

Exploring subglacial environments from the microbe's perspective

Jill Mikucki, W. Berry Lyons, Slawek Tulaczyk and the WISSARD Science Team

Subglacial environments are one of the most difficult portions of the cryosphere to access and only recently, in collaboration with large-scale drilling projects, are ecologists beginning to explore the subglacial biome. Understanding the persistence of life in extended isolation and the evolution and stability of subglacial habitats requires an integrated, interdisciplinary approach. The intense logistics involved in Antarctic subglacial research drilling underlines the need for ruggedized instrumentation that is capable of real-time, *in situ* biogeochemical measurements to maximize our understanding of these systems, despite our limited access. Here we describe the status of Antarctic subglacial exploration with a focus on Blood Falls, a hypersaline, subglacial brine that releases at the surface of Taylor Glacier in the McMurdo Dry Valleys. Geomicrobiological analyses at Blood Falls revealed a unique community of marine microorganisms that persist independent of photosynthetically derived carbon inputs by catalytically cycling sulfur to facilitate Fe(III) reduction and organic matter oxidation. These data suggest that the sulfur cycle is important in driving subglacial ecosystem function; *in situ* measurements of oxygen, iron and sulfur species *in situ* would improve our model of subglacial microbial processes. We will also discuss highlights of the recent investigation of Subglacial Lake Whillans. As we move forward with the exploration of subglacial systems, including Lake Vostok and Lake Whillans, existing models, such as the we describe here, will provide important insight into ecosystem structure and function, allow for the development of relevant tools for geomicrobiological examination of other subglacial environments on Earth and prepare us for the exploration of icy extraterrestrial targets.



WISSARD Drill Camp



'Lakeside' landing at Subglacial Lake Whillans



Canada Glacier, McMurdo Dry Valleys, Antarctica