DEVELOPMENT OF REGOLITH REFERENCE SURFACES FOR LABORATORY STUDIES

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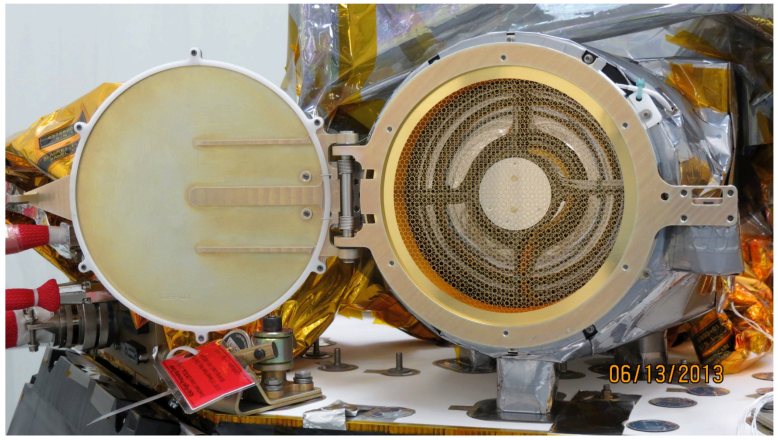
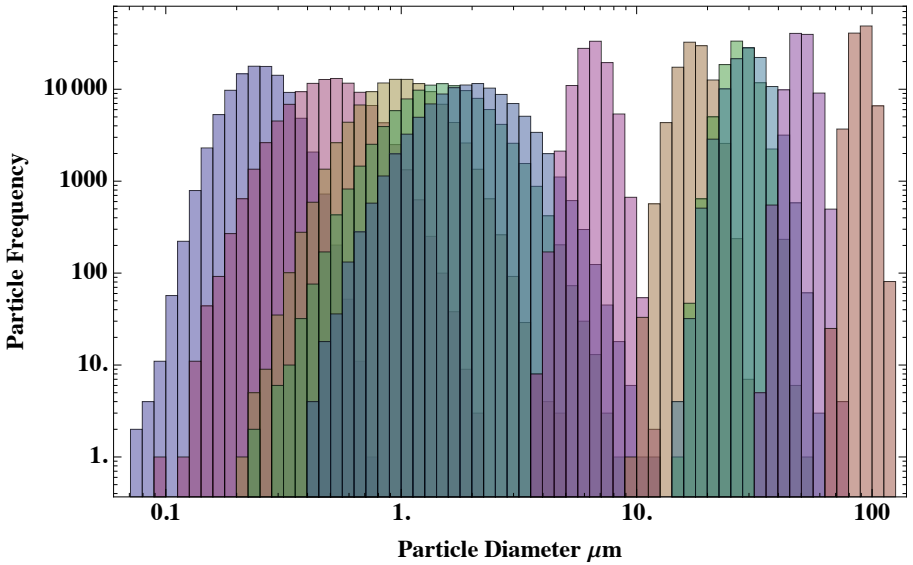
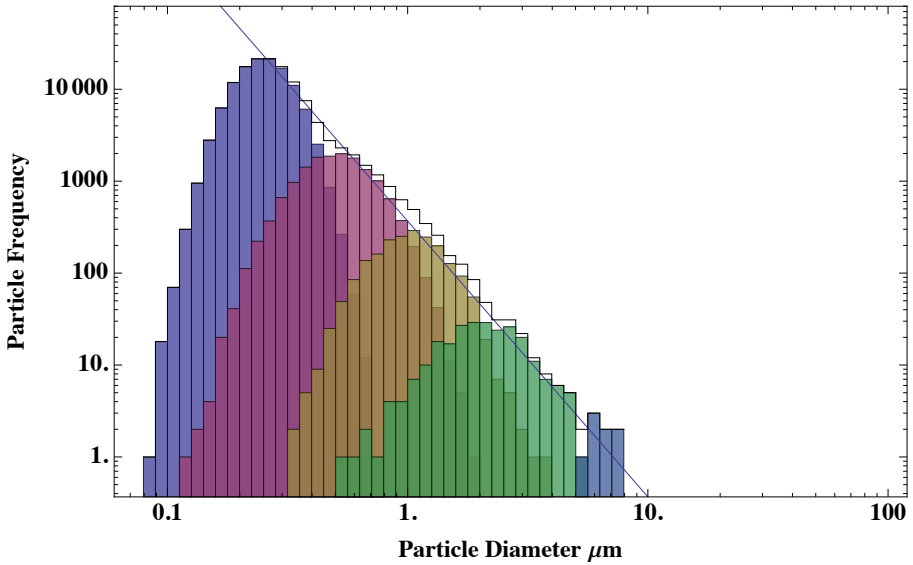
1) **Dust ejecta clouds**
2) **LADEE / LDEX**
3) **Regolith reference surfaces**
4) **In orbit exploration**



