# Dust charging and transport on surfaces of airless planetary bodies

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**Abstract**. The charging and transport of dust on the surfaces of airless planetary bodies has been a long-standing problem with potential implications on numerous observed planetary phenomena and surface processes. Our recent laboratory experiments have advanced our understanding of this problem and have produced a new "patched charge model", based around particles forming microcavities within the dusty surface. These microcavities amass large negative charges through the collection of photo- and/or secondary electrons emitted by neighboring particles resulting from exposure to ultraviolet (UV) radiation and/or energetic electrons. The large negative charges and the resulting repulsive forces between them are proposed to be responsible for electrostatic dust transport on surfaces. Predictions of this new model have been verified experimentally, demonstrating 1) dust acquires a negative charge polarity, even while exposed to UV radiation; and 2) dust attains large charge magnitudes, two orders larger than those predicted by previous charging models. Additional analysis has revealed that the plasma sheath electric field modifies dust lofting trajectories. These results have prompted computer simulation development utilizing the new initial conditions of charge and launch speed that we have observed.