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Introduction: The IceMic instrument is a combination of a seismometer and microphone deployed on the surface of the Moon (LISTEN) or Europa (EAR) to measure geophysical properties of the ice. The combination of a microphone / seismometer allows for measuring a wide range of frequencies (0.01 hertz to 40 kilohertz). The seismometer measures very small perturbations (as low as 0.01 hertz) while the microphone measures larger frequencies (up to 40 kilohertz) within the ice. We research current acoustic and vibrational sensors including those from the geological and medical fields to design an IceMic prototype. Science from IceMic contributes to geophysical measurements investigating ice dynamic properties and planetary surface shifting at a large and small scale on the Lunar surface and icy bodies.

We present results from our IceMic feasibility study. We tested the feasibility of IceMic to determine basic ice properties and water flow using the IceMic prototype at two different physical analog regimes. IceMic- EAR, Europa Acoustic Recorder, was tested on ice-covered lakes as an icy body analog. And IceMic- LISTEN, Lunar Ice Science Through Eavesdropping on Noise, was tested on ground ice atop volcanic terrain as a lunar analog.

The IceMic hydrophone is a small light-weight instrument that could be used to achieve two of the three Europa Lander mission science goals of: 1) Assess the habitability particularly through

quantitative compositional measurements of Europa via in situ techniques uniquely available to a landed mission. And 2) Characterize surface properties at the scale of the lander to support future exploration, including the local geologic context. Acoustic properties of the ice would provide a better understanding of localized ice properties including the abundance, density, flow rate, stability and salinity of the ice on the Lunar surface.

In addition to providing scientific data on the properties of the ice; IceMic would also have an additional E/PO benefit.

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References: National Aeronautics and Space Administration. (2016). Europa Lander Science Definition Team Report. JPL D-97667. Task Order NNN16D011T.