

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

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VIPER: INTRODUCTION TO THE RESOURCE PROSPECTING MISSION

Abstract

With the Artemis Program, NASA plans to return humans to the Moon to stay, which means if there are local materials available, they could be deployed to help support extended lunar stays. Since the moon's polar regions have confirmed the presence of volatiles, as revealed by LCROSS, LRO and other lunar missions, the next step is to understand the nature and distribution of those candidate resources and how they might be extracted. Recent studies have even indicated local volatiles could be processed into propellants and human life-supporting resources, significantly aiding in sustaining humans on the Moon, and eventually and later to support missions to Mars.

The Volatiles Investigating Polar Exploration Resource (VIPER) is an in-situ resource utilization (ISRU) mission within NASA's Science Mission Directorate (SMD), based on the pathfinding development of the Resource Prospector (RP) mission concept. This clever mission is targeting late 2023 and may spend over 100 days mapping and surveying four different Ice Stability Regions to understand the nature and distribution of water and volatiles already confirmed to be there, including measuring mineralogical content such as silicon and light metals from lunar regolith.

The knowledge attained by a mission like VIPER could have many-fold benefits for space exploration, but also commercial applications. VIPER is an essential, early mission supporting the "moon rush" which has developed over the past few years, with both governments and commercial entities making their cases for lunar exploration. VIPER aims to understand just how the water-ice and other volatiles are distributed, both horizontally and vertically, enabling creation of volatiles resource maps, which will guide what might be required to harvest those resources at scale.

With sufficient infrastructural investment, led by governments and then optimized by the commercial marketplace, VIPER will be a pathfinder mission addressing key decadal lunar science and early strategic knowledge gaps.