

The Micro Subglacial Lake Exploration Device (MSLED)

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Antarctic subglacial lakes are believed to significantly impact glacial ice flow and therefore the Earth system due to rising sea levels and are furthermore scientifically interesting with respect to biogenic activity within these encapsulated ecosystems. In order to contribute to the Whillans Ice Stream Subglacial Access Research Drilling (WISSARD) expedition that will explore these subglacial Antarctic environments and their impact on the cryo system, a highly miniaturized remotely operated vehicle, the Micro-Submersible Lake Exploration Device (MSLED) has been designed. Unique features are the slim form factor for the deployment through small ice boreholes as well as the extensive use of commercial-off-the-shelf components. The MSLED shall investigate Subglacial Lake Whillans with focus on the visual characterization of the lake's water and the ice-water interface, the distribution of physical and chemical parameters within the lake and the visual evidence for biogenic activity.

MSLED will perform the following functions at the Whillans Subglacial Lake and possibly the grounding-line sites of the WISSARD project:

- * record the borehole ice properties, investigate the marine ice interface, examine distribution of entrained debris in basal ice, observe geometry of ice-water interface;
- * inspect the water column for suspended particles as well as possible aquatic organisms, search for visual evidence of water stratification and/or horizontal/vertical motion;
- * investigate the sea/lake floor for evidence of erosional and sedimentary processes (glacial flutings, subaqueous sediment failures, debris flows, deltas, drainage channels, etc.), record signs of possible bioturbation and/or evidence of benthic organisms.

The vehicle is ruggedized for the operation in depths of up to 1.5 km and within a range of one kilometer around the borehole. Video from a high-resolution camera for low light applications as well as salinity, temperature and depth measurements will be transmitted to the surface in real-time. The final design is being manufactured and will be deployed in an upcoming field test in near McMurdo Station scheduled for 2011 and an upcoming field deployment in 2013. This talk outlines the scientific background that inspired the mission, the deployment method as well as detailed information on the MSLED's subsystems, first implementations and tests.



Illustration of the Micro-Submersible Lake Exploration Device (MSLED).