IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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LUMIO: DETECTING METEOROID IMPACTS ON THE LUNAR SURFACE

Abstract

Lunar meteoroid impacts have caused in the past a substantial change in the lunar surface. With no atmospheric shield, the Moon is subject to many impacts from meteoroids, ranging from a few grams to a few kilograms. The high impact rate on the lunar surface has important implications for future human and robotic assets that will inhabit the Moon for significant periods of time. Therefore, a better understanding of the meteoroid population in the cislunar environment is required for future exploration of the Moon. Moreover, refining current meteoroid models is of paramount importance for many applications, including planetary science investigations. Studying meteoroid impacts can help deepening the understanding of the spatial distribution of near-Earth objects in the Solar System. The ability to predict impacts is therefore critical to many applications, both related to engineering aspects of space exploration, and to more scientific investigations regarding evolutional processes in the Solar System. The Lunar Meteoroid Impacts Observer (LUMIO) is a CubeSat mission to observe, quantify, and characterise lunar meteoroid impacts, by detecting their impact flashes on the far-side of the Moon. This complements the information available from Earth-based observatories, which are bounded to the lunar near-side, with the goal of

synthesising a global recognition of the lunar meteoroid environment. LUMIO envisages a 12U CubeSat form-factor placed in a halo orbit at Earth-Moon L2. The detections are performed using the LUMIO-Cam, an optical instrument capable of detecting light flashes in the visible spectrum (450-950 nm). LUMIO has successfully passed the PDR and is currently moving towards Phase C. We present the latest results on the modelling of the meteoroid environment in the Earth-Moon system, including an estimate of LUMIO's potential impact on our existing knowledge of meteoroids, supported by high-fidelity simulation data. An overview of the present-day LUMIO CubeSat design is also given, with a focus on the latest developments involving both the ongoing/planned scientific activities and the development of the payload.