THE LUNAR NORTHWEST NEARSIDE: THE PRIZE IS RIGHT BEFORE YOUR EYES. J. E. Gruener[1], [1]NASA Johnson Space Center, Mail Code XI411, 2101 E. NASA Parkway, Houston, Texas, 77058, john.e.gruener@nasa.gov.

Introduction: Most recent discussions about the utilization of lunar resources have focused on water ice at the lunar poles [1]. While the potential value of polar water ice, and other frozen volatiles, may be huge, the scientific data for these potential resources is not yet sufficient to conduct a viable resource assessment. Surface water frost has been measured by several instruments from orbit, yet the datasets are not in agreement in many surface locations [2]. Also, neutron spectrometer data of the shallow subsurface does not correlate well with the surface data [3]. Surface-based mapping by mobile surveyors and prospectors will be needed to better define the distribution of polar water ice.

The unknown quantity of polar volatile deposits is matched by the unknown accessibility of these deposits. Permanent darkness in crater floors and steep slopes to reach those floors, temperatures below 40K, and intermittent direct communications with Earth will frustrate initial attempts to mine the polar volatiles [4, 5].

While the existence of the polar volatiles deposits is scientifically intriguing, the polar regions are not high priority locations for other important outstanding lunar science questions [6]. An exception to this is the idea that Malapert peak and the Leibnitz ß plateau may be remnants of the South Pole-Aitken basin rim, and the ridge that is bounded by Shackleton and De Gerlache craters may be a SPA inner ring segment [7]. Both areas could provide important data on the age and formation of the SPA basin.

An alternative location for a near-term lunar outpost and in situ resource utilization (ISRU) strategy is the northwest quadrant of the lunar near side. Known resource deposits, numerous important scientific locations, and continuous line of sight communications with Earth make this region a useful and viable initial proving ground for long-term exploration, utilization, and habitation of the Moon.

A Vast Resource Potential: Orbital remote sensing datasets have shown the vast flood basalts on the northwest nearside possess some of the highest titanium contents of the mare basalts on the Moon [8]. Furthermore, the boundaries of the regional pyroclastic deposit on the Aristarchus Plateau are well delineated by spectral reflectance [9]. Recently, this pyroclastic deposit has been shown to have a higher amount of hydration than surrounding areas [10]. Both the high-Ti basalts, and the Aristarchus regional pyroclastic deposit are ideal feedstocks for the hydrogen reduction process to produce oxygen [11]. The hydrogen reduction process is the relatively most simple process to liberate oxygen from the lunar regolith.

Abounding Scientific Enigmas: The northwest nearside of the Moon abounds with scientifically interesting and important locations. The Gruithusien domes, Aristarchus Plateau and the young lava flows south and west of plateau, the Marius Hills volcanic complex and a skylight into a possible intact lava tube, and the magnetic anomaly Reiner Gamma, are all described as high-priority landing sites in the recent Lunar Science for Landed Missions Workshop Findings Report [12]. All of these locations are within reach of robotic or human pressurized rovers, based from a centrally-situated outpost.

Challenges: While the northwest quadrant of the lunar nearside is replete with potential resources and scientific investigations, it does come with its own set of challenges. The primary challenge is associated with the diurnal cycle on the surface of the lunar near side, namely an extreme temperature range of 100s °C, and the two-week long lunar night.

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