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Lunar IceCube: Ushering in a new era of planetary remote sensing using small satellite platforms

Lunar IceCube, a 6U CubeSat designed to prospect for water in solid (ice), liquid and vapor forms and other lunar volatiles from a low-perigee, highly inclined lunar orbit, has been selected by NASA for a flight opportunity on Exploration Mission-1 (EM-1). The mission is a partnership between Morehead State University, NASA Goddard Spaceflight Center (GSFC), JPL, the Busek Company, Vermont Tech, and Kentucky Space LLC. Lunar IceCube will be deployed during lunar trajectory by the Space Launch System (SLS) and use an innovative RF Ion engine to achieve lunar capture and a science orbit (inertially locked, highly elliptical, 100 km periapsis) to investigate the distribution of water (ice, vapor, water components), as a function of time of day, latitude and regolith composition in the context of mineralogy. IceCube will include the Broadband InfraRed Compact High Resolution Exploration Spectrometer (BIRCHES), a compact version of the successful volatile-seeking new horizons ralph instrument. BIRCHES have the high spectral resolution (5 nm) and wavelength range (1 to 4 μm) needed to distinguish phase states of water. The mission addresses NASA Strategic Knowledge Gaps related to lunar volatile distribution and will complement the work of Lunar Flashlight and LunaH-Map by focusing on the distribution and transportation physics of water ice at a variety of latitudes, thus not restricted to permanently shadowed regions. The 13 secondary payload CubeSats that will be included on EM-1, including Lunar IceCube, will usher in a new era of solar system exploration with CubeSats and other small satellite platforms.

Biography

Benjamin K Malphrus is a Professor of Space Science at Morehead State University where he also directs the University's Space Science Center and serves as the Director of Space Operations for the Kentucky Space program. He has served as Principal Investigator on several nanosatellite missions including KySat-1, CXBN 1 and 2 and TechSat-1. He and his team recently received \$8M contract from NASA to design a small space probe to fly to the Moon in prospect for water ice. In the late 1990s, he has developed a Theory of Galaxy Formation that has gained wide acceptance among the astronomical community.

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