TRIBOELECTRIC CHARGING OF LUNAR DUST BY ROVER WHEELS. L. H. Yeo[1], X. Wang[1], A. Dove[2], J. Minafra[3], G. Goropse[3], and Mihaly Horanyi[1], [1]Laboratory for Atmospheric and Space Physics, [2]University of Central Florida, [3]NASA AMES Research Center

The presence of dust on the lunar surface has been identified as one of the key technical challenges for landed missions and for establishing long-term human habitats. Dust is generally charged on the lunar surface due to exposure to solar UV radiation and the flow of solar wind plasma. These charged dust particles can readily stick to photovoltaic and other mechanical or optical surfaces, affecting the operations and lifetime of electrical and mechanical components.

In addition to plasma charging processes, dust can also become charged due to mechanical processes that generate triboelectric effects. For example, walking astronauts or turning wheels of a rover can generate unexpectedly large charges on dust particles being stirred up due to these activities. This process is expected to be most efficient in unlit regions, where the contributions of UV and plasma exposure are inefficient to provide discharging currents to limit the buildup of intense charges. Hence, missions visiting resource rich regions, such as Permanently Shadowed Regions (PSRs), will have to take additional precautions to mitigate the effects of tribocharging.

In this presentation, we report on the experimental investigations of the interaction between a rover wheel and three different regolith simulants. Initial investigations were performed at the NASA AMES dust bed facility using a small remotely-controlled rover with rubber wheels. Dust particles were kicked up when the rover was rolling on the surface, forming the so-called "rooster tails", the cloud of particles behind the spinning wheels of the rover. A calibrated Faraday Cup (FC) placed on the surface collected particles falling back into the FC where their charge was measured. It was found that dust particles (10s-100 microns in radius) were mostly positively charged with a magnitude as large as equivalent to a surface potential of several hundreds of volts.

A new experimental setup with a spinning wheel has been built at the IMPACT facility. We will report on measured dust charge distributions for varying wheel speeds and surface materials, dust types and sizes, as well as vacuum conditions. The results suggest ways to mitigate triboelectric effects for rovers and safely explore lunar PSRs to gauge their availability for in situ resource utilization.