Line-of-sight Communication on the Moon - Analysis for Landing Spot Selection. P. Mahanti[1] , M. S. Robinson[1], A. Boyd[1] and S. Lawrence[1], [1]Lunar Reconnaissance Orbiter Science Operations Center, Arizona State University, Tempe, Arizona, pmahanti.lroc@gmail.com

Introduction: Sustainable communication between assets on the lunar surface is a primary requirement for any lunar science and exploration mission. There is a long history of line-of-sight communication planning for lunar exploration, evident from the requirements from the Apollo era [1]. Laser communications, to be experimentally tested in the imminent LADEE mission [2], depends also on line-of-sight availability.

High resolution lunar elevation data and the development of methods and data products well suited to this requirement will advance NASA's preparedness for conducting science and exploration on and from the Moon. Further, in context of science and exploration research directions in terms of a lunar geophysical network or for a rover assisted sample return [3] mission (robotic or human) from scientifically significant sites (e.g. the South Pole Aitken basin) – the planning of line-of-sight communication at these sites needs to be addressed to optimize site selection from several requirements. In this work an example analysis is discussed for landing spot selection.

Methods: High resolution (2 meter sampling) Lunar Reconnaissance Orbiter Camera (LROC) [4] topographic data derived from stereo observations controlled to laser ranging is now available for key sights enabling accurate line-of-sight analysis. These digital elevation models (DEMs) of scientifically prioritized sites were generated from LROC Narrow Angle Camera (NAC) stereo observations [5] tied to Lunar Orbiter Laser Altimeter (LOLA) profiles. These products provide the means to identify and characterize high priority science and exploration targets [6] at a scale relevant to surface landers and vehicles. In this work we develop and analyze viewshed maps to down-select a landing spot at the lunar South Pole Aitken basin from the communications point-of-view.

The experimental method for landing spot selection from line-of-sight analysis is as follows: Multiple exploration routes are first selected for an exploration site based on scientific target priorities and basic safety concerns. Next a viewshed analysis cross-checks the existence of continuous line-of-sight from possible landing spots (touchdown-point or start-of-mission) along the exploration routes or important waypoints. In the example shown in Fig.1, the DEM used is a priority target site located on the rim of the South Pole-Aitken basin. The three possible landing locations are indicated as A, B and C, and viewsheds were generated at each of these locations. Location A is a better choice from the communication perspective since it has about 50% of the exploration path connected by line-of-sight.

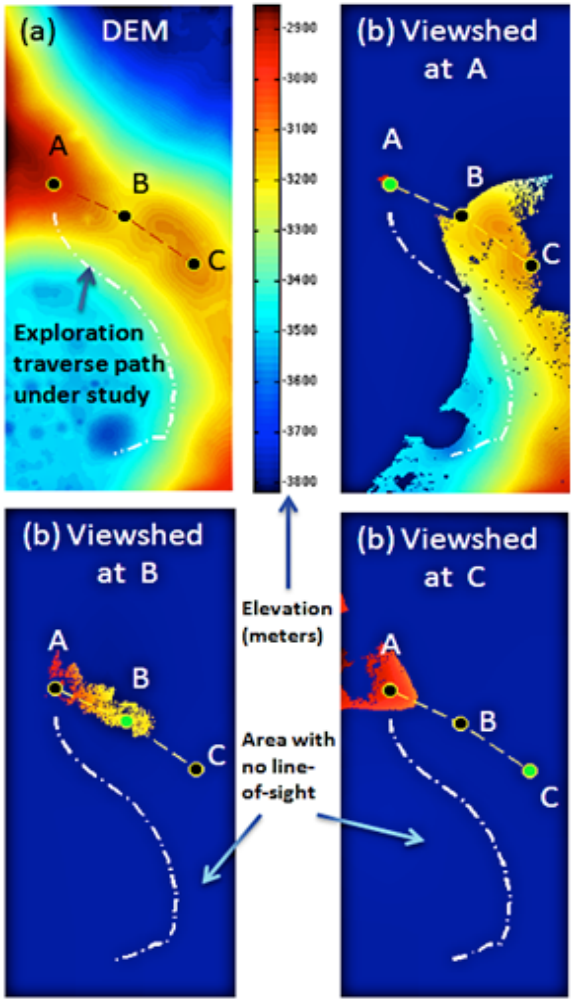

Figure 1 : Viewshed computation and line-of-sight coverage for different landing locations. [DEM source- NAC images M136226953 & M136226953; DEM center: 51.06° S, 170.84° E]

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