

The Dust Accelerator Facility at the University of Colorado

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The dust accelerator facility at NASA Solar System Exploration Research Virtual Institute's (SSERVI) Institute for Modeling Atmospheres, Plasmas, and Cosmic Dust (IMPACT) has recently completed two major target upgrades: a cryogenic ice target and a high-pressure gas target. The ice target consists of a LN₂ cryogenic system connected to both a water-ice deposition system as well as a movable freezer/holder for a pre-mixed liquid cartridge. Planned experiments include the bombardment of a variety of frozen targets and simulated ice/regolith mixtures, and the assessment of all impact products (solid ejecta, gas, plasma) as well as spectroscopy of both the impact-produced light flashes and the reflected spectra (UV, visible, IR). Such measurements are highly relevant to both physical and chemical surface modification of airless bodies due to micrometeoroid impacts. The gas target consists of a differentially pumped chamber kept at moderate background pressures, such that high-velocity (≥ 10 km/s) micrometeoroids are completely ablated within 10's of cm (i.e. within the measurement chamber). The chamber is configured with segmented electrodes to perform a spatially-resolved measurement of charge production during ablation, and localized light-collection optics enable an assessment of the light production (luminous efficiency). Such studies are critical to the understanding of past and future ground-based measurements of meteor ablation in Earth's atmosphere, which in turn can potentially provide the best estimates of the interplanetary dust particle flux.

The talk will summarize our current capabilities and recent experimental results, and extend an invitation to the planetary and space science communities. New experimental groups are continually solicited to work with us on experiments addressing the effects of debris/meteoroid impacts on spacecraft and instrumentation, the atmosphere of the Earth and other planets, as well as surface effect on airless bodies in the solar system.