The University of Texas at San Antonio

UTSA Physics and Astronomy

Final Comprehensive Exam

Elena Dolgas

Date: **: Wednesday, June 21st, 2023**

Time: **10:00 am/CT**

Advisor: **Dr. Kurt Retherford**

Abstract

"Spectral and Mineralogical Analysis of Planned CLPS Landing Sites with LRO-LAMP"

Before NASA's Artemis program brings humans back to the Moon, perhaps as early as 2025, many robotic missions will take place under the Commercial Lunar Payload Services (CLPS) initiative. Planned landing destinations include multiple areas of the South Pole and three enigmatic regions of interest: the Gruithuisen Domes, Reiner Gamma, and Mare Crisium. To aid in future CLPS surface geology measurements, we performed a series of analyses for each candidate region using both sample analogs and remote sensing. For the area encompassing the Gruithuisen Domes, we used Apollo sample 14310, as it is a plagioclase-dominant melt rock. Also from Apollo 14, 14053's composition and magnetic properties were compared to Reiner Gamma. Mare Crisium is the only CLPS site previously visited by a sample return mission, so a direct comparison was made to the drill core from Luna 24, a Soviet Union mission. Far-ultraviolet (FUV) remote sensing analysis was done with the Lyman Alpha Mapping Project (LAMP) instrument on the Lunar Reconnaissance Orbiter (LRO). We compared LAMP data with ultraviolet, visible, and near-infrared spectral observations from two previous lunar missions, Clementine and Kaguya. The Gruithuisen Domes and Reiner Gamma both exhibit high FUV albedo ratios, likely correlating to high feldspathic composition, such as plagioclase, or less space weathering, respectively. Mare Crisium, however, is more uniform in the FUV, with only some differences in albedo ratio occurring between inside the basin and outside the ring that encloses it. Analyses of South Pole landing sites further reinforced previous estimates of water ice deposits.

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