

14th HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM (A5)  
Near Term Strategies for Lunar Surface Infrastructure (1)

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RESOLVE: GROUND TRUTH FOR POLAR LUNAR VOLATILES AS A RESOURCE

**Abstract**

Our understanding of the moon has been evolving rapidly over the last few years. What the scientific community thought was dry and barren wasteland from the samples brought home from the Apollo missions, has surprised the vast majority of lunar scientists by being a wet and dynamic body as you approach the poles. In the 1990's Clementine and Lunar Prospector gave us hints that there might be water ice at the poles. This evidence was heatedly debated by the scientific community until the debate was ended dramatically by the impact of the Lunar Crater Observation and Sensing Satellite (LCROSS) in October of 2009. LCROSS indisputably showed that the Cabeus crater contained water ice. Additionally, the Lunar Reconnaissance Orbiter instruments show evidence that the water ice may not be limited solely to the permanently shadowed regions. The only question that remains now is the distribution of quantity of water at the poles and whether this ice is a resource that can be utilized to enable the exploration of Space.

NASA's In-Situ Resource Utilization project, in partnership with the Canadian Space Agency, is developing a payload that will enable us to provide ground truth answers to the question of water ice utilization on the moon. The project is named RESOLVE. RESOLVE will land near the shadowed region of Cabeus at an area that receives sunlight for several days a month. Using a Neutron Spectrometer RESOLVE will map the distribution of hydrogen in both sunlit and shadowed regions near Cabeus. RESOLVE will also drill into the lunar surface up to a meter in deep using a drill supplied by the Canadian Space Agency to deliver samples of the subsurface to an analytical suite of instruments. An oven will heat the samples and monitor the evolution of volatiles as a function of temperature. As the gasses are released, they will be analyzed by a Gas Chromatograph Mass Spectrometer which will allow us to understand the form and distribution of all of the volatiles species seen by LCROSS. The data obtained by RESOLVE will allow us to ascertain if the water ice at the poles of the moon could be effectively harvested and utilized in life support and propulsion systems.