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Abstract

**Radar Imaging of Europa's Subsurface Properties and Processes:
The View from Earth**

D. D. Blankenship¹, D A. Young, M E. Peters, and W. B. Moore
¹University of Texas at Austin

A primary objective of future Europa studies will be to characterize the distribution of shallow subsurface water as well as to identify any ice-ocean interface. Another objective will be to understand the formation of surface and subsurface features associated with interchange processes between any ocean and the surface. Achieving these objectives will require either direct or inferred knowledge of the position of any ice/water interfaces as well as any brine or layer pockets. We will review the hypothesized processes that control the thermal, compositional and structural (TCS) properties, and therefore the dielectric character, of the subsurface of Europa's icy shell. Our approach will be to extract the TCS properties for various subsurface processes thought to control the formation of major surface (e.g., ridges/bands, lenticulae, chaos, cratering...) and subsurface (e.g., rigid shell eutectics, diapirs, accretionary lenses ...) features on Europa. We will then assess the spectrum of analog processes and TCS properties represented by Earth's cryosphere including both Arctic and Antarctic ice sheets, ice shelves and valley glaciers. There are few complete analogs over the full TCS space but, because of the wide range of ice thickness, impurities and strain rates for Earth's cryosphere, there are many more analogs than many Earth and planetary researchers might imagine for significant portions of this space (e.g., bottom crevasses, marine ice shelf/subglacial lake accretion, surging polythermal glaciers...). Our ultimate objective is to use these Earth analog studies to define the radar imaging approach for Europa's subsurface that will be most useful for supporting/refuting the hypotheses for the formation of major surface/subsurface features as well as for "pure" exploration of Europa's icy shell and its interface with the underlying ocean.