The effect of magnetic fields on electrostatic dust lofting

N. Hood [1,2], X. Wang [1,2], L. H. Yeo [1,2], H. –W. Hsu [1,2], and M. Horányi [1,2]

[1] *Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado 80303, USA*
[2] *NASA/SSERVI's Institute for Modeling Plasma, Atmospheres and Cosmic Dust, Boulder, Colorado 80303, USA*
Noah.Hood@colorado.edu

Abstract. Electrostatic dust lofting is a mechanism which occurs on airless planetary bodies, where small dust particles become lofted off the surface due to exposure to the solar wind and/or ultraviolet radiation. Recent experiments have developed and experimentally verified a patched charge model, which demonstrates how negative charge accumulates in microcavities, and the mutual repulsive force causes dust to become transported or mobilized. Though our understanding of this process has increased substantially since it was first postulated as a mechanism behind the Lunar Horizon Glow, the presence of magnetic fields has been observed to drastically alter the dynamics of individual dust particles as well as the surface morphology expected from dust lofting. The mechanisms behind this process are not well understood and are important for assessing the role of electrostatic dust lofting in areas with variations in the local magnetic field, such as the so-called lunar swirls on the Moon. In this paper, we present the results of laboratory observations which demonstrate how electrostatic dust lofting changes under various magnetic field characterizations. We demonstrate that the presence of magnetic fields decreases the overall level of activity resulting from electrostatic effects, and that the extent of the decrease depends on the orientation of the magnetic field. Though this work is still in progress, we describe a working theory which postulates that the mobility of secondary electrons correlates with the level of activity. These results are critical to fully understand the effects of electrostatic dust lofting in any environment.