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The NIU Sub Ice ROVer and other sub ice instrumentation – Update Report on the development of new tools for studying subglacial environments

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Subglacial environments are one of the last unexplored environments on Earth. However, subglacial environments in particular the interaction between subglacial hydrology and subglacial geology play a key role in the dynamic of ice sheets. In addition to playing a key role in the dynamics of ice sheets, subglacial environments play a yet unquantifiable role in the fertilization of the polar ocean and global ocean circulation and in this way impact the Earth's climate. They also contain valuable paleo-records

One of the greatest challenges exploring subglacial environments is access and the development of instrumentation suitable for this environment. Hidden beneath kilometer thick glacier ice, access to the subglacial environment is only possible through narrow boreholes or utilizing autonomous underwater robots traveling hundreds of kilometers accessing the sub ice shelf cavity from the open ocean. While standard oceanographic instrumentation can satisfy the basic depth requirements borehole access requires miniaturization and redesign or at least customization.

Here we present an update report on the development of such customized instrumentation; a Remote-Operated underwater Vehicle (ROV) and a Geochemical Instrumentation Package for Sub Ice Exploration (GIPSIE), suitable to be deployed through boreholes drilled to the bottom of the ice sheet. The Sub Ice ROVer (SIR) is equipped with a suite of oceanographic instrumentation enabling to gain a better understanding of hydrological and sedimentary processes and records in the sub ice shelf cavity and subglacial lakes In 2008 the SIR passed through the final assembly stage and its systems are currently tested. The GIPSIE is profiling unit equipped with an array of chemical sensors allowing among others measurements of the oxidation state, carbon dioxide and methane, hydrogen and hydrogen sulfide levels. Other equipment includes an automated water sampling system, a camera system and geochemical pore water profiler. Assembly and testing of the GIPSIE is expected to begin later in 2009.