

Title: Lunar PSRs: Resource or Scientific Curiosity?

Speaker: Mark Robinson, Arizona State University, USA

The hypothesis that cold-trapped volatiles may exist within Permanently Shadowed Regions of the Moon date back to 1961. Since 1994 many orbital instruments have obtained polar measurements across a broad range of the electromagnetic spectrum. Neutron absorption measurements from Lunar Prospector and the Lunar Reconnaissance Orbiter provided strong indications of large-scale hydrogen sequestration within the polar. Bistatic radar measurements hinted that there could be ice deposits in or near Shackleton crater. Spectra of material ejected from the LCROSS impactor showed that Cabeus crater PSR hosts significant concentrations of water ice in the top few meters of the regolith.

Other measurements from far-ultraviolet into the near-infrared provide indications of surface ice in some PSRs. However, these measurements do not always geographically coincide; despite the great interest and large volume of relevant data, we still do not know the location and concentration of volatiles in the lunar polar regions. How are volatiles transported in the lunar environment and within the regolith? Do economically viable volatile deposits exist within PSRs, or anywhere in the polar regions? What are the geotechnical properties of putative ice-rich regoliths? This talk will summarize our state of knowledge of these enigmatic polar regions and how upcoming surface missions may bring the orbital measurements to the ground.

Mark Robinson is an Arizona State University School of Earth and Space Exploration professor. He participated in past NASA missions (Clementine, NEAR, CONTOUR, MESSENGER) and is currently the Principal Investigator of the NASA Lunar Reconnaissance Orbiter Camera and the NASA ShadowCam investigation (to be flown to the Moon on the KARI KPLO in August 2022). He is also the Science Lead for the upcoming Intuitive Machines 2 CLPS mission that will land near the lunar south pole in 2023.