LROC VIEWS THE CONSTELLATION REGIONS OF INTEREST: SCIENCE AND EXPLORATION OBSERVATIONS. S. J. Lawrence[1], B. L. Jolliff[2], B. W. Denevi[1], B. R. Hawke[3], M. S. Robinson[1], J. D. Stopar[1], M. E. Banks[4], W. B. Garry[4], H. Sato[1], V. J. Bray[5], and the LROC Team. [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ (samuel.lawrence@asu.edu) [2]Department of Earth and Space Sciences, Washington University in St. Louis, St. Louis, MO [3]Hawaii Institute of Geophysics and Planetology, School of Ocean and Earth Science and Technology, University of Hawaii at Manoa, Honolulu, HI [4]National Air and Space Museum, Smithsonian Institution, Washington, D.C. [5]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ

Introduction: The Lunar Reconnaissance Orbiter Camera (LROC) Team is executing an ambitious campaign to collect a comprehensive suite of data including geometric and photometric stereo observations, multispectral imagery, and high-resolution (0.5 m/pixel) observations for fifty high-priority sites identified by NASA's Exploration Systems Mission Directorate (ESMD) as regions of interest (ROI) for future human and robotic exploration [1]. These fifty ROIs were carefully selected [2] from sites defined for future human and robotic exploration in previous studies [3-5] and were vetted by a Lunar Exploration Analysis Group Special Action Team [6]. These ESMD ROIs were designed to provide a globally representative subset of important terrains with high science and resource potential to effectively capture the diversity of the lunar surface. Here, we provide a few example highlights of findings derived from LROC studies of the ESMD ROIs, and discuss implications for future human and robotic precursor exploration.

*Key Findings***:** To date, ongoing LROC scientific analyses of the ESMD ROIs have primarily focused on geomorphology, including analyses of digital terrain models derived from geometric stereo observations, as well as multispectral investigations of these important regions. Select example findings are summarized below.

Impact Craters: *Tycho:* The floor of Tycho is drenched in impact melt, with large-scale flows of melt that appear to originate from the central peak near the ESMD region of interest.

Central Peaks and Peak Ring Structures: *Tsiolkovskiy Crater:* The Tsiolkovskiy region of interest is located next to Tsiolkovskiy's complex central peak on the smooth lava-flooded floor. The mare floor is smooth and largely free of boulders >25 m in diameter, although LROC Narrow Angle Camera (NAC) images reveal several boulder fields (from the uplifted central peak) that have accumulated on the mare. Such boulder fields provide astronauts samples of central peak materials that originated from deep beneath the lunar surface.

Mare Units: *Mare Crisium:* Within Crisium, at least two distinct mare basalt compositional units can be discerned using LROC Wide Angle Camera (WAC) ultraviolet images. The WAC images demonstrate that the ESMD site is compositionally distinct (i.e., higher Ti content) from the mare unit sampled by the Luna 24 mission, which contains ~1% TiO_2.

Flamsteed: The Flamsteed region of interest is located in a site thought to have a very thin mare regolith. In NAC images, craters whose morphology (i.e., benches, flat floors) indicate penetration through the regolith layer into a more competent substrate are abundant consistent with the proposed thickness.

Frigoris: In the Frigoris ESMD ROI, the regolith is much thicker than at Flamsteed, and the distinctive elephant-skin texture is observed.

Cryptomare: *Balmer:* NAC images reveal ejecta from fresh craters that serve as natural drill holes into the surrounding light plains deposits. Impact craters (400-500 m) in the Balmer region penetrated far enough to reach the deeper basaltic bedrock of the buried mare deposits. The regolith in the vicinity of the Balmer ROI is fairly thick, possibly several tens of meters in places.

Volcanic Domes: *Marius Hills:* The ROI is located in easy traverse range of several sinuous rilles and volcanic domes. The volcanic domes are characterized by rough surface textures, including the presence of large boulders at the summits (~3-5 m diameter), which is consistent with the radar-derived conclusions of [7].

Gruithuisen: The textures on Gruthuisen γ are remarkably distinct from the higlands and crater surfaces, with irregular furrows oriented radially downslope. The largest of these ridges are measured in DTMs derived from NAC stereo to be ~ 30-50 m in relief.

Conclusion: Targeting of the ESMD ROIs will continue until the end of LRO's Exploration mission, but the comprehensive set of observations being collected for these 50 sites already provide an enormously useful dataset for lunar scientists and future exploration planners.

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