**The Heat Flux through the Ice Shell on Europa, Constraints from Measurements in Terrestrial Conditions.**

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**Introduction:** Europa releases its heat to the space through its ice shell. Heat transport across the ice shell of Europa controls the thermal evolution of its interior. Such process involves energy sources that drive ice resurfacing [1]. More importantly, heat flux through the ice shell controls the thickness of the ice [2], that is poorly constrained between 1 km to 30+ km [3]. Thin ice would allow ocean water to be affected by radiation from space. Thick ice would limit the heat ocean sources available to the rock-ocean interface at the ocean's bottom due to tidal dissipation and potential radioactive sources. The heat flux structures control the development of geometrical configurations on the Europa's surface like double ridges, ice diapirs, chaos regions because the rheology of ice is temperature dependent [4].

Analysis of temperature record of ice cover over a pond and water below by autonomous data loggers revealed the importance of solar radiation during the growth of ice. With no snow cover over the ice, a sufficient amount of solar radiation could penetrate through the ice and heated the water below. Due to temperature gradient, there was a heat flux from the water to the ice ($Q_{wi}$), which reduced ice growth at the bottom.

Details and variables that constrain the heat flux through the ice can be utilized to estimate the ice thickness. We show with this analog analysis provides the forth step towards measurement strategy on the surface of Europa. We identify three types of thermal profiles. First profile consists of only heat conduction, second with heat conduction and radiation, third with heat conduction and solid-state convection [5] and fourth with combination of all four mechanisms.

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