## Characterizing Sites for Landed Lunar Missions with NASA's Moon Trek Portal

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NASA' s Moon Trek (https://trek.nasa.gov/moon/) is one of a growing number of interactive, browser-based, online portals for planetary data visualization and analysis produced by NASA' s Solar System Treks Project (SSTP). Moon Trek continues to be enhanced with new data and new capabilities enabling it to facilitate the planning and conducting of upcoming lunar missions by NASA, its commercial partners, and its international partners.

Moon Trek is being used for growing number of mission planning, specifically for site characterization. Its baseline visualization and analysis tools allow users to measure the diameters, heights and depths of surface features. Users can plot Sun angles altitude and azimuth. More advanced account-level tools allow users to perform computationally-intensive analyses. These include ray-traced lighting analysis for user-specified areas over user-specified time/date ranges and time intervals. Lighting analyses also produce maps of watts per square meter for the area specified. Electric surface potential analyses can also be generated for user-specified areas and intervals. Machine learning-based hazard analyses include boulder detection and distribution, crater detection and distribution, and slope analysis. Large data products can be subsetted, allowing users to download regions of specific interest. The LRR/LLR Geometry Calculator allows researchers to find, visualize, and analyze images taken by the Lunar Reconnaissance Orbiter (LRO) that are applicable to Lunar Laser Retro-Reflector (LRR) and Lunar Laser Ranging (LLR) studies and planning.

Using an in-house stereo workflow, SSTP is able to produce new NAC-based high-resolution mosaics and DEMs. These are particularly useful in our work with Commercial Lunar Payload Services (CLPS) providers using Moon Trek in site characterization for landing and surface operations.

Important new tools are currently being integrated into Moon Trek. A Convolutional Neural Network (CNN) is being implemented, trained to automatically detect rockfalls in LRO NAC imagery, and integrated into Moon Trek. Such rockfalls are interesting because they enable remote analysis of tectonic activity, surface evolution, and mechanical surface properties. A new line-of-sight tool will support detailed studies of solar illumination, line-of-sight communications with the Earth, and communications with assets in lunar orbit.

This presentation for JpGU will highlight Moon Trek's tools that are useful in facilitating site characterization for future Lunar missions.

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