A Target for the Lunar Reconnaissance Orbiter near the Southwest Limb of the Moon

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Introduction: My principle interest is in those targets that would either support or refute the Near Side Megabasin (NSM)[1, 2, 3]. The NSM is so large that any departure from the near side sites examined in the past would provide new and useful information. This contribution is intended to propose a particular site of interest to the NSM hypothesis, but the target is also of considerable other interest, both as a remote sensing target and as a potential landing site.

Proposed Target: The site is in the pre-Nectarian Mendel-Rydberg Basin, northeast of the Eratosthenian crater Hausen, at 52 Sº, 85,5º W. It is located on the segment of the rim of the NSM that is on the near side. As a landing site, it would allow continual communication with Earth, at least at favorable libration.

Figure: LO193H3, NASA, LPI, cleaned[4].

The target is in a very interesting area that has received ejecta from many impact features. It is on the outer ejecta blanket of Bailly and is just beyond the ejecta blanket of the Orientale Basin. It appears to have received molten material from Early Imbrian Orientale Basin, which provides smoothness to the proposed landing site. Ejecta from the Eratosthenian crater Hausen should be on the surface. The history of this area may be as follows:

1. A base of about 1000 meters of ejecta near the rim of the NSM, resting on pristine crust
2. About 150 meters of ejecta from the South Pole-Aitken Basin (SPA)
3. Modification by the Mendel-Rydber Basin
4. Possible Pingre-Hausen ejecta
5. Ejecta from the Bailley Basin
6. Orientale Basin ejecta, molten material and secondaries
7. Hausen ejecta. A traverse toward Hausen should encounter material from older layers, according to the principle of layer inversion in ejecta blankets.

High-resolution multispectral data may reveal differences among these materials. In-situ or sample return and analysis would add information on the formation and subsequent modification of this complex site. An objective should be to obtain sufficient resolution to certify the safety of a landing mission.

Other data of interest: All of the soft landing missions to date have been in the same unit of the NSM: the reconstituted crust of its flat floor. Data concerning the slope up to the rim, the rim itself, and the ejecta blanket that covers all of the far side beyond its rim are needed to fully describe the NSM.

Missions to either poles would be in the NSM slope, the area from the flat floor to the rim. Almost any mission to the far side beyond the SPA Basin would be in the NSM ejecta blanket. Any samples taken there would be characteristic of the pristine crust, reworked by the NSM, SPA Basin, and other basins and craters in the neighborhood.

One test of a hypothesis is to make a prediction, and see what happens. It may be that the seismically active zone on the near side is at the boundary of the NSM transient crater. If so, a seismometer network on the far side would see a similar active zone under the SPA Basin, but not under the northern hemisphere of the far side. If we are to deploy a seismic network on the far side, it would be well if it could distinguish such a pattern.

References: [1] Byrne, C.J., The Near Sde Megabasin of the Moon, LPSC 37, talk, Abstract 1930. [2] Byrne, C.J., Interior of the Near Side Megabasin of the Moon, LPSC 38. Abstract 1248. [3] Byrne, C.J., A large near side basin on the Moon, manuscript submitted to Earth, Moon, and Planets, October 4, 2006. [4] Byrne, C.J., Lunar Orbiter photographic atlas of the near side of the Moon, Springer, 2005.