Regolith reference surface

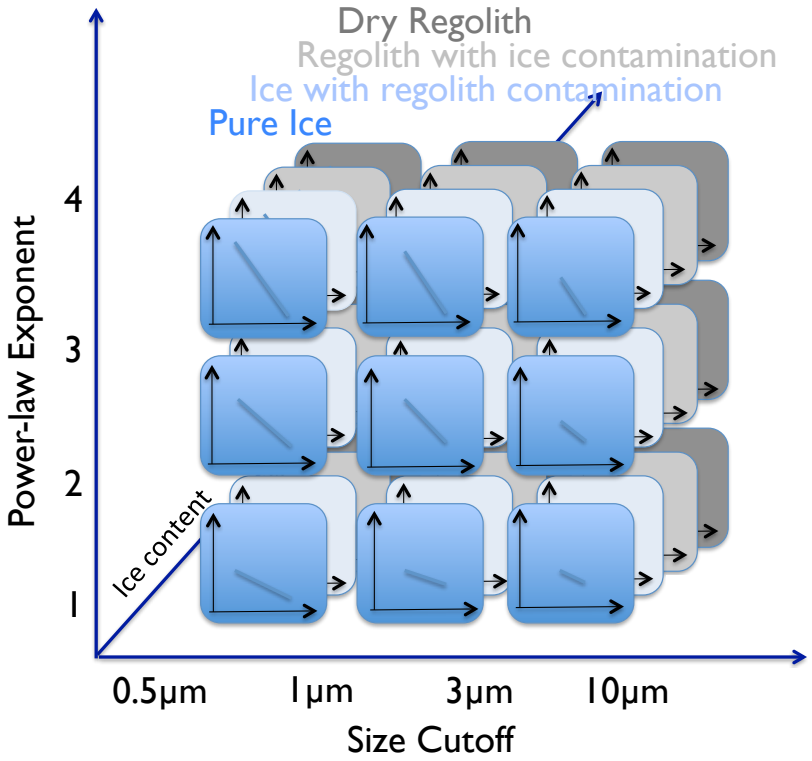




Left: Size distributions of commercially available glass sphere samples from 0.25 μm to 100 μm.

Right: Mixed samples produce “standard surfaces” with a well-defined size distribution

Regolith reference surface

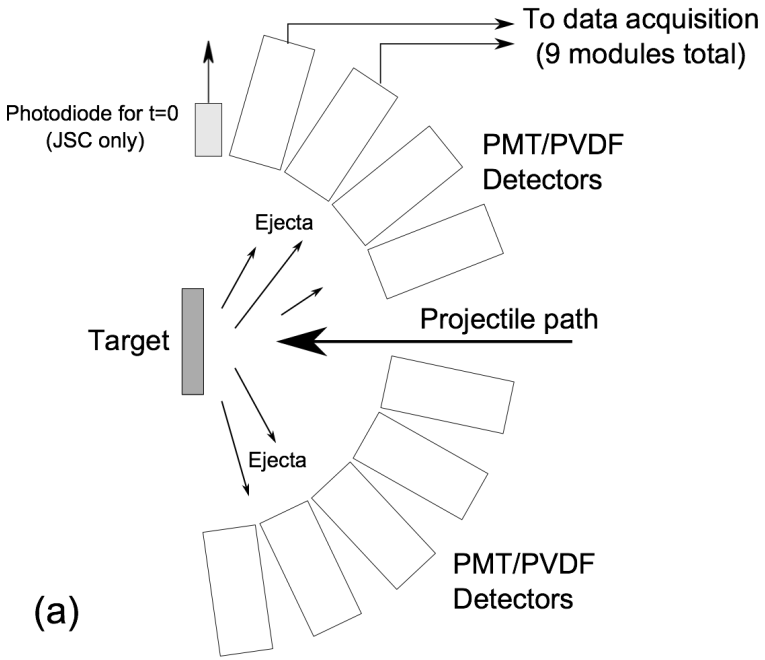


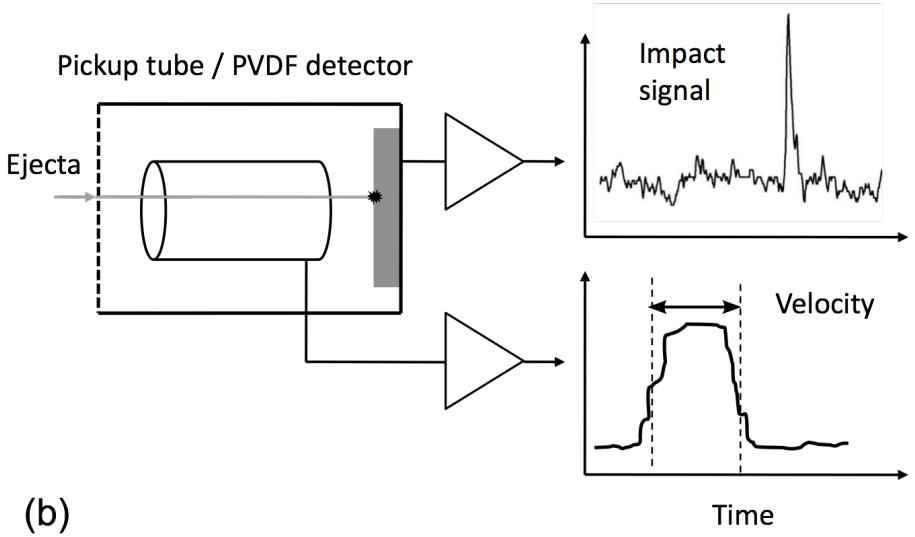
Parameters:

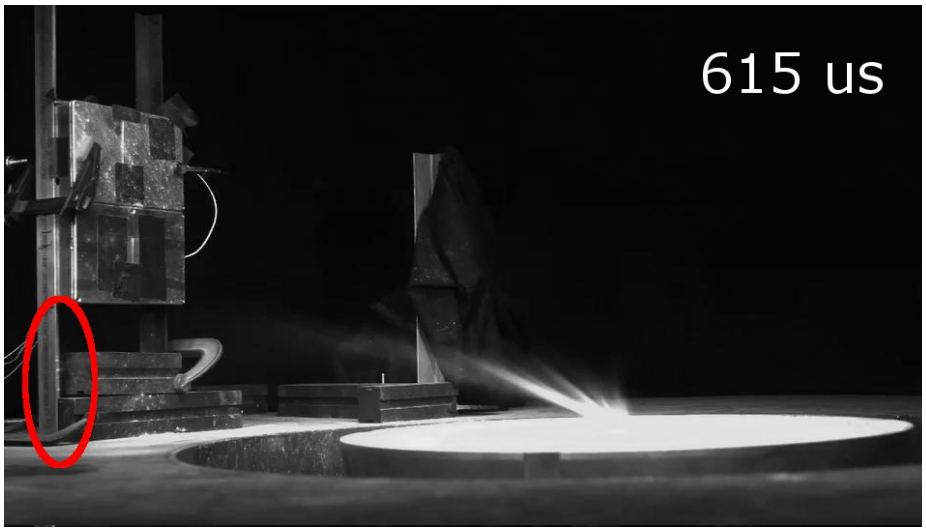
1) min size
2) max size
3) size distribution
4) ice content

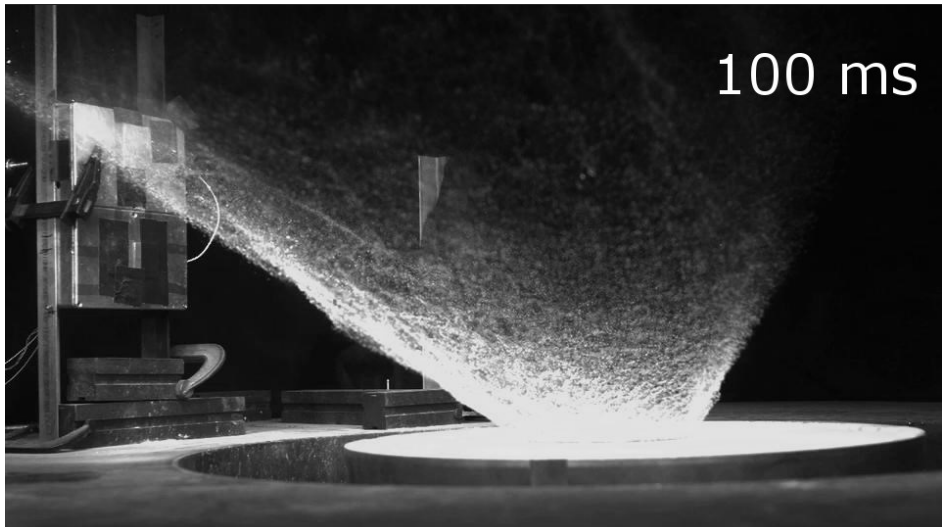
Standardized regolith samples can be used to study the effects of dust impacts, UV and plasma charging, and geotechnical properties for ISRU. The regolith samples are based on pure silica glass spheres that are combined to match power-law size distributions and cut-off smallest sizes. Their water content will range from pure ice, to regolith contaminated ice, to ice contaminated regolith, and dry pure regolith.

Ejecta characterization









Video frames from pilot experiments at AVGR in 2012, showing (top) early-time fast/fine ejecta 615 us after impact, in contrast to coarse ejecta grains (bottom) 100 ms after impact. Projectile is incident from the right onto a pumice target at 45 degrees. The fine ejecta plume terminates on the PVDF sensor at left, which detects individual grains. Red circle shows light flashes from grains impacting on support structure, indicating multi-km/s dust.

Outlook: LADEE did well !

LDEX discovered the lunar dust exosphere, and it provides new insight into the physics of ejecta production from the Moon. The density and size distribution of the dust exosphere is set by the properties of the surface.

The ejecta clouds could provide a unique opportunity to learn about the **composition** and the **geotechnical properties** of the lunar surface, enabling **resource prospecting from orbit**.

Laboratory experiments remain essential!

The new generation dust instruments are ready to fly!