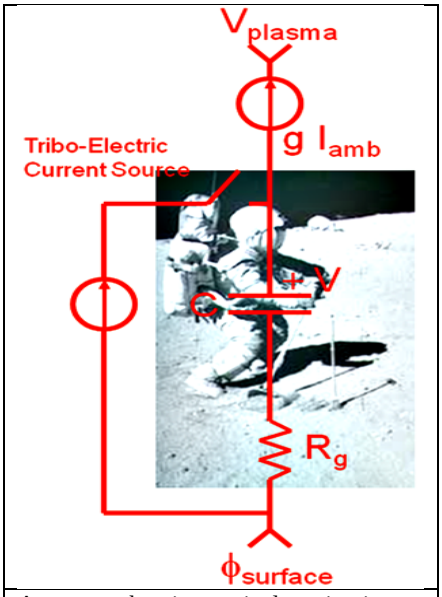
ASTRONAUT AND OBJECT CHARGING ON THE LUNAR SURFACE. T. L. Jackson[1,4] , W. M. Farrell[1,4] , G. T. Delory [2,4] , T. J. Stubbs [1,3,4] , M. R. Collier [1,4] , J. S. Halekas [2,4] , and R. R. Vondrak[1,4], [1] NASA/Goddard Space Flight Center, Greenbelt, MD, [2] University of California at Berkeley, Berkeley, CA, [3] University of Maryland, Baltimore County, Baltimore, MD, [4] NASA's Lunar Science Institute, Ames Research Center, Moffett Field, CA.

Abstract: As an astronaut or roving vehicle moves along the lunar surface, electric charge will build up. 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 [1-3]. This work will involve the advancement of the astronaut/rover charging equivalent circuit model shown in the figure below. The objective is to incorporate a new tribo-electric generator model (i.e., foot or wheel roving thru lunar regolith) as the charging source in this circuit. The dynamical current balance equations for the object [3] will then be solved including this new source term and incorporating loss/dissipation terms associated with the plasma. We hope to gain a fundamental understanding of an object's electrical interaction with the charged surface and surrounding environmental plasma and identify electrostatically challenging regions like those within polar craters.



Astronaut charging equivalent circuit model (Farrell et al. 2008)

Current Progress: So far, a model has been set up to solve the dynamical current balance equations for an astronaut roving on the lunar surface. With this model, as a first step we were able to reproduce the dissipation times presented in [1], as well as project the dissipation times associated with other locations within a lunar crater. It is observed that the astronaut will charge very quickly within polar craters where dissipative plasma currents are reduced.

References: [1] W. M. Farrell et al. (2009), *JGR*, in press. [2] W. M. Farrell et al. (2008) *GRL*, *35*, L19104. [3] R. H. Manka (1973) *Photon and Particle Interactions With Surfaces in Space*, 347.