Elastic wave analyzer for icy sub-surfaces (EWAIS) of ocean worlds

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Target: Sub-surface structures of ocean worlds (e.g., Europa, Enceladus, and Titan) and structure in icy regions on Mars.

Science:

Enable investigating the workings and habitability of ocean worlds & addressing the science questions:

- What geophysical and morphological layers are present in the near sub-surface?
- Are there liquids and non-icy solids present in near sub-surface fractures?
- What are the thermal and compositional structures of icy crusts?
- How thick is the ice that covers icy ocean moons in the outer solar system?

Objectives:

- The EWAIS instrument will be developed to operate at extremely low temperatures for probing kilometers-deep in ice with sensitivity sufficient to yield geological properties and detect/characterize discontinuities.
- It will comprise a novel array of transmitters that impact constrained mass to generate wave-train pulses in dual-frequency ranges.
- The developed breadboard will weigh <5 kg, sized D=0.3 m x H=0.2 m height, using <5 Watts average power.

CoIs:

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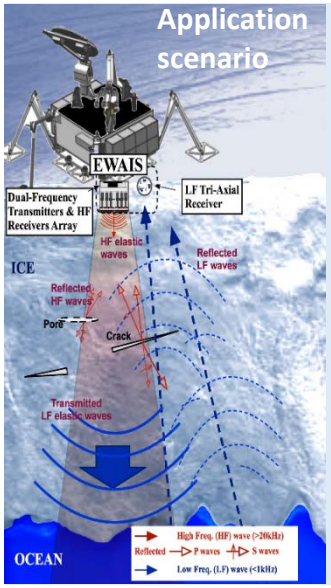
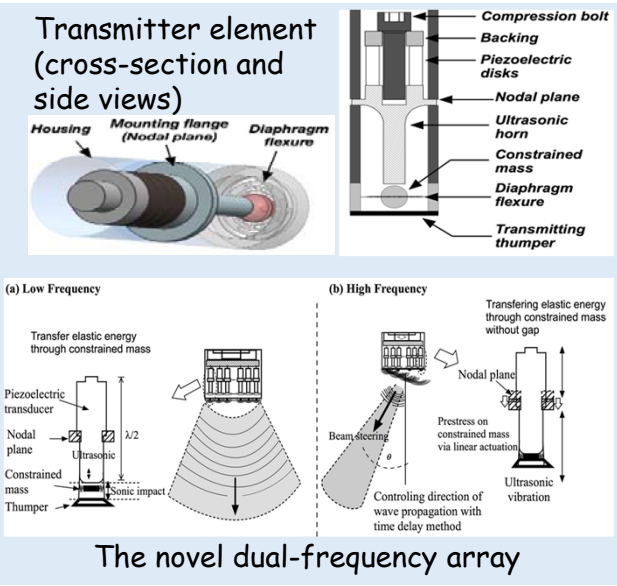
- Dr. Hyeong Jae Lee/JPL/355N
- Dr. Mark Panning/JPL/3223
- Dr. Steve Vance/JPL/3225

Collaborator: Dr. Kevin Hand/JPL/3204





Key Milestones:

Development schedule	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
* Design the dual-frequency transmitters' array components.												
- Model and optimize the transmitting transducer design parameters												
- Components design, fabrication and performance characterization												
- Develop the breadboard controller, data acquisition and processing												
* Develop the RT and 90K ice testbed with layers and discontinuities												
* Breadboard components operation testing at RT and 90K												
* Full EWAIS breadboard integration and testing												
- EWAIS system integration and completion												
- System testing at RT and 90K, and demo the ability as analyzer												
* Document the results in a report and publish in peer-reviewed journals												

TRL (2) to (4)