dust accumulates and sticks to the wheel, this behaves effectively as a new current. Hence, the overall charging of the system should no longer vary linearly, and begin to show signs of saturation. We are devising a dust current term to model this charge-limiting effect, and will present the results in discussion.

References: [1] Jackson, T. J. et al. (2011) *J. Spacecraft and Rockets* submitted. [2] Farrell, W. M. et al. (2010) *J. Geophys.Res*. 115, E03004.