

The astrobiological potential for ice microhabitats in Ocean World crater melt sheets

Michael J. Malaska

Microbes can live in ice. A plethora of diverse microbes have been found in the liquid hypersaline micropockets between ice grains in the ice sheets and icy regions of Earth. During freezedown, growing ice grains reject impurities such as dissolved salts, organics and small insoluble grains from the ice crystal. This creates hyper-concentrated microenvironments in ice where cells can survive and even proliferate as long as the liquid eutectic temperature can be maintained. These micropockets are small, on the order of 10's of microns across, yet due to the low metabolic turnover rates, chemically driven metabolisms can persist for hundreds to thousands of years. Life in terrestrial ice sheets and frozen lakes can serve as analogs to potential Ocean World transient microhabitats in shallow impact crater melt pools or in the long-lived micropockets of ductile deep crustal ice. This presentation will provide an overview of the scale and diversity of terrestrial microhabitats relevant to Ocean Worlds, especially during freezedown of an impact crater melt pool, and the technologies and techniques to search for life in planetary applications.