NASA NextSTEP Lunar Ice Cube Mission
EM1 Lunar CubeSat Orbiter
with BIRCHES (Broadband InfraRed Compact High-Resolution Exploration Spectrometer)

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Lunar Ice Cube is a NASA NextSTEP orbital 6U cubesat mission designed to determine the distribution of lunar water as a function of illumination, thermal, and regolith conditions, revisiting the same swaths on the lunar surface at up to six different times of day during the course of the six month science mission. Ice Cube is one of the cubesats with JPL involvement (also including Lunar Flashlight, for which Lunar Ice Cube will provide complimentary data, and NEA Scout) to be launched on EM1.

The GSFC payload is BIRCHES, Broadband InfraRed Compact, High-resolution Exploration Spectrometer, a miniaturized version of OVIRS on OSIRIS-Rex, which has heritage from New Horizons Ralph. BIRCHES is a compact (1.5U, 2 kg, <5W) point spectrometer with a compact cryocooled HgCdTe detector for broadband (1 to 4 micron) measurements at sufficient resolution (10 nm) to characterize and distinguish important volatiles (water, H2S, NH3, CO2, CH4, OH, organics) and mineral bands. It has built-in flexibility, using an adjustable 4-sided iris, to maintain the same spot size regardless of variations in altitude (by up to a factor of 5) or to vary spot size at a given altitude, as the application requires.

Lunar Ice Cube measurements will encompass the broad 3 um band associated with water to distinguish overlapping OH, water, and ice features and extend previous ‘snapshots’ to geospatially linked time of day and latitude coverage.