EGU23-17429, updated on 23 Apr 2024
https://doi.org/10.5194/egusphere-egu23-17429
EGU General Assembly 2023

Exploring Europa, Jupiter's Ocean World: A View from Earth

Donald D. Blankenship[1], Duncan A. Young[1], Kristian Chan[1], Natalie S. Wolfenbarger[2], Christopher Gerekos[1], and Gregor B. Steinbrügge[3]

[1]Institute for Geophysics, University of Texas, Austin, TX, United States of America
[2]Departement of Geophysics and Electrical Engineering, Stanford University, Stanford, CA, United States of America
[3]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, United States of America

Europa Subsurface Studies: The Europa Clipper is a NASA mission to study Europa, the ice-covered moon of Jupiter characterized by a global sub-ice ocean overlying a silicate mantle, through a series of fly-by observations from a spacecraft in Jovian orbit. The science goal is to "explore Europa to investigate its habitability". The Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON) is one of the primary instruments of the scientific payload. REASON is an active dual-frequency (9/60 MHz) instrument led by the University of Texas Institute for Geophysics (UTIG). It is designed to achieve multi-disciplinary measurements to investigate subsurface waters and the ice shell structure (Sounding), the surface elevation and tides (Altimetry), near-surface physical properties (Reflectometry), and the ionospheric environment including plume activity (Plasma/Particles). REASON will play a critical role in achieving the mission's habitability driven science objectives, which include characterizing the distribution of any shallow subsurface water, searching for an ice-ocean interface and evaluating a broad spectrum of ice-ocean-atmosphere exchange hypotheses.

Terrestrial Analogs: The development of successful measurement approaches and data interpretation techniques for exploring Europa and understanding its habitability will need to leverage knowledge of analogous terrestrial environments and processes. Towards this end, we are investigating, and considering for future investigations, a range of terrestrial radio glaciological analogs for hypothesized physical, chemical, and biological processes on Europa and present airborne data collected with the UTIG/University of Kansas dual-frequency radar system over a variety of terrestrial targets relevant to Europa's potential exchange processes and habitability. These targets include water filled fractures, brine rich ice, subglacial lakes, accreted marine ice, and ice roughness ranging from porous ice regolith (firn) to extensive crevasse fields. Our goal is to provide context for understanding and optimizing the observable signature of these processes in future radar data collected at Europa with implications for its habitability.