CAMELS: CAPACITANCE AND MAGNETISM EXPLORATION OF LUNAR SWIRLS. A. Abramson[1], H. Andres[1], and A. Pestone[1], [1]University of Colorado Boulder.

Introduction: Lunar swirls are areas of high albedo material that form distinct spiral patterns and appear to correspond to regional magnetic fields. According to the solar wind shielding model theory, the light-colored, high albedo regolith comprising a lunar swirl results from its regional magnetic field's ability to deflect solar winds, protecting the regolith from weathering. In contrast, the regolith outside the lunar swirl is darker in color due to bombardment from solar winds [1]. Research has indicated that areas of dark regolith between lunar swirls are lower in titanium content compared to the light-colored regolith within the lunar swirl [2]. The correlation between lunar swirls and the Moon's irregular magnetic field make them prime targets for advancing understanding of space weathering and lunar crust and surface processes. Reiner Gamma, located on the western edge of the near side of the Moon, is among the largest and most visible lunar swirls and thus represents a key site for further research [3].

Mission Objectives: The Capacitance and Magnetism Exploration of Lunar Swirls (CAMELS) mission proposes further study of Reiner Gamma by employing a satellite system of LunaSATs developed by the Great Lunar Expedition for Everyone (GLEE). LunaSATs are equipped with magnetometers and capacitance sensors to measure the magnetic fields and regolith composition in and around Reiner Gamma [4]. Vector maps obtained from CAMELS should discover constant changes in the behavior of Reiner Gamma's magnetic field, and data from the capacitive sensors should reveal that Reiner Gamma's regolith has a lower capacitance than the regolith outside of it [5]. If these predictions are accurate, CAMELS will succeed in providing evidence for the solar wind shielding model theory; even if false, CAMELS will contribute valuable insights into the nature of the Moon's magnetic field and regolith chemistry.

Concept of Operations: CAMELS will have LunaSATs report accelerometer, magnetometer, and capacitance readings over six lunar hours to generate data on how the local magnetic field and capacitance change over time. Using the capacitive sensors, the composition of Reiner Gamma's regolith can be compared with the regolith outside it to determine the effects of solar radiation on the lunar surface. A program will translate magnetometer readings using linear algebra and accelerometer readings into vector maps, providing a timelapse of the Reiner Gamma's magnetic field.

Future Applications: The unique aspect of CAMELS is its use of a satellite system directly on the Moon's surface, allowing for a different perspective of Reiner Gamma's magnetic field. Therefore, results from CAMELS can be compared to existing magnetic vector maps of Reiner Gamma, which were generated using orbital satellites and machine learning techniques. This comparison can also assist with validating previous studies' data [6-8]. Furthermore, understanding how regional magnetic fields protect certain areas of the lunar surface from the Sun's radiation can aid in the development of improved methods of radiation protection for astronauts, including those for the Artemis program [9].

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