

Dust Mobilization on Surfaces in Space

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There are a number of observations indicating that small dust grains can be mobilized and transported on the surfaces of airless bodies in space. While not a single measurement to date can unambiguously identify the responsible process, the entire body of existing observations as a whole suggests that electrodynamic processes remain the most likely candidates. If this is the case, our models have to be able to account for the electrostatic charging and subsequent dynamics of the grains sculpted by surface electric fields. The Colorado Center for Dust and Atmospheric Studies (CCLDAS) of the former NASA Lunar Science Institute conducted a series of small-scale laboratory experiments to address dust charging and mobilization issues, including the effects of flowing plasmas and UV radiation. The talk will focus on the possible role of: a) the plasma clouds generated by hypervelocity interplanetary dust impacts; and b) the highly charged solar wind minor ions. The talk will draw conclusions based on theoretical modeling and on a series of experiments to guide the analysis and interpretation of the data from the Lunar Dust Experiment (LDEX) onboard the Lunar Atmosphere and Dust Environment Mission (LADEE). By the time of this talk, LADEE is expected to collect its initial science measurements. LADEE was launched on September 9, 2013 and it is scheduled to reach its lunar orbit for scientific observations by early November. The combination of laboratory and in situ space measurements provides a unique opportunity to advance our theoretical models on the transport of charged dust particles on the lunar surface, and apply these arguments to all other airless planetary bodies.