LUNAR RESOURCES. J. Edmunson, BAE Systems/NASA Marshall Space Flight Center (320 Sparkman Drive VP61, Huntsville AL 35805, Jennifer.E.Edmunson@nasa.gov).

Introduction: The location of lunar resources for in situ resource utilization (ISRU) technology is an important consideration for establishing a lunar base. Without ISRU, lunar habitation would be limited by the extreme cost of launching a large amount of mass required for habitat building, resupplying the base, rocket fuel, and full time equivalent/work year equivalent employees. Unfortunately, the applicability of any given ISRU technology depends on the environment chosen for habitation. For this reason, many technologies must be developed to exploit the resources available in particular areas on the Moon. This abstract is intended to direct the reader to up-to-date references on the locations of these lunar resources.

Locations: Three significant divisions in the classification of lunar locations are based on geological and environmental constraints: the highlands, mare, and polar regions. One can see significant differences in albedo alone between the lunar highlands, dominated by the light-colored mineral anorthite, and the lunar mare, dominated by dark pyroxene/mafic minerals. Further, the lack sunlight in some polar regions created areas of extreme cold on the Moon, while the elevation of some polar crater rims made them some of the most illuminated locations in the Solar System.

Resources: Those of note on the surface are: sunlight, solar wind, water, rock types, and regolith.

Sunlight. Bussey et al. (2005) estimated the locations of nearly permanent illumination on the lunar surface by examining lunar topography and the astronomical properties of the Moon. This area is a candidate for lunar habitation due to its abundant solar energy. This area is located in the highlands.

Solar wind. Both hydrogen (e.g., Anders and Grevesse, 1989) and helium-3 (^{3}He, e.g., Gloeckler and Geiss, 1998) come from solar wind and are implanted on the lunar surface. The hydrogen from the solar wind is proposed as the source of OH/H_2O on the Moon (McCord et al., 2010). The ^{3}He has been proposed as a fuel source (e.g., Kulcinski and Schmitt, 2000). Estimates of ^{3}He concentrations on the lunar surface were made by Fa and Jin (2007). The mineral ilmenite retains ^{3}He better than other lunar minerals (e.g., Taylor, 1994).

Water. Ice deposits composed of H_2O were detected in permanently shadowed regions (PSRs) of the poles (highlands terrane) or as vapor in the tenuous atmosphere of the Moon with recent spacecraft (e.g.; Colaprete et al., 2010; Sridharan et al., 2010). A spatial distribution map of OH/H_2O on the lunar surface was made by Pieters et al. (2009), indicating the presence of hydrogen beyond the PSRs.

Rock types. Different highland and mare rock types are described well by Papike et al. (1998), and their context by Shearer et al. (2006). Ilmenite is in trace abundance in the highlands; it is found in much greater abundance in high-titanium mare basalts (e.g.; McKay and Williams, 1979; Heiken and Vaniman, 1990). Regions high in chromite, spinel, olivine, and anorthite have also been discovered (Sunshine et al., 2010; Pieters et al., 2010; Ohtake et al., 2010).

Regolith. Regolith can be used for many things, including sintering (e.g., Taylor and Meeks, 2005), radiation shielding (e.g.; Nealy et al., 1988; Miller et al., 2009), agriculture (e.g.., Drees and Wilding, 1989) and berm or habitat construction (e.g., Faierson et al., 2010). This resource is found all over the Moon.

Conclusions: Research is ongoing via remote sensing to determine what resources are available at what locations on the Moon, in addition to how much of each resource is available. Technology must be developed now to facilitate ISRU when humans finally (and hopefully soon) return to the Moon. Thus, multiple simulants must be created to reflect the variability of the lunar surface for testing ISRU technology.

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