THE NEXT DECADE OF LUNAR RECONNAISSANCE ORBITER OBSERVATIONS OF THE MOON: SCIENCE AND EXPLORATION IN SUPPORT OF ARTEMIS. N. E. Petro[1], LRO Project Science Team[1], [1]NASA GSFC Solar System Exploration Division (Noah.E.Petro@nasa.gov).

In the leadup to the Apollo program there was a critical need for images of selected landing sites, a need that led to the development of the Lunar Orbiter program [1]. Having demonstrated the ability to hit the Moon with Ranger missions, and land on the Moon with Surveyor, Lunar Orbiter offered a final piece of data. With those data, safe, geologically compelling landing sites were identified for the early Apollo missions, and set in motion the scientific revolution realized by Apollo. For nearly 40 years those data offered the best perspective on the Moon and provided much of the geologic context for studies of the lunar surface [2].

Fifty years after the first human landing on the Moon, 10+ years since the Lunar Reconnaissance Orbiter (LRO) began mapping the Moon, and with lunar exploration once again on the horizon, it is timely to review LRO data and look forward to future exploration enabled by LRO.

LRO's data encompasses a range of datatypes, from visible images revealing intriguing morphologies and young volcanics [3], to radiation data critical for planning extended operations in deep space [4]. In that sense, LRO data is not only telling us where to go on the Moon, but how to survive there.

LRO will support the identification and characterization of landing sites for commercial enterprises and use these landings as opportunities for science observations [e.g., 5, 6]. This new era of lunar exploration is fundamentally enabled by LRO's data, creating a period of lunar exploration on the shoulders of LRO, GRAIL, Kaguya, and the other recent missions [7].

Landing Site Characterization: LRO data was envisioned to be used to support human and robotic missions to the surface. With a decade of observations we have collected over a 1Pb of data, which is available for use in the PDS. This data volume includes maps of topography, slope, temperature, rock abundance, etc.

This new era of lunar surface exploration also enables a new age of coordinated lunar science between an orbital asset and surface assets. During Apollo, coordinated measurements of surface magnetic fields and the deep space environment by Explorer 35 [8], during this period of exploration we may offer similar coincident measurements that benefit both LRO and Artemis operations.

Future of LRO: LRO is currently funded to operate until September 2022, however we have fuel onboard to support at least 6 more years of operations. During that time our orbit will continue to drift away from the pole, however we will still be passing over areas within the "Artemis Region of Interest" (poleward of -84°).

References: [1] Kosofsky, L. J. and F. El Baz, (1970) *The Moon as Viewed by Lunar Orbiter*, 152 p. [2] Wilhelms, D. E., (1987) *The Geologic History of the Moon*, 327 p. [3] Braden, S. E., et al., (2014) *Nature Geosci*, 7, 787-791. [4] Schwadron, N. A., et al., (2014) *Space Weather*, 12, 622-632. [5] Retherford, K. D., et al., (2013) LRO-Lyman Alpha Mapping Project (LAMP) Observations of the GRAIL Impact Plumes, [6] Clegg-Watkins, R. N., et al., (2016) *Icarus*, 273, 84-95. [7] Keller, J. W., et al., (2016) *Icarus*, 273, 2-24. [8] LSI, (1972) *Post-Apollo Lunar Science*, 104 p.