INFLUENCE OF ELECTROSTATIC CHARGES ON THE MOVEMENT OF DUST BY WIND; R.N. Leach, S.J. Schrodi, and R. Greeley, Dept. of Geology, Arizona State University, Tempe, AZ, 85287-1404.

The entrainment of fine grained (<20-40 µm) material, or dust, is a complex process that is poorly understood. Previously published threshold curves that relate the minimum wind friction velocity ($U_\ast$) to particle diameter ($D_p$) show that particles smaller than about 80 µm become progressively more difficult to move [1]. This same relationship occurs under martian [2] and venusian [3] conditions, and has been attributed to the emersion of tiny grains in a laminar sublayer, effects of interparticle forces, and/or other factors. Any mechanism that could cause the agglomeration of dust into larger (e.g., "sand-size") particles would enable threshold wind speeds to be lowered. One such mechanism could be electrostatic charging of grains, as may occur through friction (termed "tribo-electric" charging) by grains moving across the bed of fine particles, corona discharging in the atmosphere, etc. To determine the influence of electrostatic charges on particle threshold (regardless of source of the charge) a series of experiments was run in which a Van de Graaff generator was used to charge a bed of silt size particles (medium diameter of 13 µm) in a wind tunnel. As a control, experiments with particles from the same source were run a) without charges and b) with the addition of an antistatic medium. All experiments were run at 1 bar atmospheric pressure. Figure 1 shows the results. For 27 runs, threshold friction velocity

![Figure 1](image.png)

*Figure 1. Threshold friction velocities ($U_\ast$) for silt (median particle diameter = 13 µm) with and without electrostatic charging. Solid symbols indicate runs in which particles were initially charged, then shows (A,B,C) the increase in threshold, presumably as the bed became discharged.*
of the control samples ranged from .29 to .33 m/sec; thresholds for three experiments in which the beds of particles were charged with the Van de Graff generator ranged from .23 to .24 m/sec, for a significant reduction in wind speeds needed for particle entrainment. However, as shown in Figure 1, continued experiments on the charged particles resulted in a gradual increase in threshold friction speed with time (i.e., subsequent runs), until the higher thresholds characteristic of the uncharged particles were reached. We attribute this to "leaking" of the electrostatic charges with time. The initial lower thresholds probably resulted from the formation of aggregates which, by virtue of their larger effective diameters, have lower thresholds than for non-aggregated silt. With time, the ability of the particles to form aggregates diminish with loss of charges, and the bed reverted to the "normal" silt.

If these results are applicable to Mars, the charging of beds of fine particles may enable entrainment by the wind at lower threshold wind speeds than for non-charged particles. Future tests will be run under low atmospheric conditions appropriate for Mars.

References Cited: