Announcing the Final Examination of Isabel Rivera for the degree of Master of Science in Physics

Date: July 7, 2021
Time: 3:00 p.m.
Zoom Link: https://ucf.zoom.us/j/93201824842?pwd=RUhDMWxPajBkbG5VOVJ3RnhTdzI4dz09
Meeting ID: 932 0182 4842
Passcode: 570259

Dissertation title: SIMULATING EJECTA BLOWN OFF THE LUNAR SURFACE DUE TO LANDING SPACECRAFT USING THE MERCURY N-BODY INTEGRATOR

Abstract:
The experiences of the Apollo lunar landings revealed the danger lunar dust can pose to surrounding hardware, outposts, and orbiting spacecraft. Future lunar missions such as the Artemis program will require more information about the trajectories of ejecta blown by landers to protect orbiting spacecraft such as the Lunar Gateway. In this paper, we simulate lunar lander ejecta trajectories using the Mercury N-body integrator. We placed cones of test particles on the Moon at the North Pole, South Pole, and Equator with various ejection speeds and angles. The results show that particles ejected at speeds near the Moon's escape velocity can take from several days to weeks to re-impact the lunar surface. The time particles spend in the vicinity of the Moon varies mostly by location. Particles stay aloft after 30 days at launch speeds as low as 2.142 km/s when launched from the Equator. Number density maps and flux density maps of the particle trajectories reveal that particles launched from the South Pole are likely to impact the Lunar Gateway at its orbit near periselene at ejection speeds as low as 2.142 km/s. Particles launched from the Equator also reach the altitude of the Gateway orbit. Particles ejected from the North Pole can impact the Gateway along its orbit at ejections speeds somewhere between 2.3324 and 2.3562 km/s.

Outline of Studies:
Major: Physics – Planetary Science Track

Educational Career:
B. S. University of South Florida, Florida, 2017

Committee in Charge:
Dr. Joshua Colwell (Chair)
Dr. Adrienne Dove
Dr. Humberto Campins

Approved for distribution by Dr. Joshua Colwell, Committee Chair, on June 29, 2021.

The public is welcome to attend remotely.