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A COMBINED RESOURCE MAPPER AND EXCAVATION CONCEPT FOR PSRS

Abstract

It is widely accepted that conditions within the Permanently Shadowed Regions of the lunar poles represent some of the most hostile conditions in cislunar space. The conditions of permanent darkness, extremely cold temperatures, no air, and harsh dust conditions will make prospecting and mining extremely difficult. The only analog is exploration and drilling for oil in the far northern regions such as in Siberia, the northern regions of Scandinavia, or in northern Alaska. Even in those severe environments, the conditions are relatively benign compared to conditions in the PSRs. While most robotic exploration tends to focus on prospecting and excavating within the PSRs. The author believes this to be very risky, as there is no terrestrial analog which corresponds to these extreme conditions. Many materials exposed to these conditions become brittle and unreliable. The author has developed a concept which allows for high resolution at-depth prospecting and excavation within the PSRs with a very limited footprint within the PSRs. The concept enables characterizing the resources without having a permanent presence there. The concept itself can operate in the sunlight for the prospecting mission, while using well known excavation methods for excavation of resource-rich regolith. The prospecting mission, since it requires only small amounts of power can be powered by the sun. Excavation will require nuclear power since the capture of materials will require addressing the shear forces of yet unknown magnitude, but it could be quite large, particularly if the process involved in depositing the ice, turned the ice to water and subsequently froze to make a very hard surface. The author will present the details of the concept and how it could enable widespread prospecting and excavation of the PSRs.