Understanding the Impact of High-Velocity Dust Due to Lunar Landings.

M.M. Wittal[1], Bruce Vu[1] James Mantovani[1], P.T. Metzger[2], and D.H. Fontes[2], [1]Granular Mechanics and Regolith Operations Laboratory NASA Kennedy Space Center, 32899, [2]University of Central Florida Planetary Sciences Group, 4111 Libra Dr. PSB 430, Orlando FL, 32816 (DurContact: mmwittal@nasa.gov)

Introduction: Evidence from earlier landings by Surveyor and Apollo have provided ample evidence regarding the dangers of high-velocity ejecta [1,2,3]. These dangers include the generation of dust that settle on equipment, posing a hazard to equipment following landing, the sandblasting of objects near the landing site, and the spread of high-velocity dust over the entire lunar surface and in lunar orbit that may remain for long periods of time. Recent work has provided valuable insight into the behavior and nature of the dust as a function of lander size, but further work is needed to gain a better understanding of the initial trajectories of this high- velocity dust.

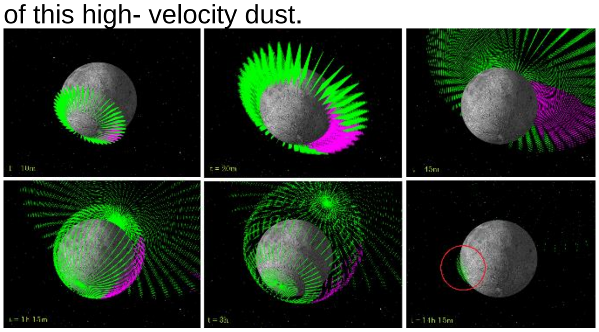

Figure 1. A numerical simulation of high-velocity dust in the lunar environment. Purple particles are in shadow.

High-Velocity Dust: This work provides a basis for understanding the impact of high-velocity dust near the landing site, across the surface of the mon, and in lunar orbit. By starting with a well-constrained set of initial conditions and considering environmental factors such as electromagnetic charge and multi-body dynamics, a broad picture of the consequences of dust due to lunar landing plumes can be assembled [1]. Initial conditions are determined using computational fluid dynamic simulations while the impacts of dust at the higher velocities are traced using numerical integration.

References:

[1] Wittal, M.M. et al. (2020) *AIAA 20-511.* [2] Wittal M.M. and Powers R.J. (2019) *AIAA 19-616.* [3] Lane, J.E. and Metzger, P.T. (2015) *Faculty Bibliography 2010s* 6646.