

Announcing the Final Examination of Nicholas Piskurich for the degree of Master of Science in Physics

Date: April 1, 2024

Time: 10:00 a.m.

Room: PSB 445

Zoom Link: <https://ucf.zoom.us/j/94916166669>

Thesis title: Mesmerizing Moon Mysteries: Unraveling the Compositions of Irregular Mare Patches (IMPs) Using Remote Observations

Abstract:

Compositional characterization of geologic features inform our understanding of lunar thermal and magmatic evolution. We investigated the compositions of hypothesized volcanic features known as irregular mare patches (IMPs) and their surroundings to better understand their formation. Large IMPs exhibit two morphologies: smooth mounds at higher elevations and uneven, blocky deposits at lower elevations; they display anomalously young ages (< 100 Ma) compared with their host mare regions (> 3 Ga). We used six datasets to assess the composition of 12 IMPs: 1) Moon Mineralogy Mapper (M^3) data to extract band spectral parameters (e.g., band centers, shapes), 2) Lunar Reconnaissance Orbiter (LRO) Diviner Lunar Radiometer Experiment (Diviner) data to characterize the wavelength position of the Christiansen feature (CF), 3) SELENE (Kaguya) Multiband Imager (MI) FeO abundance, 4) Clementine FeO abundance, 5) LRO Wide Angle Camera (WAC) TiO₂ abundance, and 6) LRO Narrow Angle Camera (NAC) derived photometric parameters such as single-scattering albedo (w). Our analysis suggests that some IMPs are compositionally unique from their surroundings, while other IMPs exhibit ambiguous compositional trends, which is consistent with the wide variety of geologic settings in which IMPs are situated. Large IMPs are similar to surrounding low albedo dark halos, which could suggest a formation association between IMPs and these dark halo regions. Spectral and photometric comparisons suggest that IMP compositions are compatible with Apollo 11 and 17 high-Ti mare basalts, as well as a group of synthetic high-Ca pyroxenes. Future remote sensing orbiters with higher spatial and spectral resolution are essential to resolve the compositions of smaller IMPs as well as the distinct smooth and rough morphological regions within larger IMPs.

Outline of Studies:

Major: Physics, Planetary Sciences Track

Educational Career:

B.S. University of Notre Dame, 2019

Committee in Charge:

Dr. Kerri Donaldson Hanna (Chair)

Dr. Yan Fernandez

Dr. Dan Britt

Approved for distribution by Dr. Kerri Donaldson Hanna, Committee Chair, on March 5, 2024.

The public is welcome to attend